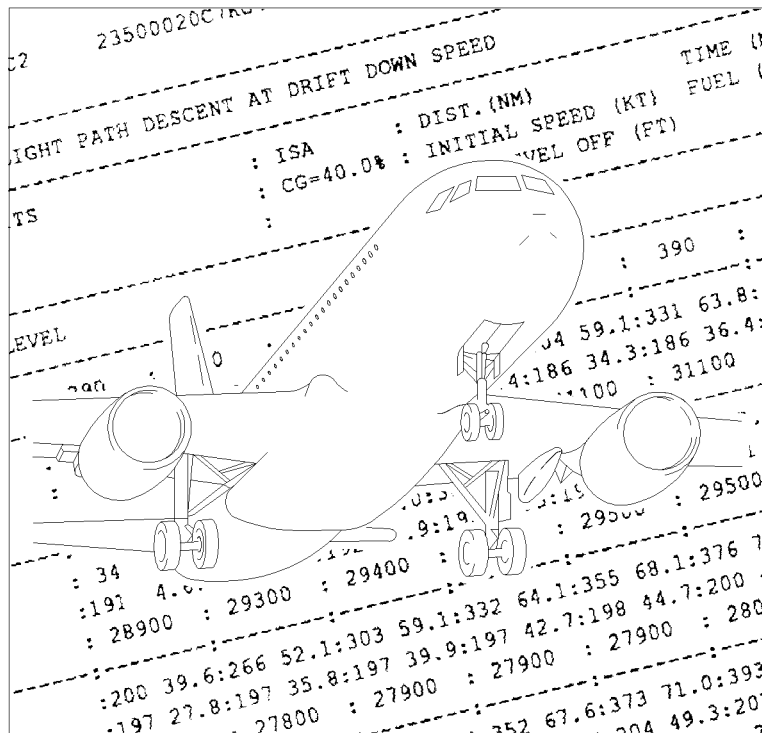


A318/A319/A320/A321

FLIGHT CREW OPERATING MANUAL



FLIGHT PREPARATION 2



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FOREWORD

This manual complements the approved Flight Manual. Airbus has attempted to ensure that the data contained in this manual agrees with the data in the Flight Manual. If there is any disagreement, the Flight Manual is the final authority.

COMMENTS — QUESTIONS — SUGGESTIONS

All manual holders and users are encouraged to submit any Flight Crew Operating Manual questions and suggestions to :

R

AIRBUS - BP N°33
 1 ROND POINT MAURICE BELLONTE
 31707 BLAGNAC CEDEX - FRANCE
 TELEX TLSBI7X or 530526F
 FAX 33.5.61.93.29.68
 ATTN. Flight Operations Support - STL
 EMAIL : fltops.fbwstd@airbus.com

FOR TECHNICAL OR
 PROCEDURAL
 CONTENT

AIRBUS - BP N°33
 1 ROND POINT MAURICE BELLONTE
 31707 BLAGNAC CEDEX - FRANCE
 TELEX TLSBP7X or 530526F
 FAX 33.5.61.93.28.06
 ATTN. Technical Documentation Services - SDC
 EMAIL : sb.reporting@airbus.com

FOR PRINTING AND
 DISTRIBUTION

NEC5-02-0010-001-A001AA

CONTENT

- R The Flight Crew Operating manual (FCOM), and the associated Quick Reference Handbook
 R (QRH), are developed specifically for flight crews, in order to provide them with all of the
 R necessary information about the operational, technical, procedural, and performance
 R characteristics that are required for the safe and efficient aircraft operation. These manuals
 R take into account all of the operational procedures to be applied during normal and
 R abnormal/emergency situations that may occur on ground or in flight.
 R The manuals are not designed to provide basic airmanship skills or piloting techniques.
 R They are intended for flight crews that have already been trained to fly this type of aircraft,
 R and are familiar with the aircraft's handling characteristics.
 R In addition, the purpose of the FCOM is to :
 R — Be used as a comprehensive reference guide during initial and refresher flight crew
 R training. Practical and training-related information is addressed in the Flight Crew
 R Training Manual (FCTM).
 R — Provide Airbus operators with a basis for their development of a customized airline
 R operations manual, in accordance with applicable requirements.

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- R The content is divided into four volumes :
- R Vol 1 = Systems' description (description of the aircraft systems).
- R Vol 2 = Flight preparation (performance information, plus loading data).
- R Vol 3 = Flight operations (operating procedures, techniques, and performance information).
- R Vol 4 = FMGS pilot's guide (procedures for FMGS use).

USE

As a comprehensive set of references, the FCOM :

- can be used by an operator's flight operations department to supplement its own crew manual
- can be issued directly to crew members for training and subsequently for line operations.

WARNINGS, CAUTIONS AND NOTES

WARNING : an operating procedure, technique, etc, which may result in personnel injury or loss of life if not carefully followed.

CAUTION : an operating procedure, technique, etc, which may result in damage to equipment if not carefully followed.

NOTE : an operating procedure, technique, etc, considered essential to emphasize.

COMPLEMENTARY INFORMATION

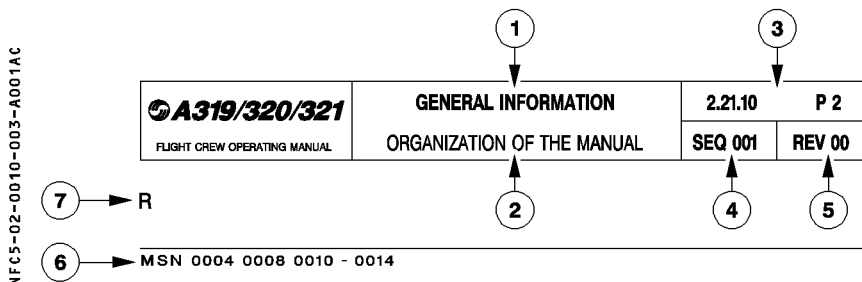
The manual includes technical information required for training as well as complementary information.

- Where a paragraph or schematic is preceded by the heading **FOR INFO** the details given are considered to be nice to know. Knowledge of these items is not required for the type rating qualification.
- ECAM warnings and cautions are summarized in a table at the end of each chapter of the volume 1. Numeric values are given for information only.

OPTIONAL EQUIPMENT

The legend ◁ indicates that a paragraph or a schematic is applicable only if the related equipment is installed.

PAGINATION



- ① Chapter title
- ② Subchapter title
- ③ FCOM volume number, chapter number, section number, page number
- ④ Sequence number is used for Airbus Industrie management of different aircraft configurations and allows to enter into list of effective pages
- ⑤ Revision number of the manual at which the page has been revised
- ⑥ Aircraft MSN
 - 0004 0008 means that the page is applicable to aircraft MSN 0004 and MSN 0008
 - 0010-0014 means that the page is applicable from aircraft MSN 0010 to MSN 0014
 - ALL means that the page is applicable to all aircraft covered by the manual.
 Correspondance between MSN and registration may be found in the cross reference table
- ⑦ An R in front of a line indicates that the line has been revised.

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REVISIONS

NORMAL REVISIONS

These are issued periodically to cover non-urgent corrections and changes and to add new data.

They are accompanied by filing instructions and an updated List of Effective Pages that includes customized pages.

A normal revision record sheet is at the front of each volume.

In addition, each volume has a list of modifications affecting the manual that gives a simple explanation of the technical content of each incorporated modification and its validity per aircraft.

R INTERMEDIATE REVISIONS

R They are issued between normal revisions to cover changes in the definition of the aircraft
R or changes in the composition of the fleet of an airline. They are numbered in ascending
R sequence e.g. 20A, 20B, 20C... for intermediate revisions issued between normal revisions
R 20 and 21.

R They are accompanied by filing instructions and an updated list of effective pages.

TEMPORARY REVISIONS

Printed on yellow paper, the Temporary Revisions (TR) are issued to cover urgent matters arising between normal revisions. They are accompanied by filing instructions and an updated customized list of effective TR.

A yellow temporary revision record sheet is at the front of each volume. It is to be filled by the FCOM's owner.

INCORPORATION OF SERVICE BULLETINS IN THE MANUAL

When a service bulletin has been accomplished on one or more aircraft of the operator fleet, and notified to Airbus Industrie, all affected manuals will reflect the new aircraft configuration at next revision. If judged necessary by Airbus Industrie or requested by the operator, a temporary revision or an intermediate revision is issued between normal revisions.

OPERATIONS ENGINEERING BULLETINS

The Operations Engineering Bulletins (OEB) are issued as the need arises to give operators revised or new, but significant, technical and procedural information.

OEBs come with an OEB record sheet. This record sheet is to be filled by the FCOM's owner.

They are accompanied by filing instructions and an updated customized list of effective OEBs.

HOW TO INSERT A REVISION

FILING INSTRUCTIONS

Use the filing instructions as follows :

- REMOVE : The page must be removed. It may be replaced by a new page if associated with an INSERT instruction. If not, the page is cancelled.
- INSERT : The page must be inserted. If not associated with a REMOVE instruction, the page is new for the operator fleet and does not replace an existing one.

The column NOTE indicates the reason for change. It states EFFECTIVITY CHANGE ONLY if the page is only revised due to effectivity change and not due to technical content.

LIST OF EFFECTIVE PAGES (LEP)

The manual after revision must comply with the LEP, which lists all the pages that are in the manual. The new pages are indicated by N and the revised pages by R.

BEST WAY TO GET UPDATED DOCUMENTATION

- R As soon as any change has been completed on any airplane, the best way to get
R updated documentation is to advise :
AIRBUS INDUSTRIE
BP 33
31707 BLAGNAC CEDEX
FRANCE
Telex : TLSBP7X.. or 530526F
FAX 33.5.61.93.28.06
ATTN : Customer Service Directorate – Technical Documentation Services (AI/SE – D)

To simplify automatic LEP processing some modifications have been grouped under a common code.

CODE	DESIGNATION
0002	STD = Mod : 22013 = 24373 = 30961 = (24373+30961)
0003	Mod : 20268 = (20139+20268+22129)
0004	Mod : 20268 = (20268+L) = (20139+20268+22129) = (20139+20268+22129+L)
0005	Mod : (20268+25647) = (20268+25647+ACA)
0008	Mod : 24404 = 24405 = (24404+25800) = (24405+25800) = (25800+27727) = (24404+25800+27727) = (24405+25800+27727)
0009	STD = Mod : 25800 = (24405+25501) = (24405+25501+25800)
0010	Mod : 24405 = (24405+25800) = (25800+27727) = (24405+25800+27727)
0013	IAE V2522 = V2524 = V2527M = V2530 = V2533 = (Mod : 28160+IAE V2500 = V2527 = V2527E)
0014	CFM 56-5-A4 = A5 = (Mod : 28160+CFM 56-5-A1 = A3)
0015	CFM 56-5-B1 = B2 = B3 = B5 = B6 = B7 = B8 = (Mod : 28160+CFM 56-5-B4)
0017	Mod : 24404 = (24404+25800) = (25800+27727) = (24404+25800+27727)
0018	Mod : 25530 = (25530+25800) = (25800+27727) = (25530+25800+27727)
0019	STD = Mod : 25800 = (24404+25502) = (24404+25502+25800)
R 0020	Mod : (22013+36310) = (22013+25800+36310)
0021	Mod : (20024+20167) = (20024+20167+21120+23869) = (20024+20167+21120+22802+23869)
R 0022	Mod : (20040+20065+20106+20107+21103+22013+25453)
0023	Mod : (20268+25530) = (20268+25530+25800) = (20268+25800+27727) = (20268+25530+25800+27727)
0024	Mod : (20024+20167) = (20024+20167+22802) = (20024+20167+21120+23869) = (20024+20167+21120+22802+23869)
0025	Mod : (20024+20167+22013) = (20024+20167+22013+22802) = (20024+20167+20586+22013+22802)
0026	Mod : (20024+20167+21120) = (20024+20167+21120+22802)
R 0028	Mod : (20040+20065+20106+20107+21103+22013+30422) = (20040+20065+20106+20107+21103+22013+25453+30422)
0029	STD = Mod : 22802 = (20586+22802)
0030	Mod : 22013 = (22013+22802) = (20586+22013+22802)
0031	Mod : 20024 = (20024+22802) = (20024+20586+22802)
0033	Mod : (20164+24373) = (20164+22013+24373)
R 0034	Mod : (21103+28378) = (21103+25714+26131)
R 0035	Mod : (20268+32121) = (21103+25714+26131) = (20268+32121+36885) = (20268+32121+36311) = (20268+32121+36297)
0041	Mod : 22461 = 23408 = (22461+23408)
0042	Mod : (20268+22013) = (20268+22013+25141)
0043	Mod : (20268+25714) = (20268+25714+26131)
0044	Mod : 22461 = 23108 = 23871 = (22461+26018) = (22461+26645) = (23108+26018) = (23871+26018) = (23871+26645) = (22461+23108+23109) = (22461+26018+26645) = (23871+26018+26645) = (22461+23108+23109+26018)
0045	Mod : (20268+22461) = (20268+23408) = (20268+22461+23408) = (20139+20268+22129+22461+23408)
0046	Mod : (25615+26018+26645) = (23108+25615+26018+26645)

CODE	DESIGNATION
0047	Mod : (25615+26018) = (23108+25615+26018)
0048	Mod : 20268 = (20268+25800) = (20268+24405+25501) = (20268+24405+25501+25800)
0049	Mod : (20268+24405) = (20268+24405+25800) = (20268+25800+27727) = (20268+24405+25800+27727)
0050	Mod : (20268+24404) = (20268+24404+25800) = (20268+25800+27727) = (20268+24404+25800+27727)
0051	Mod : 20268 = (20268+25800) = (20268+24404+25502) = (20268+24404+25502+25800)
0052	Mod : 20268 = (20268+25800)
0053	Mod : (20268+28238) = (20268+25800+28238)
0055	STD = Mod : (20139+22129) = (20139+22129+28160+28917)
0056	Mod : 20139 = (20139+28160+28917)
0058	Mod : 22461 = 23408 = (22461+23408)
0067	Mod : (20268+24044+28721+31607) = (20268+24044+28960+31607)
0068	Mod : (20268+25647) = (20268+ACA)
0069	Mod :26723 = 27410 = 27639 = 27763 = 30277 = 30835 = 30836
0070	Mod : 20268 = (20268+25800) = (20268+24404+35404) = (20268+27727+35404) = (20268+24404+25800+35404) = (20268+24404+27727+35404) = (20268+25800+27727+35404) = (20268+24404+25800+27727+35404)
0071	Mod : 20268 = (20268+25800) = (20268+24404+25502) = (20268+24404+35404) = (20268+27727+35404) = (20268+24404+25502+25800) = (20268+24404+25800+35404) = (20268+24404+27727+35404) = (20268+25800+27727+35404) = (20268+24404+25800+27727+35404)
0072	STD = Mod : 25800 = (24404+35404) = (27727+35404) = (24404+27727+35404) = (24404+25800+35404) = (25800+27727+35404) = (24404+25800+27727+35404)
0073	STD = Mod : 24404 = 24405 = (24404+25502) = (24405+25501) = (24404+35404) = (27727+35404) = (24404+25502+25800) = (24405+25501+25800) = (24404+27727+35404) = (24404+25800+35404) = (25800+27727+35404) = (24404+25800+27727+35404)
0075	Mod : (20268+24044+25647) = (20268+24044+ACA) = (20268+24044+25647+ACA)
0076	Mod : (20268+28721) = (20268+28960)
0077	Mod : (20268+24044+28721) = (20268+24044+28960)
0078	Mod : (20268+28238) = (20268+25800+28238)
0079	Mod : 20268 = (20268+25647)
0080	Mod : (20268+25647) = (ACA = CMM) = (20268+25647+ACA = CMM)
0081	STD = Mod : 24105 = 27773 = (24105+27773) = (24105+27773+28471)
0082	Mod : (20268+24044+25647) = (20268+24044+ACA) = (20268+24044+25647+ACA) = (20268+24044+25647+28960+ACA)
0083	Mod : (20024+20167+22013+30422) = (20024+20167+22013+25453+30422)
0084	Mod : (20024+25453) = (20024+20164+25453) = (20024+20586+25453)
0086	Mod : (20024+22013+25453) = (20024+22013+30422) = (20024+22013+25453+30422)
0087	Mod : (20024+22013+25453+31286) = (20024+22013+30422+31286) = (20024+22013+25453+30422+31286)
0090	Mod : (20268+24946+26965) = (20268+24946+27773) = (20268+25951+26965) = (20268+25951+27773) = (20268+26760+26965) = (20268+26760+27773) = (20268+26965+32150) = (20268+26965+32238) = (20268+26965+32239) = (20268+26965+32311) = (20268+27773+32150) = (20268+27773+32238) = (20268+27773+32239) = (20268+27773+32311) = (20268+26965+35040) = (20268+27773+35040)

	CODE	DESIGNATION
R	0091	Mod : 22013 = (22013+32656) = (22013+34221) = (22013+34221+32656)
	0092	Mod : (24946+26965) = (24946+27773) = (25951+26965) = (25951+27773) = (26760+26965) = (26760+27773) = (26965+32150) = (26965+32238) = (26965+32239) = (26965+32311) = (27773+32150) = (27773+32238) = (27773+32239) = (27773+32311) = (26965+35040) = (27773+35040)
	0093	Mod : 25530 = (25530+25800) = (25800+27727) = (25530+25800+27727)
	0094	Mod : (24946+25615+26965) = (24946+25615+27773) = (25615+25951+26965) = (25615+25951+27773) = (25615+26760+26965) = (25615+26760+27773) = (25615+26965+32150) = (25615+26965+32238) = (25615+26965+32239) = (25615+26965+32311) = (25615+27773+32150) = (25615+27773+32238) = (25615+27773+32239) = (25615+27773+32311) = (25615+26965+35040) = (25615+27773+35040)
	0095	Mod : (20268+24946+26965) = (20268+24946+27773) = (20268+25951+26965) = (20268+25951+27773) = (20268+26760+26965) = (20268+26760+27773) = (20268+26965+32150) = (20268+26965+32238) = (20268+26965+32239) = (20268+26965+32311) = (20268+27773+32150) = (20268+27773+32238) = (20268+27773+32239) = (20268+27773+32311) = (20268+26965+35040) = (20268+27773+35040) = (20268+24946+26965+US) = (20268+24946+27773+US) = (20268+25951+26965+US) = (20268+25951+27773+US) = (20268+26760+26965+US) = (20268+26760+27773+US) = (20268+26965+32150+US) = (20268+26965+32238+US) = (20268+26965+32239+US) = (20268+26965+32311+US) = (20268+27773+32150+US) = (20268+27773+32238+US) = (20268+27773+32239+US) = (20268+27773+32311+US)
R	0096	Mod : (20024+20164+20586) = (20024+20164+37565)
	0097	Mod : (20268+26965) or (20268+31106)
	0098	Mod : (20268+25647+26965) = (20268+25647+31106) = (20268+26965+ACA = MXA) = (20268+31106+ACA = MXA)
R R R R	0099	Mod : (20268+25647+26965) = (20268+25647+31106)
	0100	Mod : (20024+20167+22013) = (20024+20167+20586+22013) = (20024+20167+22013+37565)
	0101	Mod : (20024+20586+28238) = (20024+28238+37565)
	0102	Mod : (22461+27773+32311) = (22461+27773+32150) = (22461+27773+24946) = (22461+27773+26760) = (22461+27773+32238) = (22461+27773+25951) = (22461+27773+32239) = (22461+26965+32311) = (22461+26965+32150) = (22461+26965+24946) = (22461+26965+26760) = (22461+26965+32238) = (22461+26965+25951) = (22461+26965+32239) = (22461+26965+35040) = (22461+27773+32311) = (23408+27773+32150) = (23408+27773+24946) = (23408+27773+26760) = (23408+27773+32238) = (23408+27773+25951) = (23408+27773+32239) = (23408+26965+32311) = (23408+26965+24946) = (23408+26965+26760) = (23408+26965+32238) = (23408+26965+25951) = (23408+26965+32239) = (23408+26965+35040) = (23408+27773+35040) = (22461+23408+27773+32311) = (22461+23408+27773+24946) = (22461+23408+27773+26760) = (22461+23408+27773+32238) = (22461+23408+27773+25951) = (22461+23408+27773+32239) = (22461+23408+26965+32311) = (22461+23408+26965+32150) = (22461+23408+26965+24946) = (22461+23408+26965+26760) = (22461+23408+26965+32238) = (22461+23408+26965+25951) = (22461+23408+26965+32239) = (22461+23408+26965+35040) = (22461+23408+27773+35040)
R	0103	Mod : (20268+25647+CFM 56-5-B6) = (ACA = MXA+CFM 56-5-B6)
	0104	Mod : (20024+20167+21120+22013) = (20024+20167+20586+21120+22013)

CODE	DESIGNATION
0105	Mod : (20268+24946+25647+27773) = (20268+25647+27773+32311) = (20268+25647+27773+32150) = (20268+25647+26760+27773) = (20268+25647+27773+32238) = (20268+25647+27773+32239) = (20268+25647+25951+27773) = (20268+24946+25647+26965) = (20268+25647+26965+32311) = (20268+25647+26965+32150) = (20268+25647+26760+26965) = (20268+25647+26965+32238) = (20268+25647+26965+32239) = (20268+25647+25951+26965) = (20268+25647+26965+35040) = (20268+25647+27773+35040) = (20268+24946+27773+ACA) = (20268+27773+32311+ACA) = (20268+27773+32150+ACA) = (20268+26760+27773+ACA) = (20268+27773+32238+ACA) = (20268+27773+32239+ACA) = (20268+25951+27773+ACA) = (20268+24946+26965+ACA) = (20268+26965+32311+ACA) = (20268+26965+32150+ACA) = (20268+26760+26965+ACA) = (20268+26965+32238+ACA) = (20268+26965+32239+ACA) = (20268+25951+26965+ACA) = (20268+26965+35040+ACA) = (20268+27773+35040+ACA)
0106	Mod : (20268+22461+27773+32311) = (20268+22461+27773+32150) = (20268+22461+27773+24946) = (20268+22461+27773+26760) = (20268+22461+27773+32238) = (20268+22461+27773+25951) = (20268+22461+27773+32239) = (20268+22461+26965+32311) = (20268+22461+26965+32150) = (20268+22461+26965+24946) = (20268+22461+26965+26760) = (20268+22461+26965+32238) = (20268+22461+26965+25951) = (20268+22461+26965+32239) = (20268+22461+26965+35040) = (20268+22461+27773+35040) = (20268+23408+27773+32311) = (20268+23408+27773+32150) = (20268+23408+27773+24946) = (20268+23408+27773+26760) = (20268+23408+27773+32238) = (20268+23408+27773+25951) = (20268+23408+27773+32239) = (20268+23408+26965+32311) = (20268+23408+26965+32150) = (20268+23408+26965+24946) = (20268+23408+26965+26760) = (20268+23408+26965+32238) = (20268+23408+26965+25951) = (20268+23408+26965+32239) = (20268+23408+26965+35040) = (20268+23408+27773+35040) = (20268+22461+23408+27773+32311) = (20268+22461+23408+27773+32150) = (20268+22461+23408+27773+24946) = (20268+22461+23408+27773+26760) = (20268+22461+23408+27773+32238) = (20268+22461+23408+27773+25951) = (20268+22461+23408+26965+32311) = (20268+22461+23408+26965+32150) = (20268+22461+23408+26965+24946) = (20268+22461+23408+26965+26760) = (20268+22461+23408+26965+32238) = (20268+22461+23408+26965+25951) = (20268+22461+23408+26965+32239) = (20268+22461+23408+26965+35040) = (20268+22461+23408+27773+35040)
0107	Mod : (24946+25647+27773) = (25647+27773+32311) = (25647+27773+32150) = (25647+26760+27773) = (25647+27773+32238) = (25647+27773+32239) = (25647+25951+27773) = (24946+25647+26965) = (25647+26965+32311) = (25647+26965+32150) = (25647+26760+26965) = (25647+26965+32238) = (25647+26965+32239) = (25647+25951+26965) = (25647+26965+35040) = (25647+27773+35040) = (24946+27773+ACA) = (27773+32311+ACA) = (27773+32150+ACA) = (26760+27773+ACA) = (27773+32238+ACA) = (27773+32239+ACA) = (25951+27773+ACA) = (24946+26965+ACA) = (26965+32311+ACA) = (26965+32150+ACA) = (26760+26965+ACA) = (26965+32238+ACA) = (26965+32239+ACA) = (25951+26965+ACA) = (26965+35040+ACA) = (27773+35040+ACA)

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0108	$\text{Mod : (24946+25647+26965) = (24946+25647+27773) = (25647+25951+26965) = (25647+26760+26965) = (25647+25951+27773) = (25647+26760+27773) = (25647+26965+32150) = (25647+26965+32238) = (25647+26965+32239) = (25647+26965+32311) = (25647+27773+32150) = (25647+27773+32238) = (25647+27773+32239) = (25647+27773+32311) = (25647+26965+35040) = (25647+27773+35040) = (24946+26965+ACA) = (24946+27773+ACA) = (25951+26965+ACA) = (26760+26965+ACA) = (25951+27773+ACA) = (26760+27773+ACA) = (26965+32150+ACA) = (26965+32238+ACA) = (26965+32239+ACA) = (26965+32311+ACA) = (27773+32150+ACA) = (27773+32238+ACA) = (27773+32239+ACA) = (27773+32311+ACA) = (26965+35040+ACA) = (27773+35040+ACA)}$
0109	Mod : (20268+25647) = ACA = (20268+25647+ACA)
0110	Mod : (20268+25647) = ACA = MXA = (20268+ACA = MXA) = (20268+25647+ACA = MXA)
0111	Mod : (20024+20167+28238) = (20024+20167+28238+32635+35649)
0112	Mod : 34456 = (20024+34456) = (20024+37226) = (20024+20164+34456) = (20024+20586+34456)
0113	Mod : 20268 = (20268+25800) = (20268+25530+26505) = (20268+25530+25800+26505)
0114	STD = Mod : 25800 = (25530+26505) = (25530+25800+26505)
0115	Mod : (20268+31106+33323) = (20268+26965+33323)
0116	Mod : (20268+25647+31106) = (20268+25647+26965)
0117	Mod : (20024+20167+28378) = (20024+20167+33973)
0118	Mod : (20268+32619) = (20268+33239) = (20268+32619+33239)
0119	Mod : (20268+28342+32619) = (20268+28342+33239) = (20268+28342+32619+33239)
0120	$\text{"Mod: (24946+26965+20268+32619) = (24946+27773+20268+32619) = (25951+26965+20268+32619) = (25951+27773+20268+32619) = (26760+26965+20268+32619) = (26760+27773+20268+32619) = (26965+32150+20268+32619) = (26965+32238+20268+32619) = (26965+32239+20268+32619) = (26965+32311+20268+32619) = (26965+35040+20268+32619) = (27773+35040+20268+32619) = (27773+32150+20268+32619) = (27773+32238+20268+32619) = (27773+32239+20268+32619) = (27773+32311+20268+32619) = (24946+26965+20268+33239) = (24946+27773+20268+33239) = (25951+26965+20268+33239) = (25951+27773+20268+33239) = (26760+26965+20268+33239) = (26760+27773+20268+33239) = (26965+32150+20268+33239) = (26965+32238+20268+33239) = (26965+32239+20268+33239) = (26965+32311+20268+33239) = (27773+32150+20268+33239) = (27773+32238+20268+33239) = (27773+32239+20268+33239) = (27773+32311+20268+33239) = (27773+32239+20268+33239) = (27773+32311+20268+33239) = (24946+26965+20268+32619+33239) = (24946+27773+20268+32619+33239) = (25951+26965+20268+32619+33239) = (25951+27773+20268+32619+33239) = (26760+26965+20268+32619+33239) = (26760+27773+20268+32619+33239) = (26965+32150+20268+32619+33239) = (26965+32238+20268+32619+33239) = (26965+32239+20268+32619+33239) = (26965+32311+20268+32619+33239) = (27773+32150+20268+32619+33239) = (27773+32238+20268+32619+33239) = (27773+32239+20268+32619+33239) = (27773+32311+20268+32619+33239) = (ACA + 20268+25647+27773+32311) = (ACA + 20268+25647+27773+32150) = (ACA + 20268+25647+27773+24946) = (ACA + 20268+25647+27773+26760) = (ACA + 20268+25647+27773+32238) = (ACA + 20268+25647+27773+32239) = (ACA + 20268+25647+27773+25951) = (ACA + 20268+25647+26965+32311) = (ACA + 20268+25647+26965+32150) = (ACA + 20268+25647+26965+24946) = (ACA + 20268+25647+26965+26760) = (ACA + 20268+25647+26965+32238) = (ACA + 20268+25647+26965+32239) = (ACA + 20268+25647+26965+25951) = (ACA+20268+25647+26965+35040) = (ACA+20268+25647+27773+35040)}$
0121	$\text{Mod : (20024+28378) = (20024+33973) = (20024+20164+33973) = (20024+20164+20586+28378)}$

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	0122	Mod : 25453 = 28378 = 30422 = 33973 = 34456 = 37226
	0123	Mod : (20024+28378) = (20024+33973) = (20024+34456) = (20024+37226)
	0124	Mod : (20268+26965) = (20268+31106)
	0125	Mod : (20268+28342+31106) = (20268+28342+26965)
	0126	Mod : (20024+22013) = (22013+24024+32115+32622)
	0127	Mod : (20024+30422) = (20024+20164+30422) = (20024+20586+30422) = (20024+25453+30422) = (20024+20164+25453+30422) = (20024+20586+25453+30422) = (20024+25453+30422+32255)
	0128	Mod : 20164 = (20164+22013) = (20164+30961) = (20164+24373+30961) = (22013+32255)
	0129	Mod: (20268+24946+26965+33323) = (20268+24946+27773+33323) = (20268+25951+26965+33323) = (20268+25951+27773+33323) = (20268+26760+26965+33323) = (20268+26760+27773+33323) = (20268+26965+32150+33323) = (20268+26965+32238+33323) = (20268+26965+32239+33323) = (20268+26965+32311+33323) = (20268+27773+32150+33323) = (20268+27773+32238+33323) = (20268+27773+32239+33323) = (20268+27773+32311+33323) = (20268+26965+35040+33323) = (20268+27773+35040+33323)
	0130	Mod: (24946+26965+33323) = (24946+27773+33323) = (25951+26965+33323) = (25951+27773+33323) = (26760+26965+33323) = (26760+27773+33323) = (26965+32150+33323) = (26965+32238+33323) = (26965+32239+33323) = (26965+32311+33323) = (27773+32150+33323) = (27773+32238+33323) = (27773+32239+33323) = (27773+32311+33323) = (26965+35040+33323) = (27773+35040+33323)
	0131	Mod: (20268+28342+31106) = (20268+26965+28342)
	0132	Mod: (20268+31106) = (20268+26965)
	0133	Mod: (20268+24946+26965+25647) = (20268+24946+27773+25647) = (20268+25951+26965+25647) = (20268+25951+27773+25647) = (20268+26760+26965+25647) = (20268+26760+27773+25647) = (20268+26965+32150+25647) = (20268+26965+32238+25647) = (20268+26965+32239+25647) = (20268+26965+32311+25647) = (20268+27773+32150+25647) = (20268+27773+32238+25647) = (20268+27773+32239+25647) = (20268+27773+32311+25647) = (20268+26965+35040+25647) = (20268+27773+35040+25647)
	0134	Mod : 22013 = 24105 = (24946+26965) = (24946+27773) = (25951+26965) = (25951+27773) = (26760+26965) = (26760+27773) = (26965+32150) = (26965+32238) = (26965+32239) = (26965+32311) = (26965+35040) = (27773+35040) = (27773+32150) = (27773+32238) = (27773+32239) = (27773+32311)
	0135	Mod : (32401+33323+31426) = (32402+33323+31426) = (32475+33323+31426) = (32929+33323+31426)
	0136	Mod : (24946+26965+20268+32656) = (24946+27773+20268+32656) = (25951+26965+20268+32656) = (25951+27773+20268+32656) = (26760+26965+20268+32656) = (26760+27773+20268+32656) = (26965+32150+20268+32656) = (26965+32238+20268+32656) = (26965+32239+20268+32656) = (26965+32311+20268+32656) = (26965+35040+20268+32656) = (27773+35040+20268+32656) = (27773+32150+20268+32656) = (27773+32238+20268+32656) = (27773+32239+20268+32656) = (27773+32311+20268+32656)
	0137	Mod : (21103+21897+21898+22013) = (21103+21897+22013)
	0138	Mod : (21103+22013+25453+30422) = (21103+22013+30422)
	0139	Mod : (20040+20065+20106+20107) = (20040+20065+20106)
	0141	Mod : (20040+20065+20106+21103) = (20040+20065+20106+20107+21105)
	0142	Mod : (21103+30243) = (21103+30243+33223)
	0143	Mod : 21103 = (20107+21103)
	0144	Mod : (21103+24105+28238) = (21103+24105+28238+32635)

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0145	Mod : (20040+20065+21103+24105+24821+26372) = (20040+20065+21103+24105+24821+25940)
0146	Mod : (21103+22013+25453) = (21103+21897+22013+25453) = (20040+20065+21103+21897+21898+22013+25453)
0147	Mod : 25453 = 28378 = 28378 = 30422 = 33973 = 34456 = 37226
0148	Mod : (22013+36310) = (22013+36310+25800)
0149	Mod : (20268+36310) = (20268+25800+36310)
0150	Mod : (21103+22013+25453+25940) = (21103+21897+21898+22013+25453+25940)
0151	Mod : (20040+20065+21103+22013+25453+25940) = (21103+21897+21898+22013+25453+25940)
0152	Mod : 31896 = 31897 = 32401 = 32402 = 32475 = 32929 = 35119 = (31896+32401) = (31896+32402) = (31897+32401) = (31897+32929) = (32333+32929) = (31896+32332+32475) = (31897+32333+32929) = (31896+32332+35119)
0153	Mod : (21103+24105+28238+32457) = (21103+24105+28238+32457+32635)
0154	Mod : (20040+20065+21103+24105+24821) = (21897+21898+21103+24105+24821) = (21103+21897+21898+24105+24821+26638+26639)
0158	Mod : (20268+31106) = (20268+26965)
0159	Mod : 22013 = 24105 = (27773+32311) = (27773+32150) = (27773+24946) = (27773+26760) = (27773+32238) = (27773+32239) = (26965+32311) = (26965+32150) = (26965+24946) = (26965+26760) = (26965+32238) = (26965+32239) = (26965+35040) = (27773+35040)
0160	Mod : (20268+24044+31701) = (20268+24044+34818)
0161	Mod : (20268+24946+26965+33171) = (20268+24946+27773+33171) = (20268+25951+26965+33171) = (20268+25951+27773+33171) = (20268+26760+26965+33171) = (20268+26760+27773+33171) = (20268+26965+32150+33171) = (20268+26965+32238+33171) = (20268+26965+32239+33171) = (20268+26965+32311+33171) = (20268+27773+32150+33171) = (20268+27773+32238+33171) = (20268+27773+32239+33171) = (20268+27773+32311+33171) = (20268+26965+35040+33171) = (20268+27773+35040+33171)
0162	Mod : (20268+32656) = (20268+26342+34221)
0163	Mod : 20268 = (20268+28342+34221)
0164	Mod : 31896 = 31897 = 32401 = 32402 = 32475 = 32929 = 35119 = (31896+32332+32475) = (31897+32333+32929) = (31896+32332+35119)
0165	Mod : (20024+20167+21120) = (20024+20167+21120+22802)
0166	Mod : (30397+27714) = (30397+25910) = (30397+31039) = (30397+31528) = (28685+30397+34506) = (27714+28685+30397+31528+34506)
0168	Mod : (20040+20065+21103+24105) = (21103+21897+21898+24105) = (21103+24105+26638+26639) = (21103+24105+28319+28322) = (21103+21897+21898+24105+26638+26639)
0169	Mod : (21897+22013+25453) = (22013+25453+25905) = (22013+25453+25907) = (22013+25453+21898)
0170	Mod : (22013+25453+25905+30422) = (22013+25453+25907+30422) = (22013+25905+30422) = (22013+25907+30422)
0171	Mod : (20268+26965+28342) = (20268+28342+31106) = (20268+28342)
0173	Mod : STD = 26925 = (30397+33865)
0175	Mod : 20268 = (20268+25800) = (20268+24404) = (20268+24404+25502) = (20268+24404+25800) = (20268+25800+27727) = (20268+24404+25502+25800) = (20268+24404+25800+27727)

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0176	$\text{Mod : (20268+24946+26965+34041) = (20268+24946+27773+34041) =}$ $(20268+25951+26965+34041) = (20268+25951+27773+34041) =$ $(20268+26760+26965+34041) = (20268+26760+27773+34041) =$ $(20268+26965+32150+34041) = (20268+26965+32238+34041) =$ $(20268+26965+32239+34041) = (20268+26965+32311+34041) =$ $(20268+27773+32150+34041) = (20268+27773+32238+34041) =$ $(20268+27773+32239+34041) = (20268+27773+32311+34041) =$ $(20268+26965+35040+34041) = (20268+27773+35040+34041)$
0177	$\text{Mod : (21103+34456) = (20040+20065+21103+34456)}$
0178	$\text{Mod : (21103+24105+28319+28322+31687) = (21103+24105+31687)}$
0179	$\text{Mod : (21103+21897+21898) = (20106+20107+21103+21897+21898) =}$ $(21103+28330)$
0180	$\text{Mod : (20040+20065+21103+28378) = (20040+20065+21103+28378+34456)}$
0182	$\text{Mod : (20024+20167+34456) = (20024+20167+28378+34456)}$
0183	$\text{Mod : (24105+30020) = (20268+24105+30020)}$
0184	$\text{Mod : (23871+24946+26965) = (23871+24946+27773) = (23871+25951+26965) =}$ $(23871+25951+27773) = (23871+26760+26965) = (23871+26760+27773) =$ $(23871+26965+32150) = (23871+26965+32238) = (23871+26965+32311) =$ $(23871+26965+32311) = (23871+27773+32150) = (23871+27773+32238) =$ $(23871+27773+32239) = (23871+27773+32311) = (23871+26965+35040) =$ $(23871+27773+35040)$
0185	$\text{Mod : 22013 = 24105 = (MXA+24105) = (((24946+26965) = (24946+27773) =}$ $(25951+26965) = (25951+27773) = (26760+26965) = (26760+27773) =$ $(26965+32150) = (26965+32238) = (26965+32239) = (26965+32311) =$ $(27773+32150) = (27773+32238) = (27773+32239) = (27773+32311) =$ $(26965+35040) = (27773+35040))+56-5-a1)$
0186	$\text{Mod : 20268 = (20268+26346+N:US)}$
0187	$\text{Mod : 20268 = (20268+26346+22129) = (20268+26346+N:US)}$
0188	$\text{Mod : 22013 = 24105 = (20268+22013) = (20268+24105) =}$ $(24946+26965+Eng:56-5A1) = (24946+27773+Eng:56-5A1) =$ $(25951+26965+Eng:56-5A1) = (25951+27773+Eng:56-5A1) =$ $(26760+26965+Eng:56-5A1) = (26760+27773+Eng:56-5A1) =$ $(26965+32150+Eng:56-5A1) = (26965+32238+Eng:56-5A1) =$ $(26965+32239+Eng:56-5A1) = (26965+32311+Eng:56-5A1) =$ $(27773+32150+Eng:56-5A1) = (27773+32238+Eng:56-5A1) =$ $(27773+32239+Eng:56-5A1) = (27773+32311+Eng:56-5A1) =$ $(26965+35040+Eng:56-5A1) = (27773+35040+Eng:56-5A1)$
0189	$\text{Mod : 22013 = 24105 = (24946+26965) = (24946+27773) = (25951+26965) =}$ $(25951+27773) = (26760+26965) = (26760+27773) = (26965+32150) =$ $(26965+32238) = (26965+32239) = (26965+32311) = (27773+32150) =$ $(27773+32238) = (27773+32239) = (27773+32311) = (26965+35040) =$ $(27773+35040)$
0190	$\text{Mod : 22013 = 24105 = (24946+26965+Eng:56-5A1) = (24946+27773+Eng:56-5A1) =}$ $(25951+26965+Eng:56-5A1) = (25951+27773+Eng:56-5A1) =$ $(26760+26965+Eng:56-5A1) = (26760+27773+Eng:56-5A1) =$ $(26965+32150+Eng:56-5A1) = (26965+32238+Eng:56-5A1) =$ $(26965+32239+Eng:56-5A1) = (26965+32311+Eng:56-5A1) =$ $(27773+32150+Eng:56-5A1) = (27773+32238+Eng:56-5A1) =$ $(27773+32239+Eng:56-5A1) = (27773+32311+Eng:56-5A1) =$ $(26965+35040+Eng:56-5A1) = (27773+35040+Eng:56-5A1)$

CODE	DESIGNATION
0191	$\text{Mod : (22013+25647) = (24105+25647) = (24946+25647+26965) = (24946+25647+27773) = (25647+25951+26965) = (25647+26760+26965) = (25647+25951+27773) = (25647+26760+27773) = (25647+26965+32150) = (25647+26965+32238) = (25647+26965+32239) = (25647+26965+32311) = (25647+27773+32150) = (25647+27773+32238) = (25647+27773+32239) = (25647+27773+32311) = (25647+27773+35040) = (25647+26965+35040) = (24946+26965+ACA) = (24946+27773+ACA) = (25951+26965+ACA) = (26760+26965+ACA) = (25951+27773+ACA) = (26760+27773+ACA) = (26965+32150+ACA) = (26965+32238+ACA) = (26965+32239+ACA) = (26965+32311+ACA) = (27773+32150+ACA) = (27773+32238+ACA) = (27773+32239+ACA) = (27773+32311+ACA) = (27773+35040+ACA) = (26965+35040+ACA)}$
0192	$\text{Mod : 22013 = 24105 = (24946+26965) = (24946+27773) = (25951+26965) = (25951+27773) = (26760+26965) = (26760+27773) = (26965+32150) = (26965+32238) = (26965+32239) = (26965+32311) = (27773+32150) = (27773+32238) = (27773+32239) = (27773+32311) = (27773+35040) = (26965+35040)}$
0193	$\text{Mod : 28685 = 28686 = (27714+28685+31528) = (27714+28685) = (27714+28686) = (27714+28686+31039)}$
0194	$\text{Mod : 31528 = 31039 = 25910 = 27714 = (28685+34506) = (28686+34506) = (27714+28685+31528+34506)}$
0197	$\text{Mod : (27714+30397+35165) = (30397+35165+31039) = (30397+35165+31528)}$
0198	$\text{Mod : (23779+25910) = (23779+27714) = (23779+25910+28685+34506) = (23779+27714+28685+34506) = (23779+27714+28686+34506)}$
0199	$\text{Mod : (23779+31039) = (23779+31528) = (23779+27714+31039) = (23779+27714+31528) = (23779+27714+28685+31528+34506)}$
0200	$\text{Mod : 25910 = 27714 = (25910+28685+34506) = (27714+28685+34506) = (27714+28686+34506)}$
0201	$\text{Mod : 31039 = 31528 = (27714+31039) = (27714+31528) = (27714+28685+31528+34506)}$
0202	$\text{Mod : 25453 = 28238 = 28378 = 30422 = 33973 = 34456}$
0203	$\text{STD = Mod : (31896+32332) = (31897+32333)}$
0205	$\text{Mod : (25615+23124) = (25615+28009)}$
0206	$\text{Mod : (21103+28378+33223) = (21103+25714+26131+33223)}$
0208	$\text{Mod : (25615+32619) = (25615+33239)}$
0213	$\text{Mod : (20268+34221) = (20268+34221+32656)}$
0214	$\text{Mod : (24105+34221) = (24105+34221+32656)}$
0215	$\text{Mod : (20268+36310) = (20268+25800+36310) = (20268+24404+25502+36310) = (20268+24404+25502+25800+36310)}$
0216	$\text{"Mod : (20268+36297) = (20268+24946+26965+36297) = (20268+24946+27773+36297) = (20268+25951+26965+36297) = (20268+25951+27773+36297) = (20268+26760+26965+36297) = (20268+26760+27773+36297) = (20268+26965+32150+36297) = (20268+26965+32238+36297) = (20268+26965+32239+36297) = (20268+26965+32311+36297) = (20268+27773+32150+36297) = (20268+27773+32238+36297) = (20268+27773+32239+36297) = (20268+27773+32311+36297) = (20268+26965+35040+36297) = (20268+27773+35040+36297)"}$
0219	$\text{Mod : (20268+36311) = (20268+36297)}$

CODE	DESIGNATION
0223	$\text{Mod : } 36750 = (24946 + 25615 + 26965 + 36750) = (24946 + 25615 + 27773 + 36750) =$ $(25615 + 25951 + 26965 + 36750) = (25615 + 25951 + 27773 + 36750) =$ $(25615 + 26760 + 26965 + 36750) = (25615 + 26760 + 27773 + 36750) =$ $(25615 + 26965 + 32150 + 36750) = (25615 + 26965 + 32238 + 36750) =$ $(25615 + 26965 + 32239 + 36750) = (25615 + 26965 + 32311 + 36750) =$ $(25615 + 27773 + 32150 + 36750) = (25615 + 27773 + 32238 + 36750) =$ $(25615 + 27773 + 32239 + 36750) = (25615 + 27773 + 32311 + 36750) =$ $(25615 + 26965 + 35040 + 36750) = (25615 + 27773 + 35040 + 36750)$
0224	$\text{Mod : } 26750 = (24946 + 26965 + 36750) = (24946 + 27773 + 36750) =$ $(25951 + 26965 + 36750) = (25951 + 27773 + 36750) = (26760 + 26965 + 36750) =$ $(26760 + 27773 + 36750) = (26965 + 32150 + 36750) = (26965 + 32238 + 36750) =$ $(26965 + 32239 + 36750) = (26965 + 32311 + 36750) = (27773 + 32150 + 36750) =$ $(27773 + 32238 + 36750) = (27773 + 32239 + 36750) = (27773 + 32311 + 36750) =$ $(26965 + 35040 + 36750) = (27773 + 35040 + 36750)$
0225	$\text{Mod : } (20268 + 36311) = (20268 + 36297) = (20268 + 25800 + 36311) =$ $(20268 + 25800 + 36297) = (20268 + 25530 + 26505 + 36311) =$ $(20268 + 25530 + 26505 + 36297) = (20268 + 25800 + 25530 + 26505 + 36311) =$ $(20268 + 25800 + 25530 + 26505 + 36297)$
0227	$\text{Mod : } 33323 = (33323 + 31896 + 32332) = (33323 + 31897 + 32333)$
0228	$\text{Mod : } (32401 + 33323) = (32402 + 33323) = (32475 + 33323) = (32929 + 33323) =$ $(31896 + 32332 + 32475 + 33323) = (31897 + 32333 + 32929 + 33323)$
0229	$\text{Mod : } (20268 + 34818) = (20268 + 31701)$
0230	$\text{Mod : } (20268 + 36311) = (20268 + 36297) = (20268 + 36885) =$ $(20268 + 24946 + 26965 + 36311) = (20268 + 24946 + 27773 + 36311) =$ $(20268 + 25951 + 26965 + 36311) = (20268 + 25951 + 27773 + 36311) =$ $(20268 + 26760 + 26965 + 36311) = (20268 + 26760 + 27773 + 36311) =$ $(20268 + 26965 + 32150 + 36311) = (20268 + 26965 + 32238 + 36311) =$ $(20268 + 26965 + 32239 + 36311) = (20268 + 26965 + 32311 + 36311) =$ $(20268 + 27773 + 32150 + 36311) = (20268 + 27773 + 32238 + 36311) =$ $(20268 + 27773 + 32239 + 36311) = (20268 + 27773 + 32311 + 36311) =$ $(20268 + 26965 + 35040 + 36311) = (20268 + 27773 + 35040 + 36311) =$ $(20268 + 24946 + 26965 + 36297) = (20268 + 24946 + 27773 + 36297) =$ $(20268 + 25951 + 26965 + 36297) = (20268 + 25951 + 27773 + 36297) =$ $(20268 + 26760 + 26965 + 36297) = (20268 + 26760 + 27773 + 36297) =$ $(20268 + 26965 + 32150 + 36297) = (20268 + 26965 + 32238 + 36297) =$ $(20268 + 26965 + 32239 + 36297) = (20268 + 26965 + 32311 + 36297) =$ $(20268 + 27773 + 32150 + 36297) = (20268 + 27773 + 32238 + 36297) =$ $(20268 + 27773 + 32239 + 36297) = (20268 + 27773 + 35040 + 36297) =$ $(20268 + 24946 + 26965 + 36885) = (20268 + 24946 + 27773 + 36885) =$ $(20268 + 25951 + 26965 + 36885) = (20268 + 25951 + 27773 + 36885) =$ $(20268 + 26760 + 26965 + 36885) = (20268 + 26760 + 27773 + 36885) =$ $(20268 + 26965 + 32150 + 36885) = (20268 + 26965 + 32238 + 36885) =$ $(20268 + 26965 + 32239 + 36885) = (20268 + 26965 + 32311 + 36885) =$ $(20268 + 27773 + 32150 + 36885) = (20268 + 27773 + 32238 + 36885) =$ $(20268 + 27773 + 32239 + 36885) = (20268 + 27773 + 32311 + 36885) =$ $(20268 + 26965 + 35040 + 36885) = (20268 + 27773 + 35040 + 36885)$

CODE	DESIGNATION
0231	$\begin{aligned} \text{Mod : } (20268+36311) &= (20268+36885) = (20268+24946+26965+36311) = \\ &= (20268+24946+27773+36311) = (20268+25951+26965+36311) = \\ &= (20268+25951+27773+36311) = (20268+26760+26965+36311) = \\ &= (20268+26760+27773+36311) = (20268+26965+32150+36311) = \\ &= (20268+26965+32238+36311) = (20268+26965+32239+36311) = \\ &= (20268+26965+32311+36311) = (20268+27773+32150+36311) = \\ &= (20268+27773+32238+36311) = (20268+27773+32239+36311) = \\ &= (20268+27773+32311+36311) = (20268+26965+35040+36311) = \\ &= (20268+27773+35040+36311) = (20268+24946+26965+36885) = \\ &= (20268+24946+27773+36885) = (20268+25951+26965+36885) = \\ &= (20268+25951+27773+36885) = (20268+26760+26965+36885) = \\ &= (20268+26760+27773+36885) = (20268+26965+32150+36885) = \\ &= (20268+26965+32238+36885) = (20268+26965+32239+36885) = \\ &= (20268+26965+32311+36885) = (20268+27773+32150+36885) = \\ &= (20268+27773+32238+36885) = (20268+27773+32239+36885) = \\ &= (20268+27773+32311+36885) = (20268+26965+35040+36885) = \\ &= (20268+27773+35040+36885) \end{aligned}$
0232	Mod : $(20268+36297) = (20268+36885)$
0233	Mod : $30397 = (27714+28685+30397+31528)$
0234	$\begin{aligned} \text{Mod : } (20268+36311) &= (20268+36297) = (20268+36885) = (20268+25800+36311) \\ &= (20268+25800+36297) = (20268+25800+36885) = (20268+25530+26505+36311) \\ &= (20268+25530+26505+36297) = (20268+25530+26505+36885) = \\ &= (20268+25800+25530+26505+36297) = (20268+25800+25530+26505+36311) = \\ &= (20268+25800+25530+26505+36885) \end{aligned}$
0235	Mod : $(20268+36311) = (20268+36885) = (20268+36311/\text{US}) = (20268+36885/\text{US})$
0236	Mod : $(27620+30020+33323) = (27620+30020+33323+37285)$
0237	Mod : $(27620+33323) = (27620+33323+37285)$
0238	$\begin{aligned} \text{Mod : } (24946+26965+36311) &= (24946+27773+36311) = (25951+26965+36311) = \\ &= (25951+27773+36311) = (26760+26965+36311) = (26760+27773+36311) = \\ &= (26965+32150+36311) = (26965+32238+36311) = (26965+32239+36311) = \\ &= (26965+32311+36311) = (27773+32150+36311) = (27773+32238+36311) = \\ &= (27773+32239+36311) = (27773+32311+36311) = (26965+35040+36311) = \\ &= (27773+35040+36311) = (24946+26965+36885) = (24946+27773+36885) = \\ &= (25951+26965+36885) = (25951+27773+36885) = (26760+26965+36885) = \\ &= (26760+27773+36885) = (26965+32150+36885) = (26965+32238+36885) = \\ &= (26965+32239+36885) = (26965+32311+36885) = (27773+32150+36885) = \\ &= (27773+32238+36885) = (27773+32239+36885) = (27773+32311+36885) = \\ &= (26965+35040+36885) = (27773+35040+36885) \end{aligned}$
0239	Mod : $32009 = 36664 = 36666 = 36667$
0240	$\begin{aligned} \text{Mod : } 32009 &= 36664 = 36666 = 36667 = (25800+32009) = (25800+36664) = \\ &= (25800+36666) = (25800+36667) \end{aligned}$
0241	$\begin{aligned} \text{Mod : } 32009 &= 36664 = 36666 = 36667 = (25800+32009) = (25800+36664) = \\ &= (25800+36666) = (25800+36667) = (24404+25502+32009) = (24404+25502+36664) = \\ &= (24404+25502+36666) = (24404+25502+36667) = (24404+25502+25800+32009) = \\ &= (24404+25502+25800+36664) = (24404+25502+25800+36666) = \\ &= (24404+25502+25800+36667) \end{aligned}$
0242	$\begin{aligned} \text{Mod : } 32009 &= 36664 = 36666 = 36667 = (25800+32009) = (25800+36664) = \\ &= (25800+36666) = (25800+36667) = (24405+25501+32009) = (24405+25501+36664) = \\ &= (24405+25501+36666) = (24405+25501+36667) = (24405+25501+25800+32009) = \\ &= (24405+25501+25800+36664) = (24405+25501+25800+36666) = \\ &= (24405+25501+25800+36667) \end{aligned}$
0243	$\begin{aligned} \text{Mod : } 32009 &= 36664 = 36666 = 36667 = (25800+32009) = (25800+36664) = \\ &= (25800+36666) = (25800+36667) = (25530+26505+32009) = (25530+26505+36664) = \\ &= (25530+26505+36666) = (25530+26505+36667) = (25530+25800+26505+32009) = \\ &= (25530+25800+26505+36664) = (25530+25800+26505+36666) = \\ &= (25530+25800+26505+36667) \end{aligned}$

CODE	DESIGNATION
0244	Mod : 32009 = 36664 = 36666 = 36667 = (25800+32009) = (25800+36664) = (25800+36666) = (25800+36667) = (24404+32009+35404) = (24404+35404+36664) = (24404+35404+36666) = (24404+35404+36667) = (27727+32009+35404) = (27727+35404+36664) = (27727+35404+36666) = (27727+35404+36667) = (24404+27727+32009+35404) = (24404+27727+35404+36664) = (24404+27727+35404+36666) = (24404+27727+35404+36667) = (24404+25800+32009+35404) = (24404+25800+35404+36664) = (24404+25800+35404+36666) = (24404+25800+35404+36667) = (25800+27727+32009+35404) = (25800+27727+35404+36664) = (25800+27727+35404+36666) = (25800+27727+35404+36667) = (24404+25800+27727+32009+35404) = (24404+25800+27727+35404+36664) = (24404+25800+27727+35404+36666) = (24404+25800+27727+35404+36667)
0245	Mod : (24404+32009) = (24404+36664) = (24404+36666) = (24404+36667) = (24404+25800+32009) = (24404+25800+36664) = (24404+25800+36666) = (24404+25800+36667) = (25800+27727+32009) = (25800+27727+36664) = (25800+27727+36666) = (25800+27727+36667) = (24404+25800+27727+32009) = (24404+25800+27727+36664) = (24404+25800+27727+36666) = (24404+25800+27727+36667)
0246	Mod : (24405+32009) = (24405+36664) = (24405+36666) = (24405+36667) = (24405+25800+32009) = (24405+25800+36664) = (24405+25800+36666) = (24405+25800+36667) = (25800+27727+32009) = (25800+27727+36664) = (25800+27727+36666) = (25800+27727+36667) = (24405+25800+27727+32009) = (24405+25800+27727+36664) = (24405+25800+27727+36666)
0247	Mod : (25530+32009) = (25530+36664) = (25530+36666) = (25530+36667) = (25530+25800+32009) = (25530+25800+36664) = (25530+25800+36666) = (25530+25800+36667) = (25800+27727+32009) = (25800+27727+36664) = (25800+27727+36666) = (25800+27727+36667) = (25530+25800+27727+32009) = (25530+25800+27727+36664) = (25530+25800+27727+36666) = (25530+25800+27727+36667)
0248	Mod : (20268+36310+32009) = (20268+36310+36664) = (20268+36310+36666) = (20268+36310+36667) = (20268+25800+36310+32009) = (20268+25800+36310+36664) = (20268+25800+36310+36666) = (20268+25800+36310+36667) = (20268+24404+25502+36310+32009) = (20268+24404+25502+36310+36664) = (20268+24404+25502+36310+36666) = (20268+24404+25502+36310+36667) = (20268+24404+25502+25800+36310+32009) = (20268+24404+25502+25800+36310+36664) = (20268+24404+25502+25800+36310+36666) = (20268+24404+25502+25800+36310+36667)
0249	Mod : (20268+36311+32009) = (20268+36311+36664) = (20268+36311+36666) = (20268+36311+36667) = (20268+36297+32009) = (20268+36297+36664) = (20268+36297+36666) = (20268+36297+36667) = (20268+36885+32009) = (20268+36885+36664) = (20268+36885+36666) = (20268+36885+36667) = (20268+25800+36311+32009) = (20268+25800+36311+36664) = (20268+25800+36311+36666) = (20268+25800+36311+36667) = (20268+25800+36297+32009) = (20268+25800+36297+36664) = (20268+25800+36297+36666) = (20268+25800+36297+36667) = (20268+25800+36885+32009) = (20268+25800+36885+36664) = (20268+25800+36885+36666) = (20268+25530+26505+36311+32009) = (20268+25530+26505+36311+36664) = (20268+25530+26505+36311+36666) = (20268+25530+26505+36297+32009) = (20268+25530+26505+36297+36664) = (20268+25530+26505+36297+36666) = (20268+25530+26505+36885+32009) = (20268+25530+26505+36885+36664) = (20268+25530+26505+36885+36666) = (20268+25800+25530+26505+36297+32009) = (20268+25800+25530+26505+36297+36664) = (20268+25800+25530+26505+36297+36666) = (20268+25800+25530+26505+36311+32009) = (20268+25800+25530+26505+36311+36664) = (20268+25800+25530+26505+36311+36666)
0250	Mod : 20164 = 32255 = (20164+30961) = (20164+24373+30961)

CODE	DESIGNATION
0381	Mod : (20268+36297) = (20268+24946+26965+36297) = (20268+24946+27773+36297) = (20268+25951+26965+36297) = (20268+25951+27773+36297) = (20268+26760+26965+36297) = (20268+26760+27773+36297) = (20268+26965+32150+36297) = (20268+26965+32238+36297) = (20268+26965+32239+36297) = (20268+26965+32311+36297) = (20268+27773+32150+36297) = (20268+27773+32238+36297) = (20268+27773+32239+36297) = (20268+27773+32311+36297) = (20268+26965+35040+36297) = (20268+27773+35040+36297)

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N°	ISSUE DATE	
01	SEP 1987	
02	MAR 1988	
03	MAY 1988	
04	JUL 1988	
05	AUG 1988	
06	OCT 1988	
07	JAN 1989	
08	MAR 1989	
09	APR 1989	
10	AUG 1989	
11	DEC 1989	
12	SEP 1990	
13	JUL 1991	
14	MAY 1992	
15	DEC 1992	
16	JUN 1993	
17	NOV 1993	
18	MAY 1994	
19	MAY 1995	
20	SEP 1996	
21	JUN 97	
22	JAN 98	
23	AUG 98	
24	JAN 99	
25	JUN 99	
26	DEC 99	
27	MAY 00	
28	OCT 00	

R

N°	ISSUE DATE	
29	MAR 01	
30	SEP 01	
31	APR 02	
32	SEP 02	
33	MAR 03	
34	NOV 03	
35	JUL 04	
36	MAR 05	
37	DEC 05	
38	SEP 06	
39	MAY 07	

N°	TITLE	STATUS	LOCATION
To be filled by the operator, if needed.			

THIS TABLE GIVES, FOR EACH AIRCRAFT INCLUDED IN THE MANUAL, THE CROSS REFERENCE BETWEEN :

- THE MANUFACTURING SERIAL NUMBER (MSN) WHICH APPEARS IN THE LIST OF EFFECTIVE PAGES
- THE REGISTRATION NUMBER OF THE AIRCRAFT AS KNOWN BY AIRBUS INDUSTRIE.

MSN	REGISTRATION
2052	VP-BWA
2069	VP-BDM
2072	VP-BDN
2091	VP-BDO
2093	VP-BWG
2106	VP-BDK
2116	VP-BWD
2133	VP-BWE
2144	VP-BWF
2151	VP-BWH
2163	VP-BWI
2179	VP-BWJ
2222	VP-BWK
2233	VP-BWM
2243	VP-BWL
2330	VP-BWN
2337	VP-BWO
2342	VP-BWP
2875	VP-BQP
2903	VP-BQR
2912	VP-BQS
2920	VP-BQV
2947	VP-BQW
2957	VP-BQX
2965	VP-BQT
3052	VP-BRY
3063	VP-BRX
3157	VP-BRZ
3191	VP-BRW
3267	VP-BUM
3281	VP-BUK
3298	VP-BUN
3334	VP-BUP
3336	VP-BUO
3373	VP-BQU
3410	VP-BKX
3511	VP-BKY
3545	VP-BKC
3574	
3631	

AFL

M	V	CH	SEC	---	PAGE--	SEQ-	--REV--	----	VALIDATION CRITERIA-----	-----	EFFECTIVITY-----
M	V	CH	SEC	---	PAGE--	SEQ-	--REV--	----	VALIDATION CRITERIA-----	-----	EFFECTIVITY-----

2	00	00	001			001	REV021		CONTENTS		ALL
2	00	10	001			001	REV038		ORGANIZATION OF THE MANUAL		ALL
2	00	10	002			001	REV038		ORGANIZATION OF THE MANUAL		
2	00	10	003			001	REV022		ORGANIZATION OF THE MANUAL		ALL
2	00	10	004			001	REV022		ORGANIZATION OF THE MANUAL		
2	00	10	005			001	REV021		ORGANIZATION OF THE MANUAL		ALL
2	00	20	001			001	REV039		LIST OF CODES		ALL
2	00	20	002			001	REV039		LIST OF CODES		
2	00	20	003			001	REV039		LIST OF CODES		ALL
2	00	20	004			001	REV039		LIST OF CODES		
2	00	20	005			001	REV039		LIST OF CODES		ALL
2	00	20	006			001	REV039		LIST OF CODES		
2	00	20	007			001	REV039		LIST OF CODES		ALL
2	00	20	008			001	REV039		LIST OF CODES		
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2	02	40	001		360	REV037	CODE 0090 (IAE/CFM)					2106-2163 2233 2875
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2	02	40	003		230	REV025	M:20268+24044 CFM 56-5-B3					2330-2342 2903-2912
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2	02	50	007		190	REV022	MOD:20268 CFM 56-5-B5				2052-2093 2179-2222
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		2	04	45	002	025	REV023		CFM 56-5-B1/B2/B3/B4/B5/B6		
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		2	04	51	001	103	REV038		CODE 0152	ALL	
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		2	04	65	002	200	REV037		M:33323+31426		
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2	05	40	010		175	REV024			CODE:0070/56-5-B3		2957-2965 3191-3267
											3334
2	05	40	009		180	REV023			CODE 0048 CFM 56-5-B4		2106-2163 2233 2875
2	05	40	010		180	REV023			CODE 0048 CFM 56-5-B4		2920-2947 3052-3157
											3373-3631
2	05	40	009		190	REV023			CODE 0113 CFM 56-5-B5/B6		2052-2093 2179-2222
2	05	40	010		190	REV023			CODE 0113 CFM 56-5-B5/B6		2243 3281-3298 3336
2	05	40	011		175	REV024			CODE:0070/56-5-B3		2330-2342 2903-2912
2	05	40	012		175	REV024			CODE:0070/56-5-B3		2957-2965 3191-3267
											3334
2	05	40	011		180	REV023			CODE 0048 CFM 56-5-B4		2106-2163 2233 2875
2	05	40	012		180	REV023			CODE 0048 CFM 56-5-B4		2920-2947 3052-3157
											3373-3631
2	05	40	011		190	REV023			CODE 0113 CFM 56-5-B5/B6		2052-2093 2179-2222
2	05	40	012		190	REV023			CODE 0113 CFM 56-5-B5/B6		2243 3281-3298 3336
2	05	50	001		130	REV024			M:25800/56-5-B4		2106-2163 2233 2875
2	05	50	002		180	REV023			CODE 0048 CFM 56-5-B4		2920-2947 3052-3157
											3373-3631
2	05	50	001		220	REV024			M:22013+25800/56-5-B1/B2/B3		2330-2342 2903-2912
2	05	50	002		175	REV024			CODE:0070/56-5-B3		2957-2965 3191-3267
											3334
2	05	50	001		235	REV027			24105+25800/B5/B6/B7/B8/B9		2052-2093 2179-2222
2	05	50	002		190	REV023			CODE 0113 CFM 56-5-B5/B6		2243 3281-3298 3336
2	05	50	003		175	REV024			CODE:0070/56-5-B3		2330-2342 2903-2912
											2957-2965 3191-3267
											3334
2	05	50	003		180	REV023			CODE 0048 CFM 56-5-B4		2106-2163 2233 2875
											2920-2947 3052-3157
											3373-3631

M	V	CH	SEC	---	PAGE--	SEQ-	--REV--	----	VALIDATION CRITERIA-----	-----	EFFECTIVITY-----
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2	05	50	003		190	REV023			CODE 0113 CFM 56-5-B5/B6		2052-2093 2179-2222 2243 3281-3298 3336
2	05	60	001		001	REV021					ALL
2	05	60	002		001	REV023					
2	05	60	003		001	REV022					2106-2163 2233 2875
2	05	60	004		001	REV021					2920-2947 3052-3157 3373-3631
2	05	60	003		100	REV021			MOD:22013		2330-2342 2903-2912
2	05	60	004		100	REV021			MOD 22013		2957-2965 3191-3267 3334
2	05	60	003		150	REV021			MOD:24105		2052-2093 2179-2222
2	05	60	004		150	REV021			MOD:24105		2243 3281-3298 3336
2	05	70	001		015	REV021			CFM 56-5-B3		2330-2342 2903-2912
2	05	70	002		015	REV022			CFM 56-5-B3		2957-2965 3191-3267 3334
2	05	70	001		030	REV021			CFM 56-5-B4		2106-2163 2233 2875
2	05	70	002		030	REV022			CFM 56-5-B4		2920-2947 3052-3157 3373-3631
2	05	70	001		033	REV033			56-5-B5/B6		2052-2093 2179-2222
2	05	70	002		033	REV033			56-5-B5/B6		2243 3281-3298 3336
2	05	70	003		015	REV021			CFM 56-5-B3		2330-2342 2903-2912
2	05	70	004		015	REV021			CFM 56-5-B3		2957-2965 3191-3267 3334
2	05	70	003		030	REV021			CFM 56-5-B4		2106-2163 2233 2875
2	05	70	004		030	REV021			CFM 56-5-B4		2920-2947 3052-3157 3373-3631
2	05	70	003		033	REV033			56-5-B5/B6		2052-2093 2179-2222
2	05	70	004		033	REV033			56-5-B5/B6		2243 3281-3298 3336
2	05	70	005		015	REV021			CFM 56-5-B3		2330-2342 2903-2912
2	05	70	006		015	REV021			CFM 56-5-B3		2957-2965 3191-3267 3334
2	05	70	005		030	REV021			CFM 56-5-B4		2106-2163 2233 2875
2	05	70	006		030	REV021			CFM 56-5-B4		2920-2947 3052-3157 3373-3631
2	05	70	005		033	REV033			56-5-B5/B6		2052-2093 2179-2222
2	05	70	006		033	REV033			56-5-B5/B6		2243 3281-3298 3336
2	05	70	007		015	REV021			CFM 56-5-B3		2330-2342 2903-2912
2	05	70	008		015	REV021			CFM 56-5-B3		2957-2965 3191-3267 3334
2	05	70	007		030	REV021			CFM 56-5-B4		2106-2163 2233 2875
2	05	70	008		030	REV021			CFM 56-5-B4		2920-2947 3052-3157 3373-3631

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M	V	CH	SEC	---	PAGE--	SEQ-	--REV--	----	VALIDATION CRITERIA-----	-----	EFFECTIVITY-----
2	05	70	007			033	REV033		56-5-B5/B6		2052-2093 2179-2222
2	05	70	008			033	REV033		56-5-B5/B6		2243 3281-3298 3336

M	V	REV	MOD	MP	TITLE	VALIDITY
T				SB		
.	032A	20024	.....		FUEL- INSTALL A CENTRE TANK SYSTEM- ALL	
.	032A	20167	.....		STRUCTURE - REINFORCE STRUCTURE TO ALLOW MTOW 72T-MLW 63T-MZFW 59T DESIGN WEIGHTS ALL	
.	032A	20268	.....		WINGS-WING TIP FENCES-INTRODUCE WING TIPS INCLUDING FENCES- ALL	
.	033	20856	.....		LANDING GEAR - INSTALL CARBON BRAKES AND ASSOCIATED WHEELS BF-GOODRICH - VP-BWA VP-BDM VP-BDN VP-BDO VP-BWG VP-BDK VP-BWD VP-BWE VP-BWF VP-BWH VP-BWI VP-BWJ VP-BWK VP-BWM VP-BWL VP-BQP VP-BQV VP-BQW VP-BRY VP-BRX VP-BRZ VP-BUK VP-BUN VP-BUO VP-BQU VP-BKX VP-BKY VP-BKC MSN 3574 MSN 3631	
.	032A	21103	.....		EQUIPMENT/FURNISHINGS - CARGO COMPARTMENT - REARRANGE COMPARTMENT 4 INTO TWO ZONES - ALL	
.	032A	21329	.....		DOORS-CARGO COMPT DOORS-MODIFY LOCKING INDICATION ALL	
.	034A	22013	.....		FUSELAGE - REAR FUSELAGE SECTION 16A - DEFINE A321 BASIC STRUCTURE VP-BWN VP-BWO VP-BWP VP-BQR VP-BQS VP-BQX VP-BQT VP-BRW VP-BUM VP-BUP	
.	032A	23124	.....		AIR CONDITIONING - PRESSURIZATION CONTROL - IMPROVE CONTROLLER TO ENABLE USE OF EXTERNAL MODE ALL	

M	V	REV	MOD	MP	T	SB	TITLE	VALIDITY
.	032A	23320	.....				DOORS-CARGO COMPARTMENT DOOR HYDRAULIC SYSTEM-INTRODUCE MODIFIED DOOR SELECTOR VALVE ALL	
.	033	23597	.....				LANDING GEAR - MLG - BF GOODRICH BRAKES - INTRODUCE IMPROVED CARBON MATERIAL	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631
.	032A	23779	.....				MINOR IMPROVEMENTS INTRODUCED FROM A/C 508 (ST2) TO A/C 521 (ST2) ALL	
.	033	24007	.....				LANDING GEAR-MLG-WHEELS AND BRAKES- INTRODUCE NEW REAR BRAKE PLATE	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631
.	034A	24044	.....				LANDING GEAR - WHEELS AND BRAKES - INSTALL MESSIER GOODRICH WHEELS AND BRAKES ON A321	
							VP-BWN	VP-BWO VP-BWP
							VP-BQR	VP-BQS VP-BQX
							VP-BQT	VP-BRW VP-BUM
							VP-BUP	

M	V	REV	MOD	MP	T	SB	TITLE	VALIDITY
.	032A	24105	.....				FUSELAGE - REAR FUSELAGE - ADAPT SECTION 17/19 STRUCTURE TO A319 DEFINITION	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BWJ
							VP-BWK	VP-BWL VP-BUK
							VP-BUN	VP-BUO
.	033	24251	.....				POWER PLANT - A320 - CFM 56 - INSTALL DERATED ENGINES CFM 56-B4	
							VP-BDK	VP-BWD VP-BWE
							VP-BWF	VP-BWH VP-BWI
							VP-BWM	VP-BQP VP-BQV
							VP-BQW	VP-BRY VP-BRX
							VP-BRZ	VP-BQU VP-BKX
							VP-BKY	VP-BKC MSN 3574
							MSN 3631	
.	032A	24373	.....				FUEL - TANK LEVEL SENSING - INTRODUCE MODIFIED LOW FUEL PRESSURE WARNING CONTROL	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631
.	032A	24932	.....				POWER PLANT-INSTALL CFM 56-5B5 ENGINES FOR A319 (22 KLBS)	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BWJ
							VP-BWK	VP-BWL VP-BUK
							VP-BUN	VP-BUO
.	032A	25141	.....				NACELLES/PYLONS-PYLON STRUCTURE- ADAPT PRIMARY STRUCTURE TO A321-200 VERSION	
							ALL	

M	V	REV	MOD	MP	T	TITLE	VALIDITY
				SB			
.	037	25404	.....			EXHAUST-THRUST REVERSER CONTROL AND INDICATING-ACTIVATE ADDITIONAL THRUST REVERSER LOCK CONTROL ALL	
.	032A	25800	.....			POWER PLANT-GENERAL-INTRODUCE CFM56-SB/P ALL	
.	033	25810	.....			LANDING GEAR - WHEELS AND BRAKES - INSTALL BF GOODRICH CARBON BRAKES (SEPCARB III) P/N 2-1600 VP-BWA VP-BDM VP-BDN VP-BDO VP-BWG VP-BDK VP-BWD VP-BWE VP-BWF VP-BWH VP-BWI VP-BWJ VP-BWK VP-BWM VP-BWL VP-BQP VP-BQV VP-BQW VP-BRY VP-BRX VP-BRZ VP-BUK VP-BUN VP-BUO VP-BQU VP-BKX VP-BKY VP-BKC MSN 3574 MSN 3631	
.	036	25907	.....			EQPT/FURNISHINGS-ROLLER TRACKS-INSTL OF SET 4B FOR ROLLER TRACKS, LATCHES & STOPS FOR CLS VERS. IN FWD CARGO HOLD VP-BWN VP-BWO VP-BWP VP-BQR VP-BQS VP-BQX VP-BQT VP-BRW VP-BUM VP-BUP	
.	032A	26017	.....			INDICATING/RECORDING SYSTEMS-FLIGHT WARNING COMPUTER (FWC)-INTRODUCE FWC ST2 E2 ALL	
.	032A	26018	.....			INDICATING/RECORDING SYSTEMS-DISPLAY MANAGEMENT COMPUTER (DMC)-INTRODCUE DMC V32 STD ALL	
.	032A	26249	.....			AIR CONDITIONING-FLOW CONTROL AND INDICATING INTRODUCE MODIFIED AIR CONDITIONING FLOW CONTROL ALL	

M	V	REV	MOD	MP	TITLE	VALIDITY
T				SB		
.	034A	26359	.....		POWER PLANT-GENERAL-INTRODUCE CFM 56-5B3 ENGINE RATED AT 330K LBS	
					VP-BWN VP-BWO VP-BWP	
					VP-BQR VP-BQS VP-BQX	
					VP-BQT VP-BRW VP-BUM	
					VP-BUP	
.	032A	26645	.....		AUTO-FLIGHT-FAC INTRODUCE FAC STD BAM 0513	
					ALL	
.	032A	26910	.....		FLIGHT CONTROL -ELAC SYSTEM- INTRODUCE E.L.A.C. WITH ENHANCED RELAYS	
					ALL	
.	037A	26925	.....		LANDING GEAR-ALTERNATE BRAKING- INTRODUCE MODIFIED ALTERNATE BRAKING SYSTEM	
					VP-BQP VP-BQR VP-BQS	
					VP-BQV VP-BQW VP-BQX	
					VP-BQT VP-BRY VP-BRX	
					VP-BRZ VP-BRW VP-BUM	
					VP-BUK VP-BUN VP-BUP	
					VP-BUO VP-BQU VP-BKX	
					VP-BKY VP-BKC MSN 3574	MSN 3574
					MSN 3631	
.	032A	26965	.....		LANDING GEAR-WHEELS AND BRAKES- INTRODUCE BSCU COMMON STD	
					VP-BWA VP-BDM VP-BDN	
					VP-BDO VP-BWG VP-BDK	
					VP-BWD VP-BWE VP-BWF	
					VP-BWH VP-BWI VP-BWJ	
					VP-BWK VP-BWM VP-BWL	
					VP-BQP VP-BQV VP-BQW	
					VP-BRY VP-BRX VP-BRZ	
					VP-BUK VP-BUN VP-BUO	
					VP-BQU VP-BKX VP-BKY	
					VP-BKC MSN 3574 MSN 3631	
.	032A	27276	.....		FLIGHT CONTROLS-ELAC SYSTEM-INTRODUCE ELAC SOFTWARE "L80"	
					ALL	

M	REV	MOD	MP	TITLE	VALIDITY
T			SB		
.	038B	27620	.....	NAVIGATION-STANDBY DATA : ALTITUDE AND HEADING - INSTALL INTEGRATED STANDBY INSTRUMENT SYSTEM (ISIS) VP-BUM VP-BUK VP-BUN VP-BUP VP-BUO VP-BQU VP-BKX VP-BKY VP-BKC MSN 3574 MSN 3631	
.	037	27714	.....	NAVIGATION - ADIRS - REDUCE VERTICAL SEPARATION MINIMUM USING ADRI AND 2 ONLY ALL	
.	032A	27773	.....	LANDING GEAR-NORMAL BRAKING- INTRODUCE STD 8 BSCU (TWIN VERSION) ALL	
.	032A	27845	.....	FLIGHT CONTROLS-ELAC-INTRODUCE ELAC WITH ADVANCED ELAC POWER SUPPLY BOARD ALL	
.	037	28009	.....	AIR CONDITIONING-PRESSURE CONTROL AND MONITORING-INTRODUCE PRESSURE CONTROLLER P/N 9022-15702-10 ALL	
.	033	28160	.....	ELEC PWR-AC EMERGENCY GENERATION- ACTIVATE A319/A321 ELECTRICAL EMERGENCY CONFIGURATION ON A320 A/C VP-BDK VP-BWD VP-BWE VP-BWF VP-BWH VP-BWI VP-BWM VP-BQP VP-BQV VP-BQW VP-BRY VP-BRX VP-BRZ VP-BQU VP-BKX VP-BKY VP-BKC MSN 3574 MSN 3631	
.	036	28319	.....	EQUIPMENT/FURNISHINGS-FWD CARGO COMPT- INSTALL CARGO COMPONENTS FOR CLS CONFIGURATION (SET 4.28) FOR A319 VP-BWA VP-BDM VP-BDN VP-BDO VP-BWG VP-BWJ VP-BWK VP-BWL VP-BUK VP-BUN VP-BUO	

M	V	REV	MOD	MP	TITLE	VALIDITY
T				SB		
. 036	28322	.....			EQUIPMENT/FURNISHINGS-AFT CARGO COMPT- INSTALL CARGO COMPONENTS FOR CLS CONFIGURATION (SET 4.2D) FOR A319	
					VP-BWA VP-BDM VP-BDN	
					VP-BDO VP-BWG VP-BWJ	
					VP-BWK VP-BWL VP-BUK	
					VP-BUN VP-BUO	
. 036	28330	.....			EQUIPMENT/FURNISHINGS-FWD CARGO COMPT- INSTALL CARGO COMPONENTS FOR CLS CONFIGURATION (SET 4.1B) FOR A320	
					VP-BDK VP-BWD VP-BWE	
					VP-BWF VP-BWH VP-BWI	
					VP-BWM VP-BQP VP-BQV	
					VP-BQW VP-BRY VP-BRX	
					VP-BRZ VP-BQU VP-BKX	
					VP-BKY VP-BKC MSN 3574	
					MSN 3631	
. 036	28335	.....			EQUIPMENT/FURNISHINGS-AFT CARGO COMPT- INSTALL CARGO COMPONENTS FOR CLS CONFIGURATION (SET 4.1D) FOR A320	
					VP-BDK VP-BWD VP-BWE	
					VP-BWF VP-BWH VP-BWI	
					VP-BWM VP-BQP VP-BQV	
					VP-BQW VP-BRY VP-BRX	
					VP-BRZ VP-BQU VP-BKX	
					VP-BKY VP-BKC MSN 3574	
					MSN 3631	
. 033	30075	.....			LANDING GEAR - WHEELS AND BRAKES - REDUCE LENGTH OF WEAR INDICATOR ON BF GOODRICH BRAKES	
					VP-BWA VP-BDM VP-BDN	
					VP-BDO VP-BWG VP-BDK	
					VP-BWD VP-BWE VP-BWF	
					VP-BWH VP-BWI VP-BWJ	
					VP-BWK VP-BWM VP-BWL	
					VP-BQP VP-BQV VP-BQW	
					VP-BRY VP-BRX VP-BRZ	
					VP-BUK VP-BUN VP-BUO	
					VP-BQU VP-BKX VP-BKY	
					VP-BKC MSN 3574 MSN 3631	

M	V	REV	MOD	MP	T	SB	TITLE	VALIDITY
.	037B	30397	.....				CERTIFICATION DOCUMENTS - GENERAL - CERTIFY AIRCRAFT FOR OPERATION ON RUNWAYS LESS THAN 45M WIDTH	
		00-1058	55				VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BWN	VP-BWO VP-BWP
							VP-BUM	VP-BUK VP-BUN
							VP-BUP	VP-BUO VP-BQU
							VP-BKX	VP-BKY VP-BKC
							MSN 3574	MSN 3631
.	032A	30961	.....				FUEL - MAIN FUEL PUMP SYSTEM - ADAPT PUMP CONTROL LATCH FOR FLIGHT DECK REFUEL CAPABILITY	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631
.	034	31106	.....				LANDING GEAR - NORMAL BRAKING - INTRODUCE STD 9 BSCU (TWIN VERSION) ALL	
.	033	31146	.....				LANDING GEAR - WHEELS AND BRAKES - INTRODUCE OXIDATION RESISTANT BFG CARBON BRAKE	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631

M	V	REV	MOD	MP	TITLE	VALIDITY
T			SB			
.	033	31286	.....		COMMUNICATIONS-HF SYSTEM-ACTIVATE DATA LINK FUNCTION FOR HFDR1 ALL	
.	032A	31395	.....		FLIGHT CONTROLS - ELAC SYSTEM - INTRODUCE ELAC STD L81 ALL	
.	035	31426	.....		NAVIGATIONS-EGPWS-ACTIVATE GEOMETRIC ALTITUDE FUNCTION IN THE EGPWS ALL	
.	032A	31528	.....		NAVIGATION-ADIRU-RESTORE RVSM 3 CIRCUIT CAPABILITIES (SERIAL SOLUTION) ALL	
.	033	31803	.....		LANDING GEAR-WHEELS AND BRAKES-INTRODU CE GOODRICH CARBON BRAKE (SEPCARB III) P/N 2-1600-3 WITH ANTI-OXIDANT "M1" VP-BWA VP-BDM VP-BDN VP-BDO VP-BWG VP-BDK VP-BWD VP-BWE VP-BWF VP-BWH VP-BWI VP-BWJ VP-BWK VP-BWM VP-BWL VP-BQP VP-BQV VP-BQW VP-BRY VP-BRX VP-BRZ VP-BUK VP-BUN VP-BUO VP-BQU VP-BKX VP-BKY VP-BKC MSN 3574 MSN 3631	
.	032A	31896	.....		AUTOFLIGHT-FMGC-INSTALL FMGC CFM C13042AA01 (EQUIPPED WITH FMS2) HONEYWELL ALL	
.	034	32115	.....		FUEL-MANUAL (MAGNETIC) INDICATORS- DELETE ATTITUDE MONITOR ALL	

M	V	REV	MOD	MP	T	SB	TITLE	VALIDITY
.	034	32311	.....				LANDING GEAR-WHEELS AND BRAKES-CANCEL MIXABILITY BETWEEN GOODRICH BRAKES 2-1600-2 AND -3 AUTHOR. WITH MOD 31803	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BQP	VP-BQV VP-BQW
							VP-BRY	VP-BRX VP-BRZ
							VP-BUK	VP-BUN VP-BUO
							VP-BQU	VP-BKX VP-BKY
							VP-BKC	MSN 3574 MSN 3631
.	035	32619	.....				ENGINE FUEL AND CONTROL - FADEC SYSTEM INTRODUCE NEW FADEC SOFTWARE "5BK" ON SAC CFM56-5B ENGINES	
							ALL	
.	034	32622	.....				FUEL - MANUAL (MAGNETIC) INDICATORS - REINTRODUCE ATTITUDE MONITOR (ANTI-MOD TO 32115)	
							VP-BWA	VP-BDM VP-BDN
							VP-BDO	VP-BWG VP-BDK
							VP-BWD	VP-BWE VP-BWF
							VP-BWH	VP-BWI VP-BWJ
							VP-BWK	VP-BWM VP-BWL
							VP-BWN	VP-BWO VP-BWP
.	035	33239	.....				ENGINE FUEL AND CONTROL - FADEC SYSTEM - INSTALL "5BL" STANDARD ECU SOFTWARE FOR CFM56-5B ENGINES (A318 CAPABLE)	
							ALL	
.	036	33309	.....				FLIGHT CONTROLS - SLATS/FLAPS - TRANSFER THE RESPONSIBILITY FROM A-UK TO A-D (ADMINISTRATION MOD)	
							ALL	

M	V	REV	MOD	MP	TITLE	VALIDITY
T				SB		
.	037A	33323	.....		CERTIFICATION DOCUMENTS - GENERAL - EXTEND OPERATING FLIGHT ENVELOPE TO MINUS 2000FT PRESSURE ALTITUDE	
					VP-BQP	VP-BQR VP-BQS
					VP-BQV	VP-BQW VP-BQX
					VP-BQT	VP-BRY VP-BRX
					VP-BRZ	VP-BRW VP-BUM
					VP-BUK	VP-BUN VP-BUP
					VP-BUO	VP-BQU VP-BKX
					VP-BKY	VP-BKC MSN 3574
					MSN 3631	
.	038	33374	.....		INDICATING RECORDING SYSTEM - FLIGHT WARNING COMPUTER (FWC) - INSTALL FWC STANDARD H2F2	
		31-1257			ALL	
.	039B	33497	.....		NAVIGATION - STANDBY DATA: ATTITUDE AND HEADING - REPLACE THALES ISIS BY THE 3 CONVENTIONAL STANDBY INSTRUMENTS	
					VP-BUM	VP-BUK VP-BUN
					VP-BUP	VP-BUO VP-BQU
					VP-BKX	VP-BKY VP-BKC
					MSN 3574	MSN 3631
.	037A	35040	.....		LANDING GEAR - WHEELS AND BRAKES INTRODUCE GOODRICH DURACARB CARBON BRAKES WITH ANTI - OXYDAN "M1"	
					VP-BQP	VP-BQV VP-BQW
					VP-BRY	VP-BRX VP-BRZ
					VP-BUK	VP-BUN VP-BUO
					VP-BQU	VP-BKX VP-BKY
					VP-BKC	MSN 3574 MSN 3631
.	038	35800	.....		FUSELAGE - BELLY FAIRING - TRANSFER OF DEFINITION FROM AIRBUS FRANCE TO AIRBUS SPAIN	
					VP-BQP	VP-BQR VP-BQS
					VP-BQV	VP-BQW VP-BQX
					VP-BQT	VP-BRY VP-BRX
					VP-BRZ	VP-BRW VP-BUM
					VP-BUK	VP-BUN VP-BUP
					VP-BUO	VP-BQU VP-BKX
					VP-BKY	VP-BKC MSN 3574
					MSN 3631	

M	V	REV	MOD	MP	TITLE	VALIDITY
T				SB		
.	038	36505	.....		EQUIPMENT/FURNISHINGS-PAX COMPARTMENT- INST. OF CABIN LAYOUT FOR AFLOS VERSION	
					VP-BQR	VP-BQS VP-BQX
					VP-BQT	VP-BRW VP-BUM
					VP-BUP	
.	039B	37331	.....		WINGS - FIXED PARTITION - INTRODUCE A STANDARD OF BOX WITHOUT DRY BAY	
					VP-BUK	VP-BUN VP-BU0
					VP-BQU	VP-BKX VP-BKY
					VP-BKC	MSN 3574 MSN 3631

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.00	P 1
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DEFINITIONS

R — **MANUFACTURER'S EMPTY WEIGHT (MEW)**

The weight of the structure, power plant, furnishings, systems and other items of equipment that are considered an integral part of the aircraft. It is essentially a "dry" weight, including only those fluids contained in closed systems (e.g. hydraulic fluid).

R — **OPERATIONAL EMPTY WEIGHT (OEW)**

The manufacturer's weight empty plus the operator's items i.e. the flight and cabin crew and their baggage, unusable fuel, engine oil, emergency equipment, toilet chemicals and fluids, galley structure, catering equipment, seats, documents etc.

— **DRY OPERATING WEIGHT (DOW)**

The total weight of an aircraft ready for a specific type of operation excluding all usable fuel and traffic load.

Operational Empty Weight plus items specific to the type of flight i.e. catering, newspapers, pantry equipment etc.

— **TAKEOFF FUEL**

The weight of the fuel onboard at takeoff.

— **OPERATING WEIGHT**

R The weight obtained by addition of the operational empty weight and the takeoff fuel.

— **TOTAL TRAFFIC LOAD**

The weight of the payload including cargo loads, passengers and passengers bags.

— **ZERO FUEL WEIGHT (ZFW)**

R The weight obtained by addition of the total traffic load and the dry operating weight.

— **TAKEOFF WEIGHT (TOW)**

The weight at takeoff. It is equal to the addition of the zero fuel weight and takeoff fuel.

— **TRIP FUEL**

The weight of the fuel necessary to cover the normal leg without reserves.

— **LANDING WEIGHT**

The weight at landing. It is equal to takeoff weight minus trip fuel.

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.20	P 1
	CARGO LOADING		SEQ 100	REV 21

GENERAL

The aircraft has two lower deck cargo compartments :

- Forward cargo compartment, compartment 1.
- Aft cargo compartment, subdivided into compartments 3, 4 and 5.

The main access doors to forward and aft compartments are hydraulically operated.

A bulk cargo door ◀ gives additional access to the aft cargo compartment. It is manually operated.

DESCRIPTION

Each compartment is divided into sections, and is designed to be category D (for A320 and A319) or category C (A321, A319 ◀ and A320 ◀) as defined by FAR.

A placard in each compartment indicates the maximum authorized gross weight.

The compartments have separate lighting.

RESTRAINT SYSTEM

Divider nets subdivide the compartments to allow them to be partially loaded and to retain the bulk.

Door nets which protect the doors from shifting cargo, must be used whenever the compartment contain cargo.

CARGO LOADING SYSTEM ◀

A semi-automatic cargo loading system, which may be installed in forward and aft compartments, loads pallets and containers.

CARGO CAPACITY

FULL BULK

The maximum load for each compartment and section is as follows :

- **Forward**
 Compartment 1 : 3 402 kg (7 500 lb)

- **Aft**
 Compartment 3 : 2 426 kg (5 349 lb)
 Compartment 4 : 2 110 kg (4 652 lb)

CARGO LOADING SYSTEM (CLS)

When the Cargo Loading System (CLS) is installed in the FWD and AFT cargo, the maximum load of each compartment is as follows :

- **Forward**
 Compartment 1 : 3 402 kg (7 500 lb)

- **Aft**
 Compartment 3 : 2 268 kg (5 000 lb)
 Compartment 4 : 2 268 kg (5 000 lb)

The following table lists the loading possibilities (including the Maximum Gross Weight per container/pallet).

ULD	ATA	NAS 3610	IATA	Allowable MGW		Maximum number	
				kg	lb	fwd	aft
Half size	LD3-46	2K2	G	1134	2500	3	4
Full size	LD3-46W	2K2	H	1134	2500	3	4
60.4 × 61.5 in		2K3	K	1134	2500	3	4
60.4 × 61.5 in		2K3	X	1134	2500	3	4

Note : The bulk compartment is always used in bulk configuration with a maximum load of 1497 kg (3300 lb).

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.20	P 1
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GENERAL

The aircraft has two lower deck cargo compartments :

- Forward cargo compartment, compartment 1.
- Aft cargo compartment, subdivided into compartments 3, 4 and 5.

The main access doors to forward and aft compartments are hydraulically operated.

A bulk cargo door ◀ gives additional access to the aft cargo compartment. It is manually operated.

DESCRIPTION

Each compartment is divided into sections, and is designed to be category D (for A320 and A319) or category C (A321, A319 ◀ and A320 ◀) as defined by FAR.

A placard in each compartment indicates the maximum authorized gross weight.

The compartments have separate lighting.

RESTRAINT SYSTEM

Divider nets subdivide the compartments to allow them to be partially loaded and to retain the bulk.

Door nets which protect the doors from shifting cargo, must be used whenever the compartment contain cargo.

CARGO LOADING SYSTEM ◀

A semi-automatic cargo loading system, which may be installed in forward and aft compartments, loads pallets and containers.

CARGO CAPACITY

FULL BULK

In full bulk configuration, the maximum load for each compartment and section is as follows:

- **Forward**
 Compartment 1 : 2 268 kg (5 000 lb)

- **Aft**
 Section 41 : 1 326 kg (2 924 lb)
 Section 42 : 1 695 kg (3 736 lb)

CARGO LOADING SYSTEM (CLS)

When the Cargo Loading System (CLS) is installed in the FWD and AFT cargo, the maximum load for each compartment and section is as follows:

- **Forward**
 Compartment 1 : 2 268 kg (5 000 lb)

- **Aft**
 Section 41 : 1 134 kg (2 500 lb)
 Section 42 : 1 134 kg (2 500 lb)

The following table lists the loading possibilities (including the Maximum Gross Weight per container/pallet).

ULD	ATA	NAS 3610	IATA	Allowable MGW		Maximum number	
				kg	lb	fwd	aft
Half size	LD3-46	2K2	G	1134	2500	2	2
Full size	LD3-46W	2K2	H	1134	2500	2	2
60.4 × 61.5 in		2K3	K	1134	2500	2	2
60.4 × 61.5 in		2K3	X	1134	2500	2	2

Note : The bulk compartment is always used in bulk configuration with a maximum load of 1497 kg (3300 lb).

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.20	P 1
	CARGO LOADING		SEQ 105	REV 25

GENERAL

The aircraft has two lower deck cargo compartments :

- Forward cargo compartment, compartment 1 and 2.
- Aft cargo compartment, subdivided into compartments 3, 4 and 5.

The main access doors to forward and aft compartments are hydraulically operated.

A bulk cargo door ◀ gives additional access to the aft cargo compartment. It is manually operated.

DESCRIPTION

Each compartment is divided into sections, and is designed to be category C as defined by FAR.

A placard in each compartment indicates the maximum authorized gross weight.

The compartments have separate lighting.

RESTRAINT SYSTEM

Divider nets subdivide the compartments to allow them to be partially loaded and to retain the bulk.

Door nets which protect the doors from shifting cargo, must be used whenever the compartment contain cargo.

CARGO LOADING SYSTEM ◀

A semi-automatic cargo loading system, which may be installed in forward and aft compartments, loads pallets and containers.

CARGO CAPACITY

FULL BULK

In full bulk configuration, the maximum load for each compartment is as follows:

- **Forward**
Compartment 1 : 2 202 kg (4 854 lb)
Compartment 2 : 3 468 kg (7 645 lb)

- **Aft**
Compartment 3 : 3 587 kg (7 906 lb)
Compartment 4 : 2 083 kg (4 592 lb)
Compartment 5 : 1 497 kg (3 300 lb)

CARGO DOOR OPERATION

NORMAL OPERATION

OPENING

On door

- **ACCESS DOOR OPERATING HANDLE RELEASE**
Push handle flap inward.
- **DOOR UNLOCK**
Move door operating handle downward (105°) from LOCKED to UNLOCK position.

On door service panel

- **SERVICE PANEL ACCESS DOOR OPEN**
- **LEVER OF MANUAL SELECTOR VALVE HOLD ON OPEN**
The yellow hydraulic system is pressurized (YELLOW ELEC PUMP energized).
Operation of the flight controls and PTU is inhibited.
- **When the door is fully open (green light on the service panel is on) :**
 - **LEVER OF MANUAL SELECTOR VALVE RELEASE**
When released, the lever returns to the neutral position and shuts down the electric pump.

CLOSING

On door service panel

- **LEVER OF MANUAL SELECTOR VALVE HOLD ON CLOSE**
At first the lever locks in an intermediate position, maintaining a pre-set pressurization to prevent the door from dropping open. The operator can then move the lever to CLOSE and the door closes. When it is fully closed, the lever returns to the neutral position and shuts down the electric pump.
Ensure that green indicator light goes off.

On door

- **DOOR LOCK**
Immediately push the door operating handle upwards to the locked position. When the door is locked, the cargo doors view ports appear green, the CARGO door indication on ECAM extinguishes, and the handle flap mechanism locks the operating handle.

On door service panel

- ACCESS DOOR CLOSE

AUXILIARY OPERATION

In case of an electrical failure or if the electric pump fails, the operator can open or close the doors by working the hand pump.

HAND PUMP OPENING

On door

- DOOR UNLOCK
- Unlock the operating handle as if for normal operation.

On door service panel

- SERVICE PANEL ACCESS DOOR OPEN
- LEVER OF MANUAL SELECTOR VALVE HOLD ON OPEN

On ground service panel

- HAND PUMP OPERATE
- The door opens.
- When the door is fully open (green light on the service panel is on) :

On door service panel

- LEVER OF MANUAL SELECTOR VALVE RELEASE

On door service panel

– LEVER OF MANUAL SELECTOR VALVE HOLD ON CLOSE

On ground service panel

– HAND PUMP OPERATE
The door closes.

On door service panel

– LEVER OF MANUAL SELECTOR VALVE RELEASE
Release when door is fully closed.

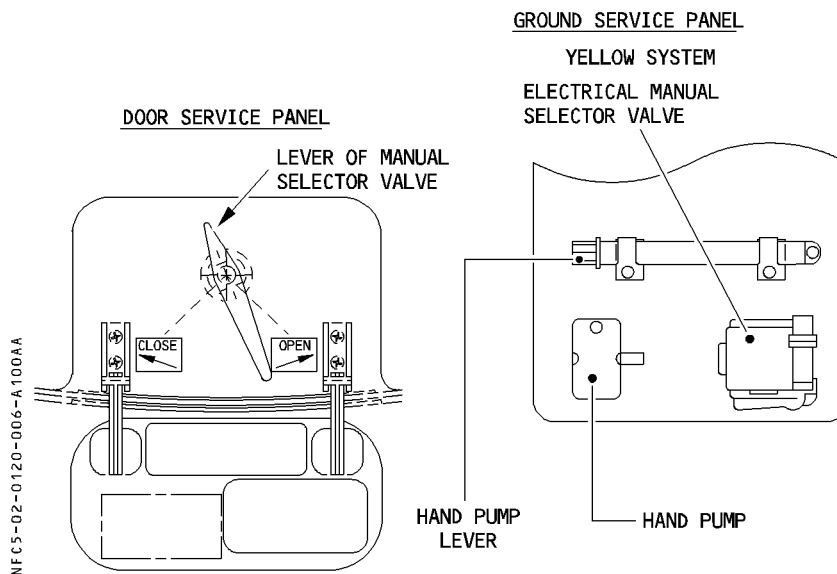
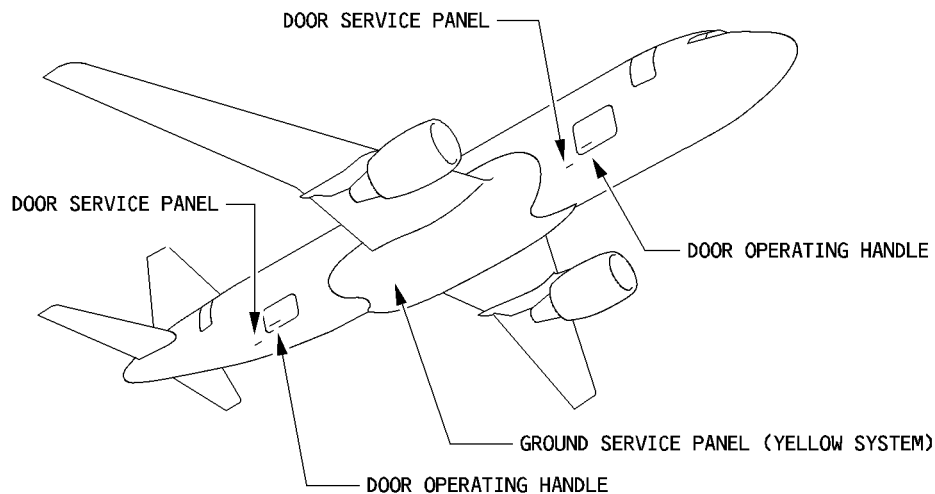
On door

– DOOR LOCK
Lock the operating handle as for normal operation.

On door service panel and ground service panel

– ACCESS DOORS CLOSE

LOCATION OF SERVICE PANELS



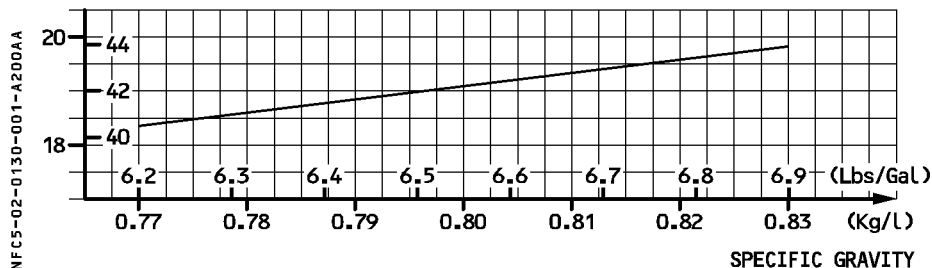
GENERAL INFORMATION

USABLE FUEL VOLUME

	WING TANKS		CENTER TANK	TOTAL
	OUTER CELL	INNER CELL		
LITERS	1760	13849	8250	23859
US GALLONS	464	3659	2180	6303

USABLE FUEL WEIGHT

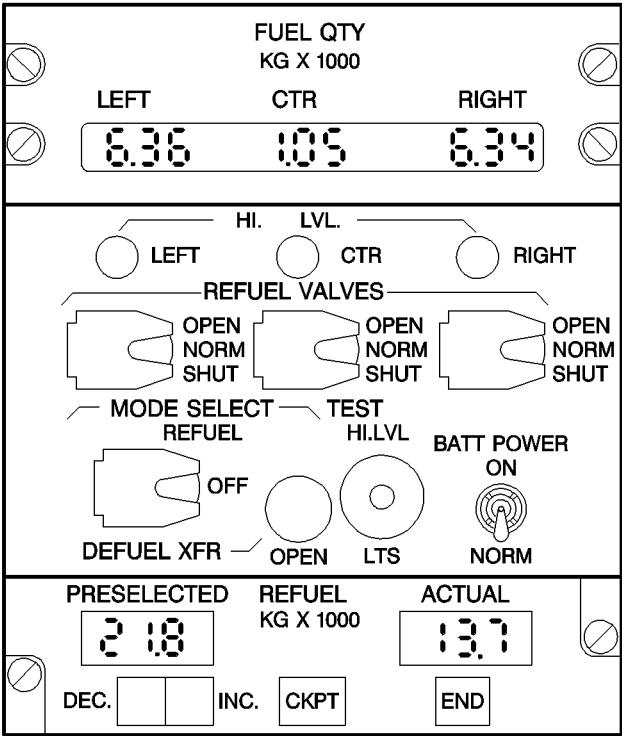
USABLE
 FUEL WEIGHT
 (x1000Kg)(x1000Lb)



REFUELING

- R — During automatic refueling, fuel goes into the center tank and outer cell of wing tanks simultaneously. When the outer cell of wing tank is full, fuel overflows into the inner cell. During manual refueling, fill the wing tanks first, then the center tank.
- With the tanks filled to the maximum capacity, there is enough space in each tank to allow for a 2 % thermal expansion of the fuel without its spilling through the vent system.
- R — Electrical transients (caused by switching among the APU, the external and the engine
- R electrical supply) during automatic refueling may stop the process. If the automatic
- R refueling process is stopped, it is necessary to re-enter the Preselected Fuel Quantity.

REFUELING CONTROL PANEL



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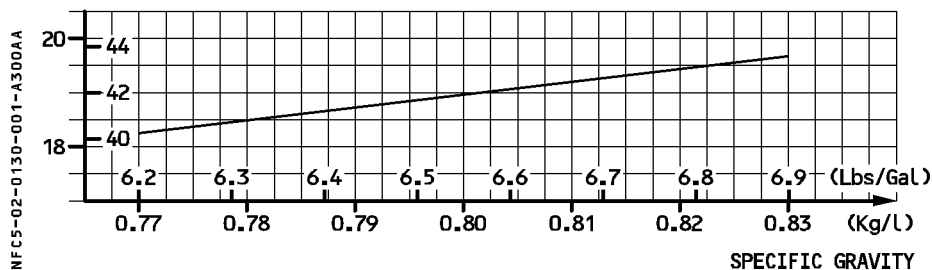
GENERAL INFORMATION

USABLE FUEL VOLUME

	WING TANKS	CENTER TANK	TOTAL
LITERS	15500	8200	23700
US GALLONS	4094	2166	6260

USABLE FUEL WEIGHT

USABLE
 FUEL WEIGHT
 (x1000Kg) (x1000Lb)



REFUELING

- R — During automatic refueling, fuel goes into the center tank and wing tanks simultaneously.
 During manual refueling, fill the wing tanks first, then the center tank.
- With the tanks filled to the maximum capacity, there is enough space in each tank to allow for a 2 % thermal expansion of the fuel without its spilling through the vent system.
- R — Electrical transients (caused by switching among the APU, the external and the engine electrical supply) during automatic refueling may stop the process. If the automatic refueling process is stopped, it is necessary to re-enter the Preselected Fuel Quantity.

REFUELING CONTROL PANEL

FUEL QTY KG X 1000		
LEFT	CTR	RIGHT
6.36	1.05	6.34

LEFT	CTR	RIGHT
HI. LVL. REFUEL VALVES OPEN NORM SHUT MODE SELECT REFUEL DEFUEL XFR	HI. LVL. REFUEL VALVES OPEN NORM SHUT TEST HI.LVL OPEN LTS	HI. LVL. REFUEL VALVES OPEN NORM SHUT BATT POWER ON NORM

PRESELECTED	REFUEL KG X 1000	ACTUAL
2.18		13.7
DEC.	INC.	CKPT
		END

NFC5-02-0130-002-A100AA

REFUELING

PREPARATION

— ACCESS PLATFORM

..... IN POSITION

— SAFETY PRECAUTIONS

..... APPLY

Make certain that no HF transmission (including HF transmission via the HF DATA LINK pb) is performed during refueling and that the tanker and the aircraft are properly grounded.

R

Connect the tanker ground cable to the parking ground point before connecting it to a

R

grounding point on the aircraft. In the cockpit, check that the PARK BRK is ON and that

R

the ACCU PRESS has sufficient pressure. Do not refuel, if a fire or engine overheat

R

warning is displayed. During refueling, do not operate the external lighting.

Note

: For APU start/shutdown during refueling, refer to FCOM 2.01.30 p 10a.

— MAX REFUELING PRESSURE

..... 50 PSI (3.5 bars)

On refueling control panel :

— TEST

..... LTS

Lights on the panel come on. FUEL QTY and the PRESELECTED and ACTUAL displays show 8's.

— TEST

..... HI.LVL

HI LVL lights change state if the high level sensors and their circuits are serviceable.

AUTOMATIC REFUELING

— REFUEL VALVES

..... CHECK NORM and GUARDED

— PRESELECTOR

..... SET

- **MODE SELECT** **REFUEL**
- **START REFUELING**
When the refueling is finished the END light comes on.
- **ACTUAL QUANTITY** **CHECK**
The actual quantity must be within 100 kg (220 lb) of the preselected quantity.
- **MODE SELECT** **OFF and GUARDED**

MANUAL REFUELING

- **REFUEL VALVES** **SHUT**
- **MODE SELECT** **REFUEL**
- **REFUEL VALVES (tanks to be filled)** **OPEN**
- **START REFUELING**
- **FUEL QTY** **MONITOR**
- **When the contents of the tanks reach the required level :**
 - **Corresponding REFUEL VALVES** **SHUT**
 - **MODE SELECT** **OFF and GUARDED**
 - **REFUEL VALVES** **NORM and GUARDED**

GROUND FUEL TRANSFER

On cockpit overhead FUEL panel

- PUMPS (of the tanks not to be defueled) OFF
- MODE SEL MAN
- PUMPS (of the tanks to be defueled) ON
- if left wing and/or center tanks is (are) to be defueled :
 - X FEED ON
 - OPEN light comes on.

On refueling control panel :

- REFUEL VALVES (of tanks not to be filled) SHUT
- REFUEL VALVES (of tanks to be filled) OPEN
- MODE SELECT DEFUEL/XFR
- OPEN light comes on.
- FUEL QTY MONITOR
- When the tank contents reach the required level :
 - Corresponding REFUEL VALVES SHUT
 - MODE SELECT OFF and GUARDED
 - OPEN light goes out.
 - REFUEL VALVES NORM and GUARDED
 - Set cockpit FUEL panel to normal configuration.

INTENTIONALLY LEFT BLANK

GROUND FUEL TRANSFER

From one wing tank to the other wing tank or to the center tank :

On cockpit overhead FUEL panel

- R
- PUMPS (of the wing tank not to be defueled) OFF
 - PUMPS (of the wing tank to be defueled) ON
 - X FEED ON
OPEN light comes on.

On refueling control panel :

- REFUEL VALVES (of tanks not to be filled) SHUT
 - REFUEL VALVES (of tanks to be filled) OPEN
 - MODE SELECT DEFUEL/XFR
OPEN light comes on.
 - FUEL QTY MONITOR
- When the tank contents reach the required level :
- Corresponding REFUEL VALVES SHUT
 - MODE SELECT OFF and GUARDED
OPEN light goes out.
 - REFUEL VALVES NORM and GUARDED
 - Set cockpit FUEL panel to normal configuration.

From center tank to the L (R) wing tank :

- L(R) TK PUMPS ON
- CTR TK L(R) XFR ON
When the wing tank is full or if the center tank is empty the transfer valve will automatically close.

INTENTIONALLY LEFT BLANK

DEFUELING

Note : Defueling by suction is not possible.

– ACCESS PLATFORM IN POSITION

– SAFETY PRECAUTIONS APPLY

Ensure that no HF transmission (including HF transmission via the HF DATA LINK pb) is done during defueling and that the tanker and aircraft are properly grounded.

R

R

R

R

Connect the tanker ground cable to the parking ground point before connecting it to a grounding point on the aircraft. In the cockpit, check that the PARK BRK is ON and that the ACCU PRESS has sufficient pressure. Do not defuel, if a fire or engine overheat warning is displayed. During defueling, do not operate the external lighting.

Note : For APU start/shutdown during defueling, refer to FCOM 2.01.30 p 10a.

– MAX DEFUELING PRESSURE 11 PSI (0.75 bar)

On cockpit overhead FUEL panel :

– PUMPS OFF

On refueling control panel :

R

– REFUEL VALVES NORM

– MODE SELECT (OPEN light comes on) DEFUEL/XFR

On cockpit overhead FUEL panel :

– MODE SEL MAN

– PUMPS (of the tank(s) to be defueled) ON

– X FEED (OPEN light comes on) ON

– FUEL QTY MONITOR

● When the tank contents reach the required level

– Corresponding PUMPS OFF

DEFUELING

Note : Defueling by suction is not possible. Fuel can be removed from wing tank only. To defuel center tank, first transfer fuel to the wing tanks.

– ACCESS PLATFORM IN POSITION

– SAFETY PRECAUTIONS APPLY
 Make certain that no HF transmission (including HF transmission via the HF DATA LINK pb) is performed during defueling and that the tanker and the aircraft are properly grounded.

R

R

R

R

Connect the tanker ground cable to the parking ground point before connecting it to a grounding point on the aircraft. In the cockpit, check that the PARK BRK is ON and that the ACCU PRESS has sufficient pressure. Do not defuel, if a fire or engine overheat warning is displayed. During defueling, do not operate the external lighting.

Note : For APU start/shutdown during defueling, refer to FCOM 2.01.30 p 10a.

– MAX DEFUELING PRESSURE 11 PSI (0.75 bar)

On cockpit overhead FUEL panel

– PUMPS OFF

On refueling control panel :

R

– REFUEL VALVES NORM
 – MODE SELECT (OPEN light comes on) DEFUEL/XFR

On cockpit overhead FUEL panel :

– PUMPS (of the tank(s) to be defueled) ON
 – X FEED (OPEN light comes on) ON
 – FUEL QTY MONITOR

● When the tank contents reach the required level

– Corresponding PUMPS OFF

- On refueling control panel :
 - MODE SELECT (OPEN light goes out) OFF and GUARDED
 - REFUEL VALVES NORM and GUARDED
 - Set cockpit FUEL panel to normal configuration.

OVERWING GRAVITY REFUELING

Overwing gravity refueling is done at the refuel point in the top of each wing. Fuel is delivered directly into the outer cell from which the inner cell is filled by opening the intercell transfer valves. Fill center tank by transfer from the right wing tank (open the X FEED valve in case of transfer from the left wing tank).

– SAFETY PRECAUTIONS

APPLY

- R
- Disembark all passengers.
Ensure that no HF transmission (including HF transmission via the HF DATA LINK pb) is done during refueling and that the tanker and aircraft are properly grounded. Connect a tanker grounding cable to aircraft grounding point on the main landing gear. Refer to Aircraft Maintenance Manual (AMM) 12–11–28 PB 301 for more detailed safety procedures.

Note : For APU start/shutdown during refueling, refer to FCOM 2.01.30 p 10a.

– TRANSFER VALVES (on ECAM FUEL page)

CHECK POSITION

● If transfer valves closed :

– MODE SELECT (on the refuel control panel)

Check OFF

– FUEL/XFR VALVE 1/WING/L C/B (A10 on 49VU) and FUEL/XFR VALVE 2/WING/L C/B (M22 on 121VU)

PULL for a minimum of 5 sec then PUSH

The refuel control panel door must be closed when the C/B’s are being pulled.

– FUEL/XFR VALVE 1/WING/R C/B (A11 on 49VU) and FUEL/XFR VALVE 2/WING/R C/B (M23 on 121VU)

PULL for a minimum of 5 sec then PUSH

Intercell transfer valves will stay open until the next refuel selection.

– FUEL/XFR VALVE 1/WING/L and R C/B’s (A10 and A11 on 49VU), and FUEL/XFR VALVE 2/WING/L and R C/B’s (M22 and M23 on 121 VU)

PULL

The refuel control panel door must be closed when the C/B’s are being pulled. Then it could be opened for subsequent procedures.

RH WING REFUELING PROCEDURE

*– OVERWING REFUEL CAP

REMOVE

*– REFUELING

START

● If the center tank is to be refueled :

– GROUND FUEL TRANSFER PROCEDURE

APPLY

OVERWING GRAVITY REFUELING

Overwing gravity refueling is done at the refuel point in the top of each wing. Fill center tank by transfer from the right wing tank (open the X FEED valve in case of transfer from the left wing tank).

— SAFETY PRECAUTIONS

APPLY

- R
- Disembark all passengers.
Make certain that no HF transmission (including HF transmission via the HF DATA LINK pb) is performed during refueling and that the tanker and the aircraft are properly grounded. Connect a tanker grounding cable to the aircraft grounding point on the main landing gear. Refer to Aircraft Maintenance Manual (AMM) 12–11–28 PB 301 for detailed safety procedures.

Note : For APU start/shutdown during refueling, refer to FCOM 2.01.30 p 10a.

RH WING REFUELING PROCEDURE

*— OVERWING REFUEL CAP

REMOVE

*— REFUELING

START

- If the center tank is to be refueled :

— GROUND FUEL TRANSFER PROCEDURE

APPLY

● When the wing tank reaches the required level :

* – REFUELING STOP

* – OVERWING REFUEL CAP INSTALL

LH WING REFUELING PROCEDURE

Perform the steps for RH wing refueling procedure marked * then :

R – FUEL/XFR VALVE 1/WING/L and R C/B's (A10 and A11 on 49VU) and FUEL/XFR
R VALVE 2/WING/L and R C/B's (M22 and M23 on 121VU) PUSH

– MODE SELECT REFUEL then OFF
Check on FUEL page that the intercell transfer valves close.

*Note : The overwing refuel point is not at the highest point of the wing and therefore
the wing tanks cannot be filled to full.*

REFUELING WITH ONE ENGINE RUNNING

- Refuel with one engine running only at airports where no external ground pneumatic power is available and only when APU is unserviceable.
- Only the RH fuel couplings can be used.
- Overwing gravity filling is not permitted.
- Disembark all passengers.
- Obtain airport authorization.
The Airport Fire Department should standby at the aircraft during the entire refueling procedure.
- Point the aircraft into the wind at a location where the slope is negligible.
Set the parking brake and check its pressure.
Run engine n° 1 at ground idle with its generator connected.
- Do not start engine n° 2, shut down engine n° 1 or attempt to start the APU before all fueling operations have been completed.
- Position the fuel truck under the extremity of the right wing. Its pressure should not exceed 30 psi.
- Follow manual refueling procedure.

OPERATION MONITORING

During the entire refueling procedure :

- Monitor the fuel truck shut off valve.
- Be sure that the fueling company is keeping permanent control of the emergency fuel shut off device.
- Have a flight crew member in the cockpit monitoring all systems and the running engine.
- Have a qualified ground crew member at the fueling station to operate the refuel valve switches.
- Monitor the refueling closely and be prepared to close the refuel valves in order not to exceed the following fuel quantities :

DENSITY (kg/l)	0.77	0.78	0.79	0.8	0.81	0.82	0.83
L(R) WING (kg)	5710	5780	5860	5930	6005	6080	6160
CENTER (kg)	6030	6110	6190	6270	6350	6430	6500

● When the wing tank reaches the required level :

*— REFUELING STOP

R *— OVERWING REFUEL CAP INSTALL

LH WING REFUELING PROCEDURE

Perform the steps for RH wing refueling procedure marked * then :

— MODE SELECT REFUEL then OFF

Note : The overwing refuel point is not at the highest point of the wing and therefore the wing tanks cannot be filled to full.

REFUELING WITH ONE ENGINE RUNNING

- Refuel with one engine running only at airports where no external ground pneumatic power is available and only when APU is unserviceable.
- Only the RH fuel couplings can be used.
- Overwing gravity filling is not permitted.
- Disembark all passengers.
- Obtain airport authorization.
The Airport Fire Department should standby at the aircraft during the entire refueling procedure.
- Point the aircraft into the wind at a location where the slope is negligible.
Set the parking brake and check its pressure.
Run engine n° 1 at ground idle with its generator connected.
- Do not start engine n° 2, shut down engine n° 1 or attempt to start the APU before all fueling operations have been completed.
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- Have a flight crew member in the cockpit monitoring all systems and the running engine.
- Have a qualified ground crew member at the fueling station to operate the refuel valve switches.
- Monitor the refueling closely and be prepared to close the refuel valves in order not to exceed the following fuel quantities :

DENSITY (kg/l)	0.77	0.78	0.79	0.8	0.81	0.82	0.83
L(R) WING (kg)	5660	5730	5810	5880	5950	6030	6100
CENTER (kg)	5990	6070	6150	6220	6300	6380	6460

After second engine start :

- Reset the 3DMCs in order to reinitialize the fuel used values :
 - DMC 1 SPLY C/B (E11 on 49VU) PULL
 - DMC 2 SPLY C/B (Q8 on 121 VU) PULL
 - DMC 3 SPLY C/B (Q9 on 121 VU) PULL
 - DMC 3 SPLY STBY (E10 on 49 VU) PULL
- After 5 seconds :
 - All C/B's PUSH

Note : The T.O MEMO does not appear automatically since one engine is kept running.

R

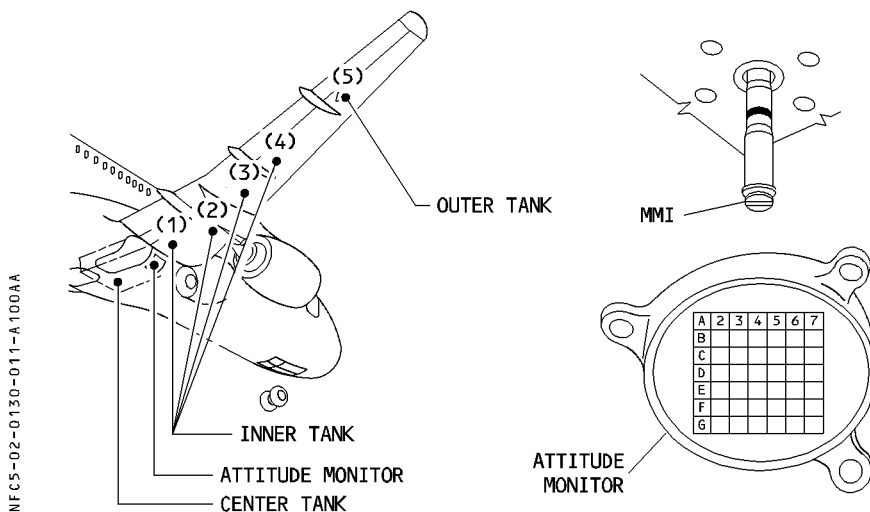
APU START/SHUTDOWN DURING REFUELING/DEFUELING

- R
- APU starts or shutdowns are permitted during refuel/defuel procedures. If it is necessary
- R
- to operate the APU, the limits that follow apply :
- R
- a) An APU start is not permitted during a refuel/defuel procedure if the APU has failed to
- R
- start or an automatic shutdown has occured
- R
- b) A normal APU shutdown must be completed if a fuel spill has occured during the refuel
- R
- defuel procedure.

USE OF MANUAL MAGNETIC INDICATORS (MMI)

Indicators are disposed as follows :

- five in each wing tank, four in inner tank and one in outer tank
- one in the center tank



— A/C ATTITUDE NOTE

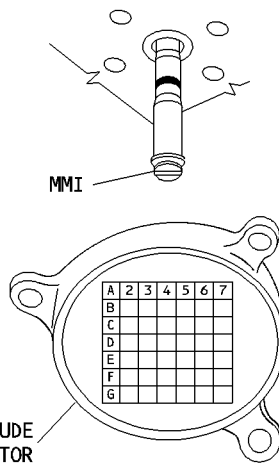
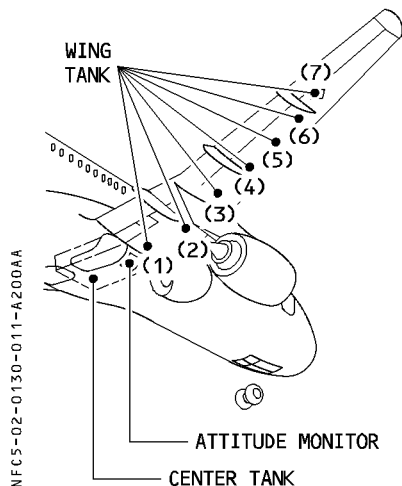
Note the grid square letter and grid square number shown by the bubble on the attitude monitor.

— ACCESS PLATFORM IN POSITION

USE OF MANUAL MAGNETIC INDICATORS (MMI)

Indicators are disposed as follows :

- seven in each wing tank,
- one in the center tank



— A/C ATTITUDE NOTE

Note the grid square letter and grid square number shown by the bubble on the attitude monitor.

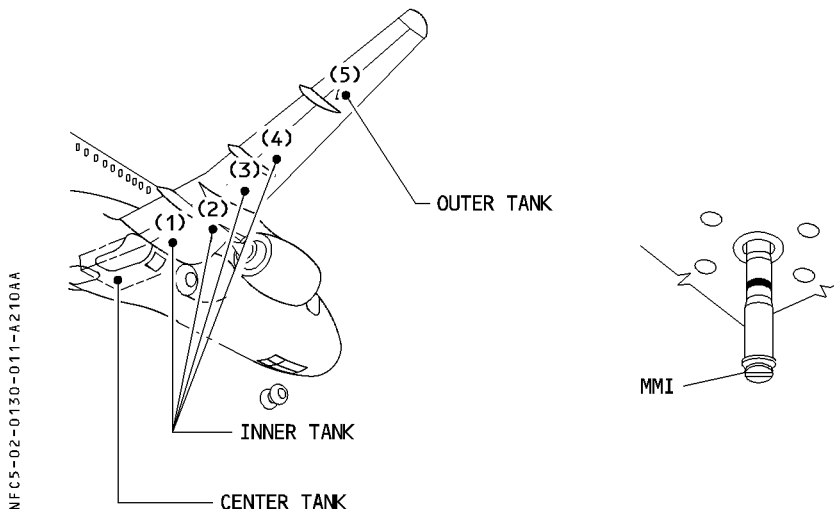
— ACCESS PLATFORM IN POSITION

USE OF MANUAL MAGNETIC INDICATORS (MMI)

Indicators are installed as follows :

- Five in each wing tank : Four in the inner tank and one in the outer tank
- One in the center tank

R



R TO DETERMINE AIRCRAFT ATTITUDE

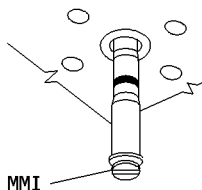
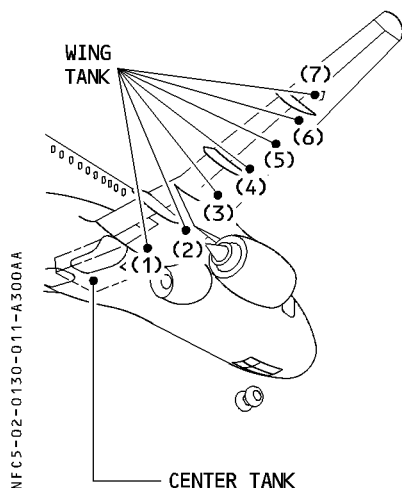
- R — Set ADIRS 1, 2, 3 to the NAV position.
- R — On the LH or RH MCDU, press MCDU MENU pushbutton.
- R — Select CFDS line key (LSK 4L).
- R — Select SYSTEM REPORT/TEST line key (LSK 5L).
- R — Select the line key adjacent to the FUEL indication.
- R — On the MCDU control panel, push the NEXT PAGE key to display the FUEL Main Menu second page.
- R — Select the line key adjacent to the INPUT PARAMETERS VALUES indication.
- R — Use the Table given on the next page to determine the equivalent number and letter from PITCH and ROLL data.
- R — Select RETURN line key (LSK 6L) until CFDS main menu appears.
- R — Press MCDU MENU pushbutton.

USE OF MANUAL MAGNETIC INDICATORS (MMI)

Indicators are installed as follows :

- Seven in each wing tank
- One in the center tank

R



R TO DETERMINE AIRCRAFT ATTITUDE

- R — Set ADIRS 1, 2, 3 to the NAV position.
- R — On the LH or RH MCDU, press MCDU MENU pushbutton.
- R — Select CFDS line key (LSK 4L).
- R — Select SYSTEM REPORT/TEST line key (LSK 5L).
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- R — Select the line key adjacent to the INPUT PARAMETERS VALUES indication.
- R — Use the Table given on the next page to determine the equivalent number and letter from PITCH and ROLL data.
- R — Select RETURN line key (LSK 6L) until CFDS main menu appears.
- R — Press MCDU MENU pushbutton.

TO DETERMINE FUEL QUANTITY IN THE OUTER TANK

- MMI number 5 UNLOCK and WITHDRAW**
 The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
 Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.
- ROD GRADUATION (which aligns with bottom wing surface) READ**
- MMI IN PLACE and LOCKED**
- Use the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the MMI stick number 5, to find the volume of fuel in the outer tank (See the following pages).**
- Multiply the result by the specific gravity to find the fuel weight.**

PITCH	REF	ROLL	REF
Minus 1.5	1	Minus 1.5	A
Minus 1.0	2	Minus 1.0	B
Minus 0.5	3	Minus 0.5	C
0.0	4	0.0	D
Plus 0.5	5	Plus 0.5	E
Plus 1.0	6	Plus 1.0	F
Plus 1.5	7	Plus 1.5	G

- Note : 1. This procedure can only be used if :
- The PITCH and ROLL data is taken from the ADIRS (identified by an “A” after the PITCH and ROLL title).
 - The PITCH data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.
 - The ROLL data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.
2. The FQIS input parameters are not automatically updated. Use the NEXT PAGE control on the MCDU to cycle the pages to update the screen.

– ACCESS PLATFORM IN POSITION

TO DETERMINE FUEL QUANTITY IN THE OUTER TANK

- MMI number 5 UNLOCK and WITHDRAW
 The crewmember must slowly withdraw the MMI, until magnetic attraction is felt between the rod and float magnets.
 Do not use force when withdrawing the MMI, as this will disengage the float magnet from the rod magnet, and bring the rod down on to the mechanical stop.
- ROD GRADUATION (which aligns with bottom wing surface) READ
- MMI IN PLACE and LOCKED
- Use the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number) and the MMI stick number 5, to find the volume of fuel in the outer tank (See the following pages).
- Multiply the result by the specific gravity to find the fuel weight.

TO DETERMINE FUEL QUANTITY IN THE WING TANK

- **MMI (from number 7 to number 1) UNLOCK and WITHDRAW**
The crewmember must slowly withdraw the MMI, until magnetic attraction is felt between the rod and float magnets.
Do not use force when withdrawing the MMI, as this will disengage the float magnet from the rod magnet, and bring the rod down on to the mechanical stop.
- **ROD GRADUATION (which aligns with bottom wing surface) READ**
MMIs shall be withdrawn from number 7 to number 1 until one MMI measures fuel.
- **MMI IN PLACE and LOCKED**
- **Enter the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the applicable MMI stick number, to find the volume of fuel in the wing tank (See the following pages).**
- **Multiply the result by the specific gravity to find the fuel weight.**

PITCH	REF	ROLL	REF
Minus 1.5	1	Minus 1.5	A
Minus 1.0	2	Minus 1.0	B
Minus 0.5	3	Minus 0.5	C
0.0	4	0.0	D
Plus 0.5	5	Plus 0.5	E
Plus 1.0	6	Plus 1.0	F
Plus 1.5	7	Plus 1.5	G

Note : 1. This procedure can only be used if :

- The PITCH and ROLL data is taken from the ADIRS (Make sure that the FQIS Status page does not show “NO DATA FROM ADIRU 1” and “NO DATA FROM ADIRU 2”).
- The PITCH data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.
- The ROLL data displayed for the LEFT, CTR, and RIGHT is no more or less than 0.1 of each other.

2. The FQIS input parameter pages are automatically updated every 5.5 seconds.

– **ACCESS PLATFORM IN POSITION**

TO DETERMINE FUEL QUANTITY IN THE WING TANK

– **MMI (from number 7 to number 1) UNLOCK and WITHDRAW**

The crewmember must slowly withdraw the MMI, until magnetic attraction is felt between the rod and float magnets.

Do not use force when withdrawing the MMI, as this will disengage the float magnet from the rod magnet, and bring the rod down on to the mechanical stop.

– **ROD GRADUATION (which aligns with bottom wing surface) READ**

MMIs shall be withdrawn from number 7 to number 1 until one MMI measures fuel.

– **MMI IN PLACE and LOCKED**

– **Enter the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the applicable MMI stick number, to find the volume of fuel in the wing tank (See the following pages).**

– **Multiply the result by the specific gravity to find the fuel weight.**

TO DETERMINE FUEL QUANTITY IN THE INNER TANK

- MMI (from number 4 to number 1) UNLOCK and WITHDRAW**
The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.
- ROD GRADUATION (which aligns with bottom wing surface) READ**
- MMI IN PLACE and LOCKED**
MMIs shall be withdrawn from number 4 to number 1 until one MMI measures fuel.
- Use the table for the applicable aircraft wing side, aircraft attitude (grid square letter and number), and the applicable MMI stick number to find the volume of fuel in the inner tank (See the following pages).**
- Multiply the result by the specific gravity to find the fuel weight.**

TO DETERMINE FUEL QUANTITY IN THE CENTER TANK

- CENTER TANK MMI UNLOCK and WITHDRAW**
The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.
- ROD GRADUATION (which aligns with bottom wing surface) READ**
- MMI IN PLACE and LOCKED**
- Use the table for the center tank, and for the applicable aircraft attitude (grid square letter and number) to find the volume of fuel in the center tank (See the following pages).**
- Multiply the result by the specific gravity to find the fuel weight.**

TO DETERMINE FUEL QUANTITY IN THE CENTER TANK

- CENTER TANK MMI UNLOCK and WITHDRAW**
 The crewmember must withdraw the MMI slowly until he feels the magnetic attraction between the rod and float magnets.
 Do not use force when withdrawing the MMI as this will disengage the float magnet from the rod magnet and bring the rod down onto the mechanical stop.
- ROD GRADUATION (which aligns with bottom wing surface) READ**
- MMI IN PLACE and LOCKED**
- Use the table for the center tank and for the applicable aircraft attitude (grid square letter and number) to find the volume of fuel in the center tank (See the following pages).**
- Multiply the result by the specific gravity to find the fuel weight.**

WING TANKS (LITERS)

M M I N°	M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING										
			A*	LEFT WING				G	RIGHT WING			A	RIGHT WING				G	LEFT WING				
				1	2	3	4		5				6	7	1	2		3	4	5	6	7**
1	2	50	50	50	50	50	50	50	2	50	50	50	50	50	50	50	50					
	4	100	100	100	100	100	100	100	4	50	50	50	50	50	50	50	50					
	6	100	100	100	100	100	100	100	6	100	100	100	100	100	100	100	100					
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150	150					
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	200	150					
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	250	200					
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	300	250					
	16	350	350	350	350	350	350	350	16	350	350	350	350	350	350	350	300					
	18	450	450	450	450	450	400	400	18	400	400	400	400	400	400	400	350					
	20	500	500	500	500	500	500	500	20	450	450	450	450	450	450	450	400					
	22	550	550	550	550	550	550	550	22	500	500	500	500	500	500	500	450					
	24	650	650	650	650	650	650	600	24	550	550	550	550	550	550	550	550					
	26	750	750	750	750	750	700	700	26	650	650	650	650	650	650	650	600					
	28	800	800	800	800	800	800	800	28	700	700	700	700	700	700	700	700					
	30	900	900	900	900	900	900	900	30	800	800	800	800	800	800	800	750					
	32	1050	1050	1050	1050	1050	1000	1000	32	900	900	900	900	900	850	850	850					
	34	1150	1150	1150	1150	1150	1150	1100	34	950	950	950	950	950	950	950	950					
	36	1250	1250	1250	1250	1250	1250	1250	36	1050	1050	1050	1050	1050	1050	1050	1050					
	38	1350	1350	1350	1350	1350	1350	1350	38	1150	1150	1150	1150	1150	1150	1150	1150					
	40	1500	1500	1500	1500	1500	1500	1500	40	1250	1250	1250	1250	1250	1250	1250	1250					
	42	1600	1600	1600	1600	1600	1600	1600	42	1350	1350	1350	1350	1350	1350	1350	1350					
	44	1750	1750	1750	1750	1750	1750	1750	44	1450	1450	1450	1450	1450	1450	1450	1450					
	46	1900	1900	1900	1900	1900	1900	1900	46	1550	1550	1550	1550	1550	1550	1550	1550					
	48	2000	2000	2000	2000	2000	2000	2050	48	1700	1700	1700	1700	1700	1700	1700	1700					
	50	2200	2200	2200	2200	2200	2200	2200	50	1800	1800	1800	1800	1800	1800	1800	1800					
	52	2350	2350	2350	2350	2350	2350	2400	52	1950	1950	1950	1950	1950	1950	1950	1950					
	54	2500	2500	2500	2500	2500	2500	2550	54	2000	2000	2050	2050	2050	2050	2050	2050					
	56	2650	2650	2700	2700	2700	2700	2650	56	2200	2200	2200	2200	2200	2200	2200	2200					
	58	2800	2800	2800	2800	2850	2850	2850	58	2300	2300	2300	2300	2300	2300	2350	2350					
	60	2950	2950	2950	3000	3000	3050	3050	60	2450	2500	2500	2500	2500	2500	2500	2500					
	62	3100	3100	3150	3150	3150	3200	3250	62	2600	2600	2650	2650	2650	2650	2650	2650					
	63	3150	3150	3200	3200	3250	3300	3350	63	2650	2650	2700	2700	2700	2700	2700	2700					
	MAX	3450	3450	3450	3500	3500	3600	3600	MAX	2950	2950	2950	2950	2950	2950	3000	3000					

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

M M I N°	M M I N°	R E A D I N G	LITERS ATTITUDE READING							M M I N°	R E A D I N G	LITERS ATTITUDE READING										
			A	LEFT WING			G	RIGHT WING				A	RIGHT WING			G	LEFT WING					
				1	2	3		4	5				6	7	1		2	3	4	5	6	7
2	2	2300	2250	2200	2200	2200	2200	2200	2	2850	2850	2850	2850	2850	2850	2850	2800					
	4	2500	2450	2400	2400	2350	2350	2350	4	3050	3050	3050	3050	3050	3000	3000						
	6	2650	2600	2600	2600	2550	2500	2500	6	3200	3200	3200	3200	3200	3200	3150						
	8	2750	2750	2750	2700	2700	2650	2650	8	3300	3300	3300	3300	3300	3300	3250						
	10	2900	2900	2900	2900	2850	2850	2850	10	3500	3500	3500	3500	3450	3450	3400						
	12	3100	3100	3100	3100	3100	3050	3000	12	3650	3650	3600	3600	3600	3600	3600						
	14	3250	3250	3250	3250	3250	3250	3200	14	3800	3800	3750	3750	3750	3750	3750						
	16	3450	3450	3450	3450	3450	3400	3400	16	3950	3900	3900	3900	3900	3900	3900						
	18	3700	3650	3650	3650	3650	3600	3600	18	4050	4050	4050	4050	4050	4050	4050						
	20	3900	3900	3900	3900	3850	3850	3850	20	4200	4200	4200	4200	4200	4200	4200						
	22	4100	4100	4050	4050	4050	4050	4050	22	4250	4250	4250	4300	4300	4300	4300						
	24	4300	4300	4300	4300	4300	4300	4300	24	4400	4400	4400	4400	4450	4450	4450						
	26	4500	4500	4500	4500	4500	4500	4550	26	4500	4500	4550	4550	4550	4600	4600						
	28	4700	4700	4750	4750	4750	4750	4750	28	4600	4650	4650	4700	4700	4750	4800						
	30	4950	4950	4950	4950	5000	5000	5000	30	4750	4750	4800	4800	4850	4850	4900						
32	5100	5100	5150	5150	5150	5200	5200	32	4850	4850	4900	4900	4950	5000	5000							
	MAX								MAX													
3																						
	2	4400	4350	4300	4250	4200	4150	4050	2	5050	5050	5100	5100	5100	5100	5100						
	4	4700	4700	4650	4600	4500	4400	4300	4	5150	5150	5200	5200	5200	5200	5200						
	6	4950	4950	4900	4850	4800	4700	4550	6	5250	5250	5300	5300	5300	5300	5300						
	8	5150	5100	5100	5050	5000	4950	4800	8	5350	5350	5400	5400	5400	5400	5400						
	10	5250	5250	5250	5250	5200	5150	5050	10	5450	5450	5500	5500	5500	5500	5500						
	12	5400	5400	5400	5400	5350	5300	5250	12	5500	5500	5550	5600	5600	5600	5650						
	14	5600	5600	5550	5550	5500	5500	5450	14	5600	5650	5650	5700	5700	5700	5750						
	16	5750	5750	5700	5700	5700	5650	5600	16	5650	5700	5700	5750	5750	5800	5800						
	18	5900	5900	5850	5850	5850	5850	5800	18	5800	5800	5850	5850	5900	5900	5950						
20	6000	6000	6000	6000	6000	6000	6000	20	5900	5900	5950	5950	6000	6000	6050							
4																						
	2	5700	5600	5550	5500	5450	5400	5300	2	6000	6050	6100	6100	6100	6100	6100						
	4	5850	5750	5700	5650	5600	5550	5500	4	6100	6100	6150	6150	6150	6200	6200						
	6	6000	5900	5850	5800	5750	5700	5650	6	6200	6200	6200	6250	6250	6250	6300						
	8	6150	6100	6050	6000	5950	5900	5850	8	6250	6300	6300	6350	6350	6350	6400						
	10	6300	6300	6250	6200	6150	6150	6100	10	6350	6400	6400	6400	6450	6450	6450						
	12	6450	6400	6400	6400	6350	6300	6250	12	6450	6450	6450	6500	6500	6550	6550						
	14	6550	6500	6500	6500	6500	6450	6450	14	6500	6550	6550	6550	6600	6600	6650						
	16	6600	6600	6600	6600	6600	6600	6550	16	6600	6600	6600	6650	6650	6700	6750						
	18	6650	6650	6650	6650	6650	6650	6650	18	6650	6700	6700	6750	6750	6750	6800						
	MAX								MAX													
5																						
	2	650	600	550	550	550	500	500	2	700	700	700	700	700	700	700						
	4	700	650	650	600	600	550	550	4	750	750	750	750	750	750	750						
	6	750	700	700	650	650	650	600	6	800	800	800	800	750	750	750						
	8	750	750	750	750	700	700	700	8	800	800	800	800	800	800	800						
	10	800	800	800	750	750	750	750	10	850	850	850	850	850	850	850						
	12	800	800	800	800	800	800	800	12	850	850	850	850	850	850	850						
	14	850	850	850	850	850	850	850	14	850	850	850	850	850	850	850						
	MAX	850	850	850	850	850	850	850	MAX	850	850	850	850	850	850	850						

WING TANKS (LITERS)

M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING						
		A	LEFT WING			G	RIGHT WING	
		1	2	3	4	5	6	7
1	0	50	50	50	50	50	50	50
	2	50	50	50	50	50	50	50
	4	100	100	100	100	100	100	100
	6	150	150	150	150	150	150	150
	8	150	150	150	150	150	150	150
	10	200	200	200	200	200	200	200
	12	250	250	250	250	250	250	250
	14	300	300	300	300	300	300	300
	16	400	350	350	350	350	350	350
	18	450	450	450	450	450	450	450
	20	500	500	500	500	500	500	500
	22	600	600	600	600	550	550	550
	24	650	650	650	650	650	650	650
	26	750	750	750	750	750	750	750
	28	850	850	850	850	850	850	850
	30	950	950	950	950	950	950	950
	32	1050	1050	1050	1050	1050	1050	1050
	34	1150	1150	1150	1150	1150	1150	1150
	36	1300	1250	1250	1250	1300	1300	1300
	38	1400	1400	1400	1400	1400	1400	1400
	40	1500	1500	1550	1550	1550	1550	1550
	42	1650	1650	1650	1650	1650	1700	1700
	44	1800	1800	1800	1800	1800	1800	1850
	46	1950	1950	1950	1950	1950	2000	2000
	48	2100	2100	2100	2100	2100	2150	2150
	50	2250	2250	2250	2250	2300	2300	2300
	52	2400	2400	2400	2450	2450	2450	2500
	54	2550	2550	2600	2600	2650	2650	2700
	56	2700	2750	2750	2800	2800	2850	2850
	58	2900	2900	2950	2950	3000	3050	3050
	60	3050	3100	3150	3150	3200	3250	3250
	62	3250	3300	3300	3350	3400	3450	3500
	64	3450	3500	3500	3550	3600	3650	3700
2	0	2150	2100	2100	2050	2050	2050	2000
	2	2300	2250	2250	2250	2200	2200	2150
	4	2450	2450	2400	2400	2350	2350	2350
	6	2600	2600	2550	2550	2550	2500	2500
	8	2800	2750	2750	2750	2700	2700	2700
	10	2950	2950	2900	2900	2900	2900	2850
	12	3150	3100	3100	3100	3100	3050	3050
	14	3300	3300	3300	3300	3300	3250	3250
	16	3500	3500	3500	3500	3500	3500	3500
	18	3700	3700	3700	3700	3700	3700	3700
	20	3900	3900	3900	3900	3900	3900	3900
	22	4150	4150	4150	4150	4150	4150	4150
	24	4350	4350	4350	4350	4350	4400	4400
	26	4550	4550	4550	4600	4600	4600	4650
	28	4750	4800	4800	4800	4850	4850	4900
	30	4950	5000	5000	5050	5100	5100	5150
	32	5150	5200	5250	5250	5300	5350	5400
	34	5350	5400	5450	5500	5550	5600	5650

M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING						
		A	RIGHT WING			G	LEFT WING	
		1	2	3	4	5	6	7
0	50	50	50	50	50	50	50	
2	100	100	100	50	50	50	50	
4	100	100	100	100	100	100	100	
6	150	150	150	150	150	150	150	
8	150	150	150	150	150	150	150	
10	200	200	200	200	200	200	200	
12	250	250	250	250	250	250	250	
14	300	300	300	300	300	300	300	
16	350	350	350	350	350	350	350	
18	400	400	400	400	400	400	400	
20	450	450	450	450	450	450	450	
22	550	550	550	500	500	500	500	
24	600	600	600	600	600	600	600	
26	650	650	650	650	650	650	650	
28	750	750	750	750	750	750	700	
30	850	800	800	800	800	800	800	
32	900	900	900	900	900	900	900	
34	1000	1000	1000	1000	1000	1000	1000	
36	1100	1100	1100	1100	1100	1100	1050	
38	1200	1200	1200	1200	1200	1200	1150	
40	1300	1300	1300	1300	1300	1300	1300	
42	1400	1400	1400	1400	1400	1400	1400	
44	1500	1500	1500	1500	1500	1500	1500	
46	1600	1600	1600	1600	1600	1600	1600	
48	1750	1750	1750	1750	1750	1750	1750	
50	1850	1850	1850	1850	1850	1850	1850	
52	2000	2000	2000	2000	2000	2000	2000	
54	2100	2100	2100	2100	2150	2150	2150	
56	2250	2250	2250	2250	2250	2250	2300	
58	2400	2400	2400	2400	2400	2400	2400	
60	2550	2550	2550	2550	2550	2550	2550	
62	2650	2700	2700	2700	2700	2700	2700	
64	2800	2800	2850	2850	2850	2850	2900	
0	2800	2750	2750	2750	2700	2700	2650	
2	2950	2900	2900	2850	2850	2850	2800	
4	3100	3050	3050	3050	3000	3000	2950	
6	3250	3200	3200	3200	3150	3150	3150	
8	3400	3400	3350	3350	3300	3300	3300	
10	3550	3550	3500	3500	3500	3450	3450	
12	3700	3700	3700	3650	3650	3650	3600	
14	3850	3850	3850	3850	3800	3800	3800	
16	4000	4000	4000	4000	4000	3950	3950	
18	4150	4150	4150	4150	4150	4150	4100	
20	4300	4300	4300	4300	4300	4300	4300	
22	4400	4450	4450	4450	4450	4450	4450	
24	4550	4550	4550	4550	4600	4600	4600	
26	4650	4650	4700	4700	4700	4750	4750	
28	4750	4800	4800	4800	4850	4850	4850	
30	4850	4900	4900	4950	4950	5000	5000	
32	4950	5000	5000	5050	5050	5100	5150	
34	5050	5100	5150	5150	5200	5200	5250	

M M I N°	R E A D I N G	LITERS ATTITUDE READING							M M I N°	R E A D I N G	LITERS ATTITUDE READING										
		A	LEFT WING			G	RIGHT WING				A	RIGHT WING			G	LEFT WING					
			1	2	3		4	5				6	7	1		2	3	4	5	6	7
3	0	4300	4200	4150	4100	4000	3950	3850	0	5050	5050	5050	5050	5000	5000	5000					
	2	4500	4450	4350	4300	4250	4150	4100	2	5150	5150	5150	5150	5150	5100	5100					
	4	4700	4650	4600	4550	4450	4400	4300	4	5250	5250	5250	5250	5250	5250	5250	5250	5250	5250		
	6	4900	4850	4800	4750	4700	4650	4600	6	5350	5350	5350	5350	5350	5350	5350	5350	5350	5350		
	8	5100	5050	5050	5000	4950	4900	4850	8	5450	5450	5450	5450	5450	5450	5450	5450	5450	5450		
	10	5300	5250	5250	5200	5150	5150	5100	10	5550	5550	5550	5550	5550	5550	5550	5550	5550	5550		
	12	5450	5450	5450	5400	5400	5350	5350	12	5650	5650	5650	5650	5650	5650	5650	5650	5650	5650		
	14	5650	5650	5650	5650	5600	5600	5600	14	5700	5750	5750	5750	5750	5750	5750	5800	5800	5800		
	16	5800	5800	5800	5850	5850	5850	5800	16	5800	5800	5850	5850	5850	5850	5850	5900	5900	5900		
	18	5950	5950	6000	6000	6000	6050	6050	18	5900	5900	5900	5950	5950	5950	5950	6000	6000	6000		
	20	6100	6100	6150	6150	6200	6250	6250	20	6000	6000	6000	6050	6050	6050	6050	6100	6100	6100		
	22	6200	6250	6300	6350	6400	6400	6450	22	6050	6100	6100	6150	6150	6150	6150	6200	6200	6200		
4	0	5650	5600	5550	5450	5400	5300	5200	0	6100	6100	6100	6050	6050	6050	6050	6050	6050	6050		
	2	5800	5750	5700	5650	5600	5550	5450	2	6150	6150	6150	6150	6150	6150	6150	6150	6150	6150		
	4	5950	5950	5900	5850	5800	5750	5700	4	6250	6250	6250	6250	6250	6250	6250	6250	6250			
	6	6100	6100	6050	6050	6000	5950	5900	6	6350	6350	6350	6350	6350	6350	6350	6350	6350	6350		
	8	6250	6200	6200	6200	6200	6150	6150	8	6400	6400	6450	6450	6450	6450	6450	6450	6450			
	10	6350	6350	6350	6350	6350	6350	6350	10	6500	6500	6500	6500	6550	6550	6550	6550	6550			
	12	6500	6500	6500	6550	6550	6550	6550	12	6550	6600	6600	6600	6600	6600	6600	6650	6650			
	14	6600	6650	6650	6650	6700	6700	6750	14	6650	6650	6650	6700	6700	6700	6700	6750	6750			
	16	6750	6750	6800	6800	6850	6850	6900	16	6700	6750	6750	6750	6800	6800	6800	6800	6800			
	18	6850	6900	6950	6950	7000	7050	7050	18	6800	6800	6850	6850	6850	6900	6900	6900	6900			
	20	7000	7000	7050	7100	7150	7150	7200	20	6850	6900	6900	6900	6950	6950	6950	7000	7000			
	5	0	6450	6350	6300	6200	6050	5900	5750	0	6800	6800	6750	6750	6700	6650	6650	6650	6650		
2		6550	6500	6450	6350	6250	6150	5950	2	6900	6850	6850	6800	6800	6750	6750	6750	6750			
4		6700	6650	6600	6500	6450	6350	6200	4	6950	6950	6900	6900	6850	6850	6800	6800				
6		6800	6750	6700	6650	6600	6550	6400	6	7000	7000	7000	6950	6950	6900	6900	6900				
8		6950	6900	6850	6800	6750	6700	6600	8	7100	7050	7050	7050	7000	7000	7000	7000				
10		7050	7000	7000	6950	6900	6850	6800	10	7150	7150	7100	7100	7100	7100	7100	7050				
12		7150	7150	7100	7100	7050	7000	6950	12	7200	7200	7200	7200	7150	7150	7150	7150				
14		7250	7250	7250	7200	7200	7150	7100	14	7250	7250	7250	7250	7250	7250	7200	7200				
16		7350	7350	7350	7350	7300	7300	7300	16	7300	7300	7300	7300	7300	7300	7300	7300				
18		7450	7450	7450	7450	7450	7450	7400	18	7400	7400	7350	7350	7350	7350	7350	7350				
20		7550	7550	7550	7550	7550	7550	7550	20	7450	7450	7450	7450	7450	7450	7450	7450				
6		0	7150	7100	7050	6950	6900	6800	6650	0	7400	7400	7400	7350	7350	7350	7300	7300			
	2	7250	7200	7150	7100	7050	6950	6850	2	7500	7450	7450	7450	7400	7400	7400	7400				
	4	7350	7300	7300	7250	7150	7100	7000	4	7550	7500	7500	7500	7500	7450	7450	7450				
	6	7450	7400	7400	7350	7300	7250	7200	6	7600	7550	7550	7550	7550	7550	7500	7500				
	8	7550	7500	7500	7450	7450	7400	7350	8	7600	7600	7600	7600	7600	7600	7550	7550				
	10	7650	7600	7600	7550	7550	7500	7450	10	7650	7650	7650	7650	7650	7650	7650	7650				
	12	7700	7700	7700	7650	7650	7650	7600	12	7700	7700	7700	7700	7700	7700	7700	7700				
	14	7800	7800	7750	7750	7750	7750	7700	14	7750	7750	7750	7750	7750	7750	7750	7750				
	16	7850	7850	7850	7850	7850	7850	7800	16	7800	7800	7800	7800	7800	7800	7800	7800				
	7	0	7600	7600	7550	7500	7450	7400	7300	0	7800	7800	7800	7800	7800	7750	7750	7750			
		2	7700	7700	7650	7600	7550	7500	7450	2	7850	7850	7850	7850	7800	7800	7800	7800			
		4	7800	7750	7750	7700	7650	7650	7600	4	7900	7900	7900	7850	7850	7850	7850				
6		7850	7850	7800	7800	7750	7750	7700	6	7950	7900	7900	7900	7900	7900	7900	7900				
8		7900	7900	7900	7850	7850	7850	7800	8	7950	7950	7950	7950	7950	7950	7950	7950				
10		7950	7950	7950	7950	7900	7900	7900	10	8000	8000	8000	8000	8000	8000	8000	8000				
12		8000	8000	8000	8000	8000	7950	7950	12	8000	8000	8000	8000	8000	8000	8000	8000				
14		8050	8050	8050	8000	8000	8000	8000	14	8050	8050	8050	8050	8050	8050	8050	8050				

M M I N°	M M I N G	LITERS ATTITUDE MONITOR READING							M M I N G	LITERS ATTITUDE MONITOR READING							
		B*	LEFT WING			F	RIGHT WING			B	RIGHT WING			F	LEFT WING		
		1	2	3	4	5	6	7		1	2	3	4	5	6	7**	
1	2	50	50	50	50	50	50	50	2	50	50	50	50	50	50	50	
	4	50	50	50	50	50	50	50	4	50	50	50	50	50	50	50	
	6	100	100	100	100	100	100	100	6	100	100	100	100	100	100	100	
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150	
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	150	
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	200	
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	250	
	16	350	350	350	350	360	350	350	16	350	350	350	350	350	350	300	
	18	400	400	400	400	400	400	400	18	400	400	400	400	400	400	350	
	20	450	450	450	450	450	450	450	20	450	450	450	450	450	450	450	
	22	550	550	550	550	550	550	550	22	500	500	500	500	500	500	500	
	24	600	600	600	600	600	600	600	24	550	550	550	550	550	550	550	
	26	700	700	700	700	700	700	700	26	650	650	650	650	650	650	650	
	28	800	800	800	800	800	800	800	28	700	700	700	700	700	700	700	
	30	900	900	900	900	900	900	850	30	800	800	800	800	800	800	800	
	32	1000	1000	1000	1000	1000	1000	950	32	900	900	900	900	900	900	850	
	34	1100	1100	1100	1100	1100	1100	1100	34	1000	1000	1000	1000	950	950	950	
	36	1200	1200	1200	1200	1200	1200	1200	36	1100	1100	1100	1100	1050	1050	1050	
	38	1300	1300	1300	1300	1300	1300	1300	38	1200	1200	1200	1200	1200	1150	1150	
	40	1450	1450	1450	1450	1450	1450	1450	40	1300	1300	1300	1300	1300	1300	1300	
	42	1550	1550	1550	1550	1550	1550	1550	42	1400	1400	1400	1400	1400	1400	1400	
	44	1700	1700	1700	1700	1700	1700	1700	44	1500	1500	1500	1500	1500	1500	1500	
	46	1800	1800	1800	1800	1800	1800	1800	46	1600	1600	1600	1600	1600	1600	1600	
	48	1950	1950	1950	1950	1950	1950	1950	48	1700	1700	1700	1700	1700	1700	1700	
	50	2100	2100	2100	2100	2100	2100	2100	50	1850	1850	1850	1850	1850	1850	1850	
	52	2250	2250	2250	2250	2250	2250	2250	52	1950	1950	1950	1950	1950	1950	1950	
	54	2400	2400	2400	2400	2400	2400	2450	54	2100	2100	2100	2100	2100	2100	2100	
	56	2550	2550	2600	2600	2600	2600	2600	56	2250	2250	2250	2250	2250	2250	2250	
	58	2750	2750	2750	2750	2750	2750	2750	58	2400	2400	2400	2400	2400	2400	2400	
	60	2850	2850	2850	2850	2900	2900	2950	60	2550	2550	2550	2550	2550	2550	2550	
	62	3000	3000	3000	3050	3050	3050	3100	62	2700	2700	2700	2700	2700	2700	2700	
	63	3050	3050	3050	3100	3150	3150	3200	63	2750	2750	2750	2750	2750	2750	2750	
	MAX	3350	3350	3350	3350	3400	3450	3500	MAX	3000	3000	3000	3000	3000	3000	3000	

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

M M I N°	M M I N G	LITERS ATTITUDE MONITOR READING							M M I N G	LITERS ATTITUDE MONITOR READING										
		B	LEFT WING				F	RIGHT WING			B	RIGHT WING				F	LEFT WING			
		1	2	3	4	5	6	7		1	2	3	4	5	6	7				
2	2	2350	2350	2300	2300	2250	2200	2200	2	2800	2750	2750	2750	2700	2700	2650				
	4	2550	2500	2500	2450	2450	2400	2400	4	2950	2950	2900	2900	2900	2900	2850				
	6	2750	2700	2700	2650	2650	2600	2600	6	3100	3100	3100	3100	3100	3050	3050				
	8	2850	2850	2800	2800	2800	2750	2750	8	3200	3200	3200	3200	3200	3200	3150	3150			
	10	3000	3000	3000	3000	3000	2950	2900	10	3400	3400	3350	3350	3350	3350	3300	3300			
	12	3150	3150	3200	3150	3150	3150	3100	12	3550	3550	3550	3550	3500	3500	3450				
	14	3350	3350	3350	3350	3350	3300	3300	14	3750	3700	3700	3700	3650	3650	3650				
	16	3550	3550	3550	3550	3500	3500	3450	16	3900	3850	3850	3850	3850	3800	3800	3800			
	18	3750	3750	3750	3750	3700	3700	3650	18	4050	4000	4000	4000	4000	4000	3950				
	20	4000	3950	3950	3950	3950	3900	3900	20	4200	4150	4150	4150	4150	4150	4150	4150			
	22	4150	4100	4100	4100	4100	4100	4100	22	4250	4250	4250	4250	4250	4250	4250				
	24	4300	4300	4300	4300	4300	4300	4300	24	4400	4400	4400	4400	4400	4400	4400	4400			
	26	4500	4500	4500	4500	4500	4500	4500	26	4500	4500	4500	4550	4550	4550	4550				
	28	4700	4700	4700	4700	4700	4750	4750	28	4650	4650	4650	4650	4700	4700	4750				
	30	4850	4900	4900	4900	4950	4950	4950	30	4750	4750	4800	4800	4850	4850	4900				
	32	5050	5100	5100	5100	5100	5150	5150	32	4850	4900	4900	4950	4950	5000	5050				
		MAX								MAX										
3																				
	2	4550	4500	4500	4450	4400	4350	4300	2	5000	5000	5000	5000	5000	5000	4950				
	4	4800	4800	4800	4750	4650	4600	4500	4	5100	5100	5100	5100	5100	5100	5100				
	6	5050	5000	5000	5000	4900	4850	4750	6	5200	5200	5200	5250	5200	5200	5200				
	8	5150	5150	5150	5150	5100	5000	5000	8	5300	5300	5350	5350	5350	5350	5350				
	10	5300	5300	5300	5300	5250	5200	5150	10	5400	5400	5450	5450	5450	5450	5450				
	12	5450	5450	5450	5450	5400	5400	5350	12	5500	5500	5550	5550	5550	5550	5550				
	14	5600	5600	5600	5550	5550	5550	5500	14	5600	5600	5650	5650	5650	5650	5700				
	16	5700	5700	5700	5700	5700	5700	5700	16	5700	5700	5700	5750	5750	5750	5800				
	18	5850	5850	5850	5850	5850	5850	5850	18	5800	5800	5800	5850	5850	5850	5900				
	20	6000	6000	6050	6050	6050	6000	6000	20	5900	5900	5950	5950	6000	6000	6000				
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4																				
	2								2	5950	5950	6100	6000	6050	6050	6050				
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	6	6000	6000	5950	5900	5850	5800	5800	6	6150	6150	6200	6200	6200	6200	6200				
	8	6150	6150	6100	6100	6050	6000	6000	8	6250	6250	6250	6300	6300	6300	6300				
	10	6300	6300	6250	6250	6250	6200	6150	10	6350	6350	6350	6400	6400	6400	6400				
	12	6400	6400	6400	6400	6350	6350	6300	12	6400	6450	6450	6450	6500	6500	6500				
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5																				
	2	650	650	600	600	600	550	550	2	750	700	700	700	700	700	700				
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	8	800	800	750	750	750	750	700	8	800	800	800	800	800	800	800				
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	14	850	850	850	850	850	850	850	14	850	850	850	850	850	850	850				
	MAX	850	850	850	850	850	850	850	MAX	850	850	850	850	850	850	850				

M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING										
		B	LEFT WING			F	RIGHT WING				B	RIGHT WING			F	LEFT WING					
			1	2	3		4	5				6	7	1		2	3	4	5	6	7
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	2	50	50	50	50	50	50	50	2	100	100	50	50	50	50	50	50				
	4	100	100	100	100	100	100	100	4	100	100	100	100	100	100	100	100				
	6	150	150	150	150	150	150	150	6	150	150	150	150	150	150	150	150				
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150	150				
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	200	200				
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	250	250				
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	300	300				
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	18	450	450	450	400	400	400	400	18	400	400	400	400	400	400	400	400				
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	22	600	550	550	550	550	550	550	22	550	550	550	550	500	500	500	500				
	24	650	650	650	650	650	650	650	24	600	600	600	600	600	600	600	600				
	26	750	750	750	750	700	700	700	26	700	700	650	650	650	650	650	650				
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	30	900	900	900	900	900	900	900	30	850	850	850	850	850	800	800	800				
	32	1000	1000	1000	1000	1000	1000	1000	32	950	900	900	900	900	900	900	900				
	34	1150	1100	1100	1100	1100	1100	1100	34	1000	1000	1000	1000	1000	1000	1000	1000				
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	38	1350	1350	1350	1350	1350	1350	1350	38	1200	1200	1200	1200	1200	1200	1200	1200				
	40	1450	1450	1450	1450	1500	1500	1500	40	1300	1300	1300	1300	1300	1300	1300	1300				
	42	1600	1600	1600	1600	1600	1600	1600	42	1450	1450	1400	1400	1400	1400	1400	1400				
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	46	1850	1850	1850	1900	1900	1900	1900	46	1650	1650	1650	1650	1650	1650	1650	1650				
	48	2000	2000	2000	2000	2050	2050	2050	48	1800	1800	1800	1800	1800	1800	1800	1800				
	50	2150	2150	2150	2200	2200	2200	2200	50	1900	1900	1900	1900	1900	1900	1900	1900				
	52	2300	2300	2300	2350	2350	2350	2350	52	2050	2050	2050	2050	2050	2050	2050	2050				
	54	2450	2450	2500	2500	2500	2550	2550	54	2150	2150	2200	2200	2200	2200	2200	2200				
	56	2600	2650	2650	2650	2700	2700	2700	56	2300	2300	2300	2300	2350	2350	2350	2350				
	58	2800	2800	2800	2850	2850	2900	2900	58	2450	2450	2450	2450	2500	2500	2500	2500				
	60	2950	2050	3000	3000	3050	3050	3050	60	2600	2600	2600	2600	2650	2650	2650	2650				
	62	3100	3150	3150	3200	3200	3250	3250	62	2750	2750	2750	2750	2800	2800	2800	2800				
	64	3300	3350	3350	3400	3400	3450	3450	64	2900	2900	2900	2950	2950	2950	2950	2950				
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	0	2250	2200	2200	2200	2150	2150	2100	0	2700	2650	2650	2600	2600	2550	2550	2550				
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	4	2550	2550	2500	2500	2450	2450	2450	4	3000	2950	2950	2900	2900	2900	2850	2850				
	6	2700	2700	2700	2650	2650	2600	2600	6	3150	3100	3100	3100	3050	3050	3000	3000				
	8	2900	2850	2850	2850	2800	2800	2800	8	3300	3300	3250	3250	3200	3200	3200	3200				
	10	3050	3050	3000	3000	3000	3000	2950	10	3450	3450	3450	3400	3400	3350	3350	3350				
	12	3250	3200	3200	3200	3200	3150	3150	12	3650	3600	3600	3600	3550	3550	3550	3550				
	14	3400	3400	3400	3400	3350	3350	3350	14	3800	3800	3750	3750	3750	3700	3700	3700				
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	18	3800	3800	3800	3750	3750	3750	3750	18	4100	4100	4100	4100	4100	4050	4050	4050				
	20	4000	4000	4000	4000	4000	3950	4000	20	4250	4250	4250	4250	4250	4250	4250	4250				
	22	4200	4200	4200	4200	4200	4200	4200	22	4400	4400	4400	4400	4400	4400	4400	4400				
	24	4400	4400	4400	4400	4400	4400	4400	24	4550	4550	4550	4550	4550	4550	4550	4550				
	26	4600	4600	4600	4600	4600	4650	4650	26	4650	4650	4700	4700	4700	4750	4750	4750				
	28	4800	4800	4800	4850	4850	4850	4900	28	4800	4800	4800	4850	4850	4850	4900	4900				
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	32	5150	5150	5200	5250	5250	5300	5350	32	5000	5000	5050	5100	5100	5150	5150	5150				
34	5300	5300	5350	5400	5450	5500	5550	34	5100	5150	5150	5200	5200	5250	5300	5300					

M M I N°	M M I N G	R E A D I N G	LITERS ATTITUDE READING								
			B	LEFT WING			F	RIGHT WING			
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3	0	4550	4450	4400	4350	4250	4200	4150			
	2	4750	4700	4600	4550	4500	4400	4350			
	4	4900	4900	4800	4750	4700	4650	4600			
	6	5100	5050	5000	4950	4900	4850	4800			
	8	5250	5200	5200	5200	5150	5100	5050			
	10	5400	5400	5350	5350	5350	5300	5250			
	12	5500	5550	5550	5550	5550	5500	5500			
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	16	5800	5800	5850	5850	5850	5900	5900			
	18	5900	5950	5950	6000	6000	6050	6100			
	20	6050	6100	6100	6150	6150	6200	6250			
	22	6200	6200	6250	6300	6300	6350	6400			
4	0	5750	5750	5750	5700	5650	5600	5500			
	2	5900	5900	5850	5850	5850	5800	5750			
	4	6050	6000	6000	6000	6000	5950	5900			
	6	6150	6150	6150	6150	6150	6150	6100			
	8	6300	6300	6300	6300	6300	6300	6300			
	10	6400	6400	6400	6400	6450	6450	6450			
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	18	6850	6900	6900	6950	6950	7000	7050			
	20	6950	7000	7000	7050	7100	7100	7150			
	5	0	6550	6500	6450	6350	6300	6200	6100		
2		6650	6600	6550	6500	6450	6350	6300			
4		6750	6750	6700	6650	6550	6500	6450			
6		6850	6850	6800	6750	6700	6650	6600			
8		7000	6950	6900	6900	6850	6800	6750			
10		7100	7050	7050	7000	6950	6950	6900			
12		7200	7150	7150	7100	7100	7050	7050			
14		7250	7250	7250	7250	7200	7200	7150			
16		7350	7350	7350	7350	7300	7300	7300			
18		7450	7450	7450	7450	7450	7400	7400			
20		7500	7500	7550	7550	7550	7550	7550			
6		0	7250	7200	7150	7100	7050	7000	6900		
	2	7300	7300	7250	7200	7150	7100	7050			
	4	7400	7400	7350	7300	7300	7250	7200			
	6	7500	7450	7450	7400	7400	7350	7300			
	8	7550	7550	7550	7500	7500	7450	7450			
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	10	7950	7950	7950	7950	7950	7950	7950			
	12	8000	8000	8000	8000	8000	8000	8000			
	14	8050	8050	8050	8050	8050	8000	8000			

M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							R E A D I N G	LITERS ATTITUDE MONITOR READING								
		C*	LEFT WING			E	RIGHT WING			C	RIGHT WING			E	LEFT WING			
		1	2	3	4	5	6	7		1	2	3	4	5	6	7**		
1	2	50	50	50	50	50	50	50	2	50	50	50	50	50	50	50	50	
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	18	400	400	400	400	400	400	400	18	400	400	400	400	400	400	400	400	
	20	450	450	450	450	450	450	450	20	450	450	450	450	450	450	450	450	
	22	550	550	550	550	500	500	500	22	500	500	500	500	500	500	500	500	
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	28	750	750	750	750	750	750	750	28	750	750	750	750	750	750	700	700	
	30	850	850	850	850	850	850	850	30	800	800	800	800	800	800	800	800	
	32	950	950	950	950	950	950	950	32	900	900	900	900	900	900	900	900	
	34	1050	1050	1050	1050	1050	1050	1050	34	1000	1000	1000	1000	1000	1000	1000	1000	
	36	1200	1150	1150	1150	1150	1150	1150	36	1100	1100	1100	1100	1100	1100	1100	1100	
	38	1300	1300	1300	1250	1250	1250	1250	38	1200	1200	1200	1200	1200	1200	1200	1200	
	40	1400	1400	1400	1400	1400	1400	1400	40	1300	1300	1300	1300	1300	1300	1300	1300	
	42	1500	1500	1500	1500	1500	1500	1500	42	1400	1400	1400	1400	1400	1400	1400	1400	
	44	1600	1600	1600	1600	1600	1600	1600	44	1550	1550	1500	1500	1500	1500	1500	1500	
	46	1750	1750	1750	1750	1750	1750	1750	46	1650	1650	1650	1650	1650	1650	1650	1650	
	48	1850	1850	1850	1850	1900	1900	1900	48	1800	1750	1750	1750	1750	1750	1750	1800	
	50	2000	2000	2000	2000	2000	2000	2050	50	1900	1900	1900	1900	1900	1900	1900	1900	
	52	2150	2150	2150	2150	2150	2150	2200	52	2000	2000	2000	2000	2000	2000	2000	2050	
	54	2300	2300	2300	2300	2300	2300	2350	54	2150	2150	2150	2150	2150	2150	2150	2200	
	56	2450	2500	2500	2500	2500	2500	2500	56	2300	2300	2300	2300	2300	2300	2300	2350	
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	60	2800	2800	2800	2800	2850	2850	2850	60	2600	2600	2600	2600	2600	2650	2650	2650	
	62	2900	2950	2950	2950	2950	2950	3000	62	2750	2750	2750	2750	2800	2800	2800	2800	
	63	2950	3000	3000	3000	3050	3050	3100	63	2800	2800	2800	2800	2850	2850	2850	2850	
	MAX	3250	3250	3300	3350	3350	3350	3400	MAX	3100	3100	3100	3100	3100	3100	3100	3100	

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

M M I N°	M M I N°	R E A D I N G	LITERS ATTITUDE READING							R E A D I N G	M M I N°	LITERS ATTITUDE MONITOR READING										
			C	LEFT WING				E	RIGHT WING			C	RIGHT WING				E	LEFT WING				
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	6	2800	2800	2800	2800	2750	2750	2700	6	3000	3000	3000	3000	3000	2950	2900						
	8	2900	2900	2900	2900	2900	2850	2850	8	3100	3100	3100	3100	3100	3100	3050						
	10	3100	3100	3100	3100	3100	3050	3000	10	3300	3300	3300	3250	3250	3250	3200						
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	14	3450	3450	3450	3450	3400	3400	3350	14	3650	3650	3600	3600	3600	3550	3500						
	16	3650	3650	3650	3600	3600	3550	3550	16	3800	3800	3800	3750	3750	3750	3700						
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	22	4200	4200	4150	4150	4150	4100	4100	22	4250	4250	4200	4200	4200	4200	4200						
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	MAX								MAX													
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	4	4900	4900	4900	4900	4800	4750	4650	4	5050	5100	5100	5100	5100	5050	5000						
	6	5100	5100	5100	5050	5050	5000	4900	6	5150	5200	5200	5200	5200	5150	5150						
	8	5200	5200	5200	5200	5200	5150	5100	8	5250	5300	5300	5300	5300	5300	5300						
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	12	5450	5450	5450	5450	5450	5450	5400	12	5500	5500	5500	5500	5550	5550	5550						
	14	5600	5600	5600	5600	5600	5600	5550	14	5600	5600	5600	5650	5650	5650	5650						
	16	5700	5700	5700	5700	5700	5700	5700	16	5700	5700	5750	5750	5750	5750	5800						
	18	5800	5850	5850	5850	5850	5850	5850	18	5800	5800	5850	5850	5900	5900	5900						
	20	5950	5950	6000	6000	6000	6000	6000	20	5900	5950	5950	6000	6000	6000	6000						
4	2	5800	5750	5750	5700	5700	5700	5700	2	5900	5900	5900	5900	5950	5950	5950						
	4	5950	5900	5900	5850	5850	5800	5800	4	6000	6000	6000	6050	6050	6050	6050						
	6	6050	6050	6000	6000	6000	5950	5950	6	6100	6100	6150	6150	6150	6150	6150						
	8	6200	6150	6150	6150	6150	6100	6100	8	6200	6250	6250	6250	6250	6250	6250						
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	12	6400	6400	6400	6400	6400	6400	6400	12	6400	6400	6450	6450	6450	6450	6450						
	14	6500	6500	6500	6500	6500	6500	6500	14	6500	6500	6500	6550	6550	6550	6550						
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	18	6730	6740	6750	6750	6760	6760	6770	18	6750	6750	6770	6790	6800	6810	6820						
		MAX								MAX												
5	2	700	700	650	650	600	600	600	2	750	700	700	700	700	650	650						
	4	750	750	700	700	650	650	650	4	750	750	750	750	700	700	700						
	6	750	750	750	750	700	700	700	6	800	800	750	750	750	750	750						
	8	800	800	800	750	750	750	750	8	800	800	800	800	800	800	800						
	10	800	800	800	800	800	800	800	10	850	850	850	800	800	800	800						
	12	850	850	850	800	800	800	800	12	850	850	850	850	850	850	850						
	14	850	850	850	850	850	850	850	14	900	900	850	850	850	850	850						

M M I N°	M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING										
			C	LEFT WING			E	RIGHT WING				C	RIGHT WING			E	LEFT WING					
				1	2	3		4	5				6	7	1		2	3	4	5	6	7
1	0	50	50	50	50	50	50	50	0	50	50	50	50	50	50	50	50	0				
	2	50	50	50	50	50	50	50	2	100	50	50	50	50	50	50	50	2				
	4	100	100	100	100	100	100	100	4	100	100	100	100	100	100	100	100	4				
	6	150	150	150	150	150	150	150	6	150	150	150	150	150	150	150	150	6				
	8	150	150	150	150	150	150	150	8	150	150	150	150	150	150	150	150	8				
	10	200	200	200	200	200	200	200	10	200	200	200	200	200	200	200	200	10				
	12	250	250	250	250	250	250	250	12	250	250	250	250	250	250	250	250	12				
	14	300	300	300	300	300	300	300	14	300	300	300	300	300	300	300	300	14				
	16	350	350	350	350	350	350	350	16	350	350	350	350	350	350	350	350	16				
	18	450	400	400	400	400	400	400	18	400	400	400	400	400	400	400	400	18				
	20	500	500	500	500	500	500	500	20	500	500	450	450	450	450	450	450	20				
	22	550	550	550	550	550	550	550	22	550	550	550	550	550	500	500	500	22				
	24	650	650	650	650	650	600	600	24	600	600	600	600	600	600	600	600	24				
	26	700	700	700	700	700	700	700	26	700	700	700	700	700	700	650	650	26				
	28	800	800	800	800	800	800	800	28	800	750	750	750	750	750	750	750	28				
	30	900	900	900	900	900	900	900	30	850	850	850	850	850	850	850	850	30				
	32	1000	1000	1000	1000	1000	1000	1000	32	950	950	950	950	950	950	950	950	32				
	34	1100	1100	1100	1100	1100	1100	1100	34	1050	1050	1050	1050	1050	1050	1050	1050	34				
	36	1200	1200	1200	1200	1200	1200	1200	36	1150	1150	1150	1150	1150	1150	1150	1150	36				
	38	1300	1300	1300	1300	1300	1300	1300	38	1250	1250	1250	1250	1250	1250	1250	1250	38				
	40	1450	1450	1450	1450	1450	1450	1450	40	1350	1350	1350	1350	1350	1350	1350	1350	40				
	42	1550	1550	1550	1550	1550	1550	1550	42	1450	1450	1450	1450	1450	1450	1450	1450	42				
	44	1700	1700	1700	1700	1700	1700	1700	44	1600	1600	1600	1600	1600	1600	1600	1600	44				
	46	1800	1800	1800	1800	1800	1850	1850	46	1700	1700	1700	1700	1700	1700	1700	1700	46				
	48	1950	1950	1950	1950	1950	1950	2000	48	1850	1850	1850	1850	1850	1850	1850	1850	48				
	50	2100	2100	2100	2100	2100	2100	2150	50	1950	1950	1950	1950	2000	2000	2000	2000	50				
	52	2250	2250	2250	2250	2250	2250	2300	52	2100	2100	2100	2100	2100	2100	2100	2150	2150	52			
	54	2400	2400	2400	2400	2400	2450	2450	54	2250	2250	2250	2250	2250	2250	2250	2300	2300	54			
	56	2550	2550	2550	2550	2600	2600	2600	56	2400	2400	2400	2400	2400	2400	2400	2450	2450	56			
	58	2700	2700	2700	2750	2750	2750	2800	58	2500	2550	2550	2550	2550	2550	2550	2600	2600	58			
	60	2850	2850	2900	2900	2900	2950	2950	60	2650	2700	2700	2700	2700	2700	2750	2750	2750	60			
	62	3000	3050	3050	3050	3100	3100	3150	62	2850	2850	2850	2850	2900	2900	2900	2900	2900	62			
	64	3200	3200	3250	3250	3300	3300	3350	64	3000	3000	3000	3050	3050	3050	3050	3100	3100	64			
2	0	2350	2350	2300	2300	2250	2250	2250	0	2550	2550	2550	2500	2500	2450	2450	2450	0				
	2	2500	2500	2450	2450	2400	2400	2400	2	2700	2700	2700	2650	2650	2600	2600	2600	2				
	4	2650	2650	2600	2600	2600	2550	2550	4	2900	2850	2850	2800	2800	2750	2750	2750	4				
	6	2800	2800	2800	2750	2750	2750	2700	6	3050	3000	3000	2950	2950	2950	2900	2900	6				
	8	3000	2950	2950	2950	2900	2900	2900	8	3200	3200	3150	3150	3100	3100	3100	3100	8				
	10	3150	3150	3100	3100	3100	3100	3050	10	3350	3350	3350	3300	3300	3300	3250	3250	10				
	12	3350	3300	3300	3300	3250	3250	3250	12	3550	3500	3500	3500	3450	3450	3450	3450	12				
	14	3500	3500	3500	3450	3450	3450	3450	14	3700	3700	3650	3650	3650	3650	3600	3600	14				
	16	3700	3700	3650	3650	3650	3650	3650	16	3900	3850	3850	3850	3800	3800	3800	3800	16				
	18	3900	3900	3850	3850	3850	3850	3850	18	4050	4050	4000	4000	4000	4000	4000	4000	18				
	20	4100	4050	4050	4050	4050	4050	4050	20	4200	4200	4200	4200	4200	4150	4150	4150	20				
	22	4250	4250	4250	4250	4250	4250	4250	22	4350	4350	4350	4350	4350	4350	4350	4350	22				
	24	4450	4450	4450	4450	4450	4450	4450	24	4500	4500	4550	4550	4550	4550	4550	4550	24				
	26	4650	4650	4650	4650	4650	4650	4650	26	4650	4650	4700	4700	4700	4700	4700	4700	26				
	28	4800	4800	4850	4850	4850	4850	4900	28	4800	4800	4800	4850	4850	4850	4900	4900	28				
	30	4950	5000	5000	5000	5050	5050	5100	30	4900	4950	4950	5000	5000	5050	5050	5050	30				
	32	5100	5150	5150	5200	5250	5250	5300	32	5050	5050	5100	5100	5150	5150	5200	5200	32				
	34	5250	5250	5300	5350	5400	5450	5500	34	5150	5150	5200	5250	5300	5300	5350	5350	34				

M M I N°	R E A D I N G	LITERS ATTITUDE READING														
		C	LEFT WING			E	RIGHT WING									
			1	2	3		4	5	6	7						
3	0	4700	4650	4600	4550	4500	4400	4350	0	4900	4900	4900	4850	4800	4800	4750
	2	4850	4800	4750	4750	4650	4600	4550	2	5050	5050	5000	5000	4950	4950	4900
	4	5000	5000	4950	4900	4850	4800	4750	4	5150	5150	5150	5150	5100	5100	5050
	6	5150	5150	5100	5100	5050	5000	4950	6	5250	5250	5250	5250	5250	5250	5200
	8	5300	5300	5250	5250	5250	5200	5150	8	5400	5400	5400	5400	5400	5400	5350
	10	5400	5400	5400	5400	5400	5400	5350	10	5500	5500	5500	5500	5500	5500	5500
	12	5550	5550	5550	5550	5550	5550	5550	12	5600	5600	5600	5600	5650	5650	5650
	14	5650	5700	5700	5700	5700	5750	5750	14	5700	5700	5700	5750	5750	5750	5750
	16	5800	5800	5850	5850	5850	5900	5900	16	5800	5800	5850	5850	5850	5900	5900
	18	5900	5950	5950	6000	6000	6050	6050	18	5900	5900	5950	5950	6000	6000	6000
	20	6050	6050	6100	6150	6150	6150	6200	20	6000	6000	6050	6050	6100	6100	6150
	22	6150	6200	6200	6250	6250	6300	6350	22	6100	6100	6150	6150	6200	6250	6250
4	0	5850	5850	5800	5800	5750	5750	5700	0	6000	6000	5950	5950	5950	5950	5900
	2	5950	5950	5950	5950	5900	5900	5850	2	6100	6100	6100	6050	6050	6050	6050
	4	6100	6100	6050	6050	6050	6050	6000	4	6200	6200	6200	6200	6150	6150	6150
	6	6200	6200	6200	6200	6200	6200	6200	6	6300	6300	6300	6300	6300	6300	6300
	8	6300	6300	6300	6300	6300	6300	6300	8	6350	6400	6400	6400	6400	6400	6400
	10	6400	6450	6450	6450	6450	6450	6450	10	6450	6450	6500	6500	6500	6500	6500
	12	6550	6550	6550	6550	6600	6600	6600	12	6550	6550	6600	6600	6600	6600	6600
	14	6650	6650	6650	6700	6700	6700	6750	14	6650	6650	6650	6700	6700	6700	6750
	16	6750	6750	6800	6800	6800	6850	6850	16	6750	6750	6750	6800	6800	6800	6850
	18	6850	6850	6900	6900	6950	6950	7000	18	6800	6850	6850	6850	6900	6900	6950
	20	6950	6950	7000	7000	7050	7100	7100	20	6900	6900	6950	6950	7000	7000	7050
	5	0	6600	6550	6500	6450	6400	6350	6250	0	6750	6700	6650	6650	6600	6550	6500
2		6700	6700	6650	6600	6550	6450	6400	2	6800	6800	6750	6700	6700	6650	6600
4		6800	6800	6750	6700	6650	6600	6550	4	6900	6850	6850	6800	6800	6750	6700
6		6900	6900	6850	6800	6800	6750	6700	6	6950	6950	6950	6900	6900	6850	6800
8		7000	7000	6950	6950	6900	6850	6800	8	7050	7050	7000	7000	6950	6950	6900
10		7100	7100	7050	7050	7000	7000	6950	10	7100	7100	7100	7100	7050	7050	7000
12		7200	7150	7150	7150	7100	7100	7050	12	7200	7200	7200	7150	7150	7150	7100
14		7250	7250	7250	7250	7200	7200	7200	14	7250	7250	7250	7250	7250	7200	7200
16		7350	7350	7350	7350	7300	7300	7300	16	7350	7350	7300	7300	7300	7300	7300
18		7450	7400	7400	7400	7400	7400	7400	18	7400	7400	7400	7400	7400	7400	7400
20		7500	7500	7500	7500	7500	7500	7500	20	7450	7450	7450	7450	7450	7450	7450
6		0	7300	7250	7200	7200	7150	7100	7000	0	7350	7350	7300	7300	7250	7250	7200
	2	7350	7350	7300	7300	7250	7200	7150	2	7450	7400	7400	7350	7350	7300	7300
	4	7450	7400	7400	7350	7350	7300	7250	4	7500	7500	7450	7450	7450	7400	7400
	6	7500	7500	7500	7450	7450	7400	7350	6	7550	7550	7550	7500	7500	7500	7450
	8	7600	7550	7550	7550	7500	7500	7450	8	7600	7600	7600	7600	7550	7550	7550
	10	7650	7650	7650	7600	7600	7600	7550	10	7650	7650	7650	7650	7650	7600	7600
	12	7700	7700	7700	7700	7700	7650	7650	12	7700	7700	7700	7700	7700	7700	7700
	14	7800	7750	7750	7750	7750	7750	7750	14	7750	7750	7750	7750	7750	7750	7750
7	0	7700	7700	7700	7650	7650	7600	7550	0	7750	7750	7750	7750	7700	7700	7700
	2	7800	7750	7750	7750	7700	7700	7650	2	7800	7800	7800	7800	7800	7750	7750
	4	7850	7800	7800	7800	7800	7750	7750	4	7850	7850	7850	7850	7850	7850	7800
	6	7900	7900	7850	7850	7850	7850	7800	6	7900	7900	7900	7900	7900	7900	7850
	8	7950	7950	7900	7900	7900	7900	7900	8	7950	7950	7950	7950	7950	7950	7900
	10	8000	7950	7950	7950	7950	7950	7950	10	8000	8000	8000	8000	8000	7950	7950
	12	8000	8000	8000	8000	8000	8000	8000	12	8000	8000	8000	8000	8000	8000	8000
	14	8050	8050	8050	8050	8050	8050	8000	14	8050	8050	8050	8050	8050	8050	8050

M M I N°	M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°
			D*	BOTH WINGS								D	BOTH WINGS						
				1	2	3	4	5	6				7	1	2	3	4	5		6	7**
1		2	50	50	50	50	50	50	50	18	3950	3900	3900	3850	3850	3850	3800	2	
		4	100	100	100	100	100	100	100	20	4100	4100	4050	4050	4050	4000	4000		
		6	100	100	100	100	100	100	100	22	4200	4200	4150	4150	4150	4150	4150		
		8	150	150	150	150	150	150	150	24	4350	4350	4350	4300	4300	4300	4300		
		10	200	200	200	200	200	200	200	26	4500	4500	4500	4500	4500	4500	4500		
		12	250	250	250	250	250	250	250	28	4650	4650	4650	4650	4650	4700	4700		
		14	300	300	300	300	300	300	300	30	4800	4800	4800	4850	4850	4850	4900		
		16	350	350	350	350	360	350	350	32	4950	4950	5000	5000	5000	5050	5100		
		18	400	400	400	400	400	400	400	MAX									
		20	450	450	450	450	450	450	450										
		22	500	500	500	500	500	500	500	2	4800	4800	4800	4800	4750	4750	4600		
		24	600	600	600	600	600	600	600	4	5000	5000	5000	5000	4950	4900	4850		
		26	650	650	650	650	650	650	650	6	5100	5150	5150	5100	5100	5100	5050		
		28	750	750	750	750	750	750	750	8	5250	5250	5250	5250	5250	5200	5200		
		30	850	850	850	850	850	850	850	10	5350	5350	5350	5400	5400	5350	5350		
		32	950	950	950	950	950	950	950	12	5450	5500	5500	5500	5500	5500	5500		
		34	1050	1050	1050	1050	1050	1000	1000	14	5600	5600	5600	5600	5600	5600	5600		
		36	1150	1150	1150	1150	1150	1100	1100	16	5700	5700	5700	5750	5750	5750	5750		
		38	1250	1250	1250	1250	1250	1250	1250	18	5800	5800	5850	5850	5850	5900	5900		
		40	1350	1350	1350	1350	1350	1350	1350	20	5900	5900	5950	5950	5950	6000	6000		
		42	1450	1450	1450	1450	1450	1450	1450	MAX									
		44	1550	1550	1550	1550	1550	1550	1550										
		46	1700	1700	1700	1700	1700	1700	1700	2	5900	5850	5800	5800	5800	5800	5800		
		48	1800	1800	1800	1800	1800	1800	1800	4	6000	5950	5950	5950	5950	5950	5950		
		50	1950	1950	1950	1950	1950	1950	1950	6	6100	6100	6050	6050	6050	6050	6050		
		52	2100	2100	2100	2100	2100	2100	2100	8	6200	6200	6200	6200	6200	6200	6200		
		54	2250	2250	2250	2250	2250	2250	2250	10	6300	6300	6300	6300	6300	6300	6300		
		56	2400	2400	2400	2400	2400	2400	2400	12	6400	6400	6400	6400	6400	6400	6400		
		58	2550	2550	2550	2550	2550	2600	2600	14	6500	6500	6500	6500	6500	6500	6500		
		60	2700	2700	2700	2700	2700	2750	2750	16	6600	6600	6600	6600	6600	6600	6600		
		62	2850	2850	2850	2850	2850	2900	2900	18	6750	6750	6770	6800	6800	6810	6820		
		63	2900	2900	2900	2900	2900	2950	2950	MAX									
		MAX	3050	3050	3100	3100	3100	3150	3150										
2																	5		
		2	2550	2550	2500	2500	2450	2450	2450	2	700	700	700	650	650	650		600	
		4	2750	2700	2700	2700	2650	2650	2600	4	750	750	750	700	700	700		650	
		6	2900	2900	2850	2850	2850	2800	2800	6	800	800	750	750	750	750		700	
		8	3000	3000	2950	2950	2950	2950	2900	8	800	800	800	800	800	750		750	
		10	3200	3150	3150	3150	3150	3100	3050	10	850	800	800	800	800	800		800	
		12	3350	3350	3350	3350	3300	3300	3250	12	850	850	850	850	850	850		850	
		14	3550	3550	3550	3500	3500	3450	3450	14	850	850	850	850	850	850		850	
	16	3750	3750	3700	3700	3650	3650	3600	MAX	850	850	850	850	850	850	850			

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

CENTER TANK (LITERS)

READING M M I	LITERS ATTITUDE MONITOR READING LINES A AND G*							READING M M I	LITERS ATTITUDE MONITOR READING LINES B AND F						
	1	2	3	4	5	6	7		1	2	3	4	5	6	7**
2	300	300	350	350	350	350	350	2	300	300	300	300	300	300	350
4	400	450	450	500	500	500	500	4	400	450	450	450	500	500	500
6	600	600	650	650	650	650	650	6	600	600	650	650	650	650	600
8	750	750	750	750	750	750	750	8	750	750	750	750	750	750	750
10	900	850	850	850	850	850	900	10	900	850	850	850	850	850	900
12	1050	1000	1000	1000	1000	1000	1050	12	1050	1000	1000	1000	1000	1000	1050
14	1250	1250	1200	1200	1200	1200	1200	14	1250	1200	1200	1200	1200	1200	1200
16	1450	1450	1400	1400	1400	1400	1400	16	1450	1450	1450	1450	1400	1400	1400
18	1650	1650	1600	1600	1600	1600	1600	18	1700	1700	1650	1650	1600	1600	1600
20	1900	1850	1850	1850	1850	1800	1800	20	1900	1900	1900	1850	1850	1850	1800
22	2100	2050	2050	2050	2050	2000	2000	22	2100	2100	2100	2050	2050	2000	2000
24	2300	2250	2250	2250	2200	2200	2150	24	2300	2300	2250	2250	2200	2200	2150
26	2450	2450	2450	2450	2450	2400	2350	26	2500	2500	2450	2450	2400	2350	2350
28	2700	2650	2650	2650	2600	2550	2550	28	2700	2700	2650	2650	2600	2550	2500
30	2900	2850	2850	2850	2800	2800	2750	30	2900	2900	2900	2850	2800	2800	2750
32	3050	3050	3050	3050	3000	3000	2950	32	3100	3100	3100	3050	3050	3000	2950
34	3250	3250	3250	3250	3200	3200	3150	34	3300	3300	3300	3250	3250	3200	3150
36	3500	3500	3450	3450	3450	3400	3400	36	3500	3500	3500	3450	3450	3400	3400
38	3700	3700	3700	3700	3650	3650	3600	38	3700	3700	3700	3700	3650	3650	3600
40	3900	3900	3900	3900	3900	3850	3800	40	3950	3950	3950	3900	3900	3850	3800
42	4100	4100	4100	4100	4100	4050	4050	42	4150	4150	4150	4100	4100	4050	4000
44	4350	4350	4350	4300	4300	4250	4250	44	4350	4350	4350	4300	4300	4250	4200
46	4550	4550	4550	4550	4500	4500	4450	46	4550	4550	4550	4550	4500	4500	4450
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72	7200	7200	7150	7150	7100	7100	7050	72	7200	7200	7150	7150	7150	7100	7100
74	7400	7400	7350	7350	7300	7300	7300	74	7400	7400	7350	7350	7350	7300	7300
76	7600	7600	7600	7550	7550	7500	7500	76	7600	7600	7600	7550	7550	7500	7500
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MAX	7950	7900	7900	7900	7850	7800	7800	MAX	7900	7900	7850	7850	7850	7800	7800

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

M M I N°	R E A D I N G	LITERS ATTITUDE MONITOR READING							M M I N°	
		D	BOTH WINGS							
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1	0	50	50	50	50	50	50	50	3	
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	4	100	100	100	100	100	100	100		
	6	150	150	150	150	150	150	150		
	8	150	150	150	150	150	150	150		
	10	200	200	200	200	200	200	200		
	12	250	250	250	250	250	250	250		
	14	300	300	300	300	300	300	300		
	16	350	350	350	350	350	350	350		
	18	400	400	400	400	400	400	400		
	20	500	500	500	450	450	450	450		
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	26	700	700	700	700	700	700	700		
	28	800	800	800	800	750	750	750		
	30	900	850	850	850	850	850	850		
	32	950	950	950	950	950	950	950		
	34	1050	1050	1050	1050	1050	1050	1050		
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	40	1400	1400	1400	1400	1400	1400	1400		
	42	1500	1500	1500	1500	1500	1500	1500		
	44	1650	1650	1650	1650	1650	1650	1650		
	46	1750	1750	1750	1750	1750	1750	1750		
	48	1900	1900	1900	1900	1900	1900	1900		
	50	2000	2000	2050	2050	2050	2050	2050		
	52	2150	2150	2150	2150	2200	2200	2200		
	54	2300	2300	2300	2300	2350	2350	2350		
	56	2450	2450	2450	2450	2500	2500	2500		
	58	2600	2600	2600	2650	2650	2650	2700		
	60	2750	2750	2800	2800	2800	2800	2850		
	62	2900	2900	2950	2950	3000	3000	3000		
	64	3050	3100	3100	3150	3150	3150	3200		
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		6	2950	2900	2900	2850	2850	2850	2800	
		8	3100	3050	3050	3050	3000	3000	3000	
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		14	3600	3600	3600	3550	3550	3550	3550	
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34		5200	5200	5250	5300	5350	5350	5400		
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		6	2950	2900	2900	2850	2850	2850	2800	
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		12	3450	3400	3400	3400	3350	3350	3350	
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	6	2950	2900	2900	2850	2850	2850	2800		
	8	3100	3050	3050	3050	3000	3000	3000		
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34	5200	5200	5250	5300	5350	5350	5400			
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	6	2950	2900	2900	2850	2850	2850	2800		
	8	3100	3050	3050	3050	3000	3000	3000		
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	6	2950	2900	2900	2850	2850	2850	2800		
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	12	3450	3400	3400	3400	3350	3350	3350		
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	26	4650	4650	4650	4700	4700	4700	4700		
28	4800	4800	4850	4850	4850	4850	4900			
30	4950	4950	5000	5000	5050	5050	5050			
32	5050	5100	5100	5150	5200	5200	5250			
34	5200	5200	5250	5300	5350	5350	5400			
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	4	2750	2750	2750	2700	2700	2650	2650		
	6	2950	2900	2900	2850	2850	2850	2800		
	8	3100	3050	3050	3050	3000	3000	3000		
	10	3250	3250	3200	3200	3200	3200	3150		
	12	3450	3400	3400	3400	3350	3350	3350		
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28	4800	4800	4850	4850	4850	4850	4900			
30	4950	4950	5000	5000	5050	5050	5050			
32	5050	5100	5100	5150	5200	5200	5250			
34	5200	5200	5250	5300	5350	5350	5400			
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	4	2750	2750	2750	2700	2700	2650	2650		
	6	2950	2900	2900	2850	2850	2850	2800		
	8	3100	3050	3050	3050	3000	3000	3000		
	10	3250	3250	3200	3200	3200	3200	3150		
	12	3450	3400	340						

CENTER TANK (LITERS)

M M I R E A D I N G	LITERS ATTITUDE MONITOR READING LINES A AND G*							M M I R E A D I N G	LITERS ATTITUDE MONITOR READING LINES B AND F						
	1	2	3	4	5	6	7		1	2	3	4	5	6	7**
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4	400	450	450	500	500	500	500	4	400	450	450	450	500	500	500
6	600	600	650	650	650	650	650	6	600	600	650	650	650	650	600
8	750	750	750	750	750	750	750	8	750	750	750	750	750	750	750
10	900	850	850	850	850	850	900	10	900	850	850	850	850	850	900
12	1050	1000	1000	1000	1000	1000	1050	12	1050	1000	1000	1000	1000	1000	1050
14	1250	1250	1200	1200	1200	1200	1200	14	1250	1200	1200	1200	1200	1200	1200
16	1450	1450	1400	1400	1400	1400	1400	16	1450	1450	1450	1450	1400	1400	1400
18	1650	1650	1600	1600	1600	1600	1600	18	1700	1700	1650	1650	1600	1600	1600
20	1900	1850	1850	1850	1850	1800	1800	20	1900	1900	1900	1850	1850	1850	1800
22	2100	2050	2050	2050	2050	2000	2000	22	2100	2100	2100	2050	2050	2000	2000
24	2300	2250	2250	2250	2200	2200	2150	24	2300	2300	2250	2250	2200	2200	2150
26	2450	2450	2450	2450	2450	2400	2350	26	2500	2500	2450	2450	2400	2350	2350
28	2700	2650	2650	2650	2600	2550	2550	28	2700	2700	2650	2650	2600	2550	2500
30	2900	2850	2850	2850	2800	2800	2750	30	2900	2900	2900	2850	2800	2800	2750
32	3050	3050	3050	3050	3000	3000	2950	32	3100	3100	3100	3050	3050	3000	2950
34	3250	3250	3250	3250	3200	3200	3150	34	3300	3300	3300	3250	3250	3200	3150
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56	5600	5600	5600	5600	5550	5500	5450	56	5600	5600	5600	5600	5550	5500	5450
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62	6200	6200	6200	6150	6150	6100	6100	62	6200	6200	6200	6200	6150	6150	6100
64	6400	6400	6400	6400	6350	6300	6300	64	6400	6400	6400	6400	6350	6350	6300
66	6600	6600	6600	6600	6550	6550	6500	66	6600	6600	6600	6600	6550	6550	6500
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72	7200	7200	7150	7150	7100	7100	7050	72	7200	7200	7150	7150	7150	7100	7100
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76	7600	7600	7600	7550	7550	7500	7500	76	7600	7600	7600	7550	7550	7500	7500
78	7850	7800	7800	7800	7750	7700	7700	78	7800	7800	7800	7750	7750	7700	7700
MAX	7950	7900	7900	7900	7850	7800	7800	MAX	7900	7900	7850	7850	7850	7800	7800

* GRID SQUARE LETTER

** GRID SQUARE NUMBER

READING M M I	LITERS ATTITUDE MONITOR READING LINES C AND E							READING M M I	LITERS ATTITUDE MONITOR READING LINES D						
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6	600	600	650	650	650	600	600	6	600	600	650	650	650	650	600
8	750	750	750	750	750	750	750	8	750	750	750	750	750	750	750
10	850	850	850	850	850	850	850	10	900	900	900	900	900	900	900
12	1050	1000	1000	1000	1000	1000	1000	12	1050	1000	1000	1000	1000	1000	1050
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16	1450	1450	1450	1400	1400	1400	1400	16	1500	1450	1450	1450	1400	1400	1400
18	1650	1650	1650	1650	1600	1600	1600	18	1700	1700	1700	1650	1650	1650	1600
20	1900	1900	1900	1900	1900	1850	1800	20	1900	1900	1900	1900	1900	1850	1850
22	2100	2100	2100	2100	2050	2050	2000	22	2100	2100	2100	2100	2050	2050	2000
24	2300	2300	2250	2250	2250	2200	2200	24	2300	2300	2300	2250	2250	2200	2200
26	2500	2500	2450	2450	2400	2400	2350	26	2500	2500	2450	2450	2400	2400	2350
28	2700	2650	2650	2650	2600	2600	2550	28	2700	2700	2700	2650	2600	2600	2550
30	2900	2900	2850	2850	2800	2800	2750	30	2900	2900	2900	2900	2850	2800	2750
32	3100	3100	3100	3100	3050	3050	3000	32	3100	3100	3100	3100	3050	3050	3000
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56	5600	5600	5600	5600	5550	5500	5450	56	5600	5600	5600	5600	5550	5500	5450
58	5800	5800	5800	5800	5750	5700	5650	58	5800	5800	5800	5800	5750	5700	5650
60	6000	6000	6000	6000	5950	5950	5900	60	6000	6000	6000	6000	5950	5950	5900
62	6200	6200	6200	6200	6150	6100	6100	62	6200	6200	6200	6200	6150	6150	6100
64	6400	6400	6400	6400	6350	6300	6300	64	6400	6400	6400	6400	6350	6350	6300
66	6600	6600	6600	6600	6550	6550	6500	66	6600	6600	6600	6600	6550	6550	6500
68	6800	6800	6800	6750	6750	6700	6700	68	6800	6800	6800	6800	6750	6750	6700
70	7000	7000	7000	6950	6950	6900	6900	70	7000	7000	7000	7000	6950	6950	6900
72	7200	7200	7150	7150	7150	7150	7100	72	7200	7200	7200	7150	7150	7150	7100
74	7400	7400	7400	7350	7350	7300	7300	74	7400	7400	7400	7350	7350	7350	7300
76	7600	7600	7600	7550	7550	7500	7500	76	7600	7600	7600	7550	7550	7550	7500
78	7800	7800	7800	7750	7750	7700	7700	78	7800	7800	7800	7750	7750	7700	7700
MAX	7900	7900	7850	7850	7850	7800	7800	MAX	7900	7900	7900	7900	7850	7850	7800

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.40	P 1
	WEIGHT and BALANCE		SEQ 001	REV 28

LOAD and TRIM SHEET

This chart allows the determination of Aircraft CG location (MAC) function of dry operating weight, pantry adjustment, cargo loads, passengers and fuel on board.

The operational limits shown on the load and trim sheet are more restrictive than the certified limits because error margins have been taken into account.

The load and trim sheet needs to be updated when :

- a modification which changes the aircraft certified limits is included or
- a modification (cabin layout, cargo arrangement ...) which influences the operational limits is made.

It is the airline responsibility to define a load and trim sheet and to keep it up to date.

R On page 2 is a description of the Load and Trim Sheet utilization (see example p. 3), for a
R typical passenger arrangement.

Refer to customized load and trim sheet for preparing a revenue flight.

R DATA

- R Dry Operating Weight = 42500 kg and CG = 27 % (H-arm = 18.93 m)
- R Deviation or adjustment = + 100 kg in zone F
- R Cargo = 5500 kg with the following distribution :
- R cargo 1 = 2000 kg ; cargo 3 = 1500 kg ; cargo 4 = 1500 kg ; cargo 5 = 500 kg
- R Passengers = 145 pax with the following distribution :
- R cabin OA = 50 ; cabin OB = 55 ; cabin OC = 40
- R Fuel = 13000 kg

DESCRIPTION

- R a) Enter Master data in (1).
- R b) Compute Dry Operating Weight Index using the formula indicated in (2) and report in (3).
- R c) Dry Operating Index = 53.4.
- R d) Enter weight deviation or adjustment in (4) and read corresponding index variation in (5) : + 1.43.
- R e) Calculate corrected index and report in (6) : 54.83.
- R f) Enter master data in table (7) and determine Zero Fuel Weight : 60280 kg and Takeoff Weight : 73280 kg.
- R g) Enter cargo weight and passenger number per compartment in (8).
- R h) Enter index scale (9) with corrected index and proceed through cargo and passenger scales (10).
- R i) From the final point draw a vertical line which intersects (12) the zero fuel weight horizontal line (11).
- R j) Check if the intersection point is within the Zero Fuel Weight operational limits, if not rearrange cargo loading.
- R k) Read in table (13) the fuel index correction : - 2 and carry forward in fuel scale (14).
- R l) From this point draw a vertical line which intersects (16) the takeoff weight horizontal line (15).
- R m) Check if the intersection point is within the Takeoff Weight operational limits.
- R n) Read zero fuel weight and CG position : 32.7 % and fill in table (17).
- R o) Read takeoff CG position : 30.5 % and fill in table (18).

CAUTION

If there is no customized trim sheet for your airline in this section 2.01.40, do not use the information enclosed herein for day to day operation as margins and load C.G. vary with cabin and cargo layout.

Note : When referring to CG lower than 27 %, an operational margin is taken into account. It is the reason why performance at forward CG (lower than 25 %) must be used for operational CG lower than 27 %.

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.40	P 1
	WEIGHT and BALANCE		SEQ 001	REV 28

LOAD and TRIM SHEET

This chart allows the determination of Aircraft CG location (MAC) function of dry operating weight, pantry adjustment, cargo loads, passengers and fuel on board.

The operational limits shown on the load and trim sheet are more restrictive than the certified limits because error margins have been taken into account.

The load and trim sheet needs to be updated when :

- a modification which changes the aircraft certified limits is included or
- a modification (cabin layout, cargo arrangement ...) which influences the operational limits is made.

It is the airline responsibility to define a load and trim sheet and to keep it up to date.

R On page 2 is a description of the Load and Trim Sheet utilization (see example p. 3), for a
R typical passenger arrangement.

Refer to customized load and trim sheet for preparing a revenue flight.

R DATA

- R Dry Operating Weight = 40500 kg and CG = 25.5 % (H-arm = 17.27 m)
- R Deviation or adjustment = + 100 kg in zone F
- R Cargo = 4000 kg with the following distribution :
- R cargo 1 = 1500 kg ; cargo 4 = 2000 kg ; cargo 5 = 500 kg
- R Passengers = 120 pax with the following distribution :
- R cabin OA = 50 ; cabin OB = 70
- R Fuel = 14000 kg

DESCRIPTION

- R a) Enter Master data in (1).
- R b) Compute Dry Operating Weight Index using the formula indicated in (2) and report in (3).
- R c) Dry Operating Index = 50.85.
- R d) Enter weight deviation or adjustment in (4) and read corresponding index variation in (5) : + 1.21.
- R e) Calculate corrected index and report in (6) : 51.06.
- R f) Enter master data in table (7) and determine Zero Fuel Weight : 54680 kg and Takeoff Weight : 68680 kg.
- R g) Enter cargo weight and passenger number per compartment in (8).
- R h) Enter index scale (9) with corrected index and proceed through cargo and passenger scales (10).
- R i) From the final point draw a vertical line which intersects (12) the zero fuel weight horizontal line (11).
- R j) Check if the intersection point is within the Zero Fuel Weight operational limits, if not rearrange cargo loading.
- R k) Read in table (13) the fuel index correction : - 4 and carry forward in fuel scale (14).
- R l) From this point draw a vertical line which intersects (16) the takeoff weight horizontal line (15).
- R m) Check if the intersection point is within the Takeoff Weight operational limits.
- R n) Read zero fuel weight and CG position : 31 % and fill in table (17).
- R o) Read takeoff CG position : 28.4 % and fill in table (18).

CAUTION

If there is no customized trim sheet for your airline in this section 2.01.40, do not use the information enclosed herein for day to day operation as margins and load C.G. vary with cabin and cargo layout.

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LOADING		2.01.40	P 1
	WEIGHT and BALANCE		SEQ 001	REV 28

LOAD and TRIM SHEET

This chart allows the determination of Aircraft CG location (MAC) function of dry operating weight, pantry adjustment, cargo loads, passengers and fuel on board.

The operational limits shown on the load and trim sheet are more restrictive than the certified limits because error margins have been taken into account.

The load and trim sheet needs to be updated when :

- a modification which changes the aircraft certified limits is included or
- a modification (cabin layout, cargo arrangement ...) which influences the operational limits is made.

It is the airline responsibility to define a load and trim sheet and to keep it up to date.

R On page 2 is a description of the Load and Trim Sheet utilization (see example p. 3), for a
R typical passenger arrangement.

Refer to customized load and trim sheet for preparing a revenue flight.

R DATA

- R Dry Operating Weight = 49000 kg and CG = 22 % (H-arm = 23 m)
- R Deviation or adjustment = + 100 kg in zone F
- R Cargo = 8500 kg with the following distribution :
- R cargo 1 = 1000 kg ; cargo 2 = 1000 kg ; cargo 3 = 3000 kg
- R cargo 4 = 3000 kg ; cargo 5 = 500 kg
- R Passengers = 180 pax with the following distribution :
- R cabin OA = 50 ; cabin OB = 70 ; cabin OC = 60
- R Fuel = 17000 kg

DESCRIPTION

- R a) Enter Master data in (1).
- R b) Compute Dry Operating Weight Index using the formula indicated in (2) and report in (3).
- R c) Dry Operating Index = 43.96.
- R d) Enter weight deviation or adjustment in (4) and read corresponding index variation in (5) : + 1.70.
- R e) Calculate corrected index and report in (6) : 45.66.
- R f) Enter master data in table (7) and determine Zero Fuel Weight : 72720 kg and Takeoff Weight : 89720 kg.
- R g) Enter cargo weight and passenger number per compartment in (8).
- R h) Enter index scale (9) with corrected index and proceed through cargo and passenger scales (10).
- R i) From the final point draw a vertical line which intersects (12) the zero fuel weight horizontal line (11).
- R j) Check if the intersection point is within the Zero Fuel Weight operational limits, if not rearrange cargo loading.
- R k) Read in table (13) the fuel index correction : – 10 and carry forward in fuel scale (14).
- R l) From this point draw a vertical line which intersects (16) the takeoff weight horizontal line (15).
- R m) Check if the intersection point is within the Takeoff Weight operational limits.
- R n) Read zero fuel weight and CG position : 32 % and fill in table (17).
- R o) Read takeoff CG position : 28 % and fill in table (18).

CAUTION

If there is no customized trim sheet for your airline in this section 2.01.40, do not use the information enclosed herein for day to day operation as margins and load C.G. vary with cabin and cargo layout.



LOAD and TRIM SHEET

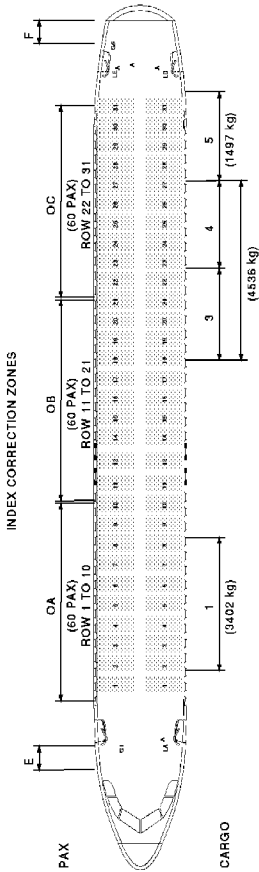
A320-200
VERSION : 180 YC

DRY OPERATING WEIGHT CONDITIONS	
WEIGHT (kg)	H-arm (m)
1 42 500	18.93
2 = $\frac{(H\text{-arm} - 18.8499) \times W}{1000} + 50$	
3 DRY OPERATING WEIGHT INDEX	53.4

AIRCRAFT REGISTER :	
DATE :	PREPARED BY :
FLT NO. :	CAPT. SIGNATURE :
FROM :	TO :

DRY OPERATING WEIGHT		42 500
WEIGHT DEVIATION (PANTRY)	±	+ 100
CORRECTED DRY OPERATING WEIGHT	=	42 600
CARGO	+	5 500
PASSENGERS	145 × 8 =	12 180
ZERO FUEL WEIGHT	+	60 280
TOTAL FUEL ONBOARD	=	13 000
TAKEOFF WEIGHT	=	73 280

4 ONES	E	F	G	H
WEIGHT DEVIATION (kg)	0	+100		

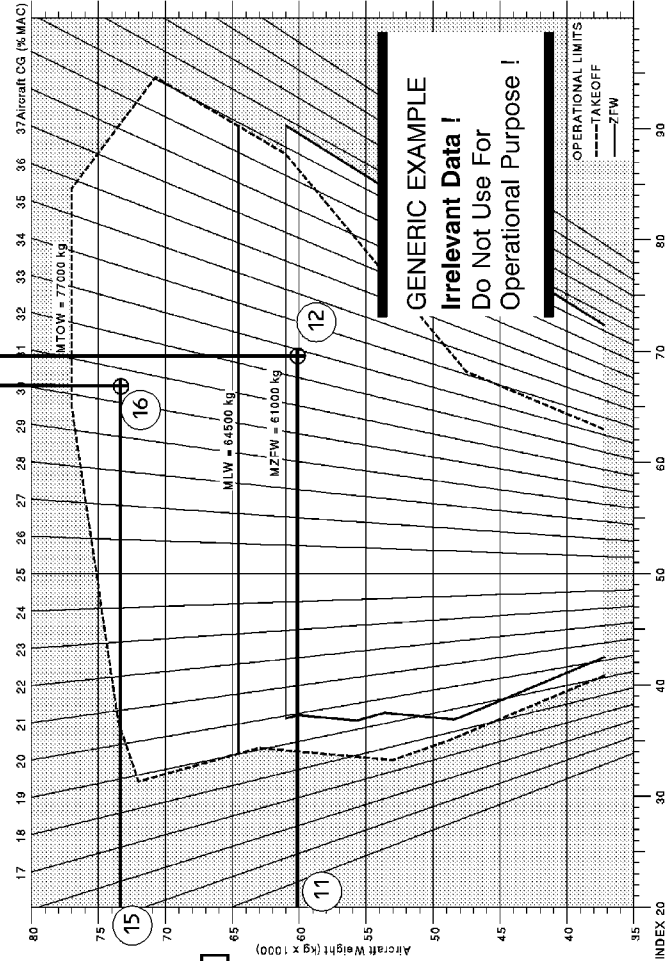


BASIC INDEX CORRECTION		ZONES			
DRY OPERAT. WEIGHT DEVIATION		E	F	G	H
		+100 kg	-1,22	+1,43	
-100 kg		+1,22	-1,43		
		1.43			

-100 kg	+1.22	-1.43			
5 INDEX CORRECTION			1.43		
			CORRECTED INDEX		
6			54.83		
ALL WEIGHTS IN KILOGRAMS			INDEX		
500 kg			500 kg		
500 kg			500 kg		
500 kg			500 kg		
250 kg			250 kg		
5 PAX			5 PAX		
25 PAX			25 PAX		
5 PAX			5 PAX		

[illegible]

13	REL INDEX CORRECTION			
	Weight (kg)	Index	Weight (kg)	Index
	3500	+1	1500	-2
	4000	+1	1200	-2
	4500	+0	1500	-2
	5000	+0	1300	-2
	5500	-1	1350	-3
	6000	-1	1400	-4
	6500	-2	1450	-4
	7000	-2	1500	-5
	7500	-2	1550	-6
	8000	-3	1600	-7
	8500	-3	1650	-8
	9000	-3	1700	-8
	9500	-3	1750	-9
	10000	-3	1800	-10
	10500	-3	1850	-11
	11000	-3	FULL	-11



CG % MAC	30.5
TAKEOFF	18

17	ZFW CDU INPUT	AIRCRAFT CG % MAC
	WEIGHT (kg x 1000)	
	6 0 13	3 2 7

CAUTION : WHEN THE T.O. CG IS LOWER THAN 27% MAC THE BASIC PERFORMANCE MUST BE CORRECTED

- T.O. : Make CG correction or use appropriate RTOW chart.
- LDG : Make CG correction on LDG speed and distance.

FUEL INDEX TABLE PER TANK

The fuel index table has been established assuming a fuel distribution in accordance with refuel distribution given in section 2.01.30 of this volume.
 If after refueling the actual distribution deviates from the chart values, the actual and the trim sheet CG will show a discrepancy. The following tables allow to determine the fuel index taking into account the actual fuel quantity in each tank. To determine the actual takeoff CG enter the tables with the actual fuel quantities in each tank, read the fuel index for each tank and use their sum to enter the trim sheet. Check that the actual CG is inside the operational limits. If the CG is outside the limits transfer fuel to achieve a distribution in accordance with the chart or rearrange the load.

Note : These tables are valid only when used with the following formulae for the index :

R
$$I = W \times (H - arm - 18.85) / 1000 + K \text{ or } I = [(CG - 25) \times W \times 0.000042] + K$$

 R (Weight in kg, H-arm in m)

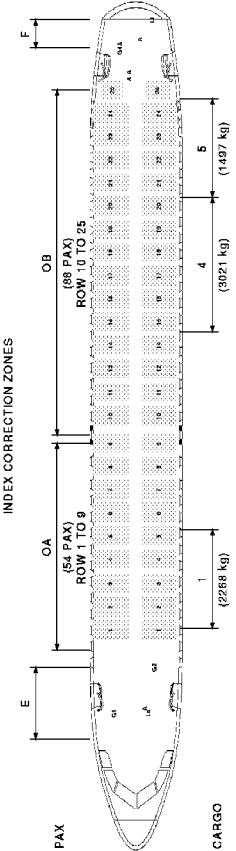
Example

DATA : Fuel in left inner fuel tank = 4500 kg
 Fuel in right inner fuel tank = 4500 kg
 Fuel in left outer fuel tank = 200 kg
 Fuel in right outer fuel tank = FULL
 Fuel in center tank = 0 kg

		Weight	Index	
Inner tank	Left	4500	–	3
	Right	4500	–	3
Outer tank	Left	200		0
	Right	691	+	2
Center tank		0		0
TOTAL		9891	–	4

Enter the trim sheet with a fuel index of – 4

DRY OPERATING WEIGHT CONDITIONS	
WEIGHT (kg)	H-arm (m)
1 40 500	17.27
2 $= \frac{(\text{H-arm} - 17.2500) \times W}{1000} + 50$	
3 DRY OPERATING WEIGHT INDEX	50.85



BASIC INDEX CORRECTION					
DRY OPERAT. WEIGHT DEVIATION	ZONES				
	E	F	G	H	
+100 kg	-1.01	+1.21			
-100 kg	+1.01	-1.21			
5 INDEX CORRECTION					+1.21

-100 kg	+1.01	-1.21	
5	INDEX CORRECTION	+1.21	
8	ONES		
	ARGO 1	1500	
	CARGO 4	2000	
	CARGO 5	500	
	CABIN 0A	50	
	CABIN 0B	70	

52.06

6

CORRECTED INDEX

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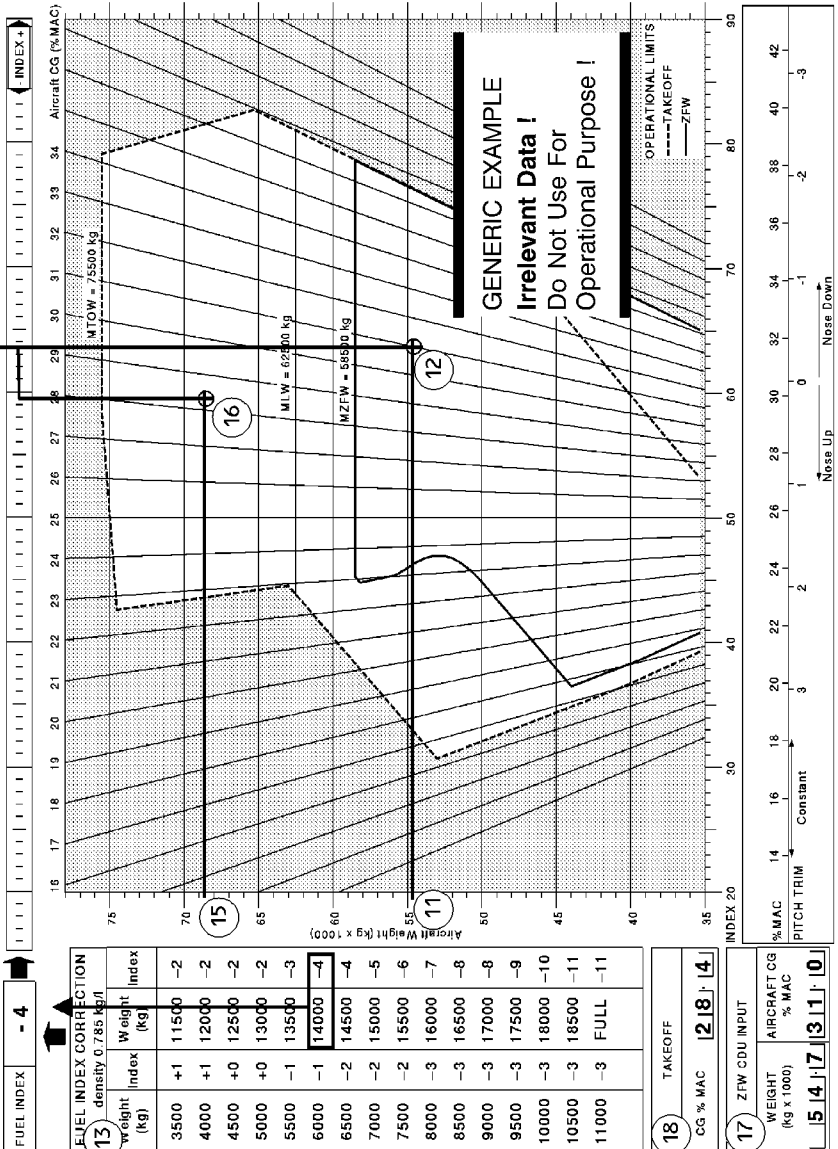
6

CORRECTED INDEX

52.06

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CORRECTED INDEX



FUEL INDEX TABLE PER TANK

The fuel index table has been established assuming a fuel distribution in accordance with refuel distribution given in section 2.01.30 of this volume.

If after refueling the actual distribution deviates from the chart values, the actual and the trim sheet CG will show a discrepancy. The following tables allow to determine the fuel index taking into account the actual fuel quantity in each tank. To determine the actual takeoff CG enter the tables with the actual fuel quantities in each tank, read the fuel index for each tank and use their sum to enter the trim sheet. Check that the actual CG is inside the operational limits. If the CG is outside the limits transfer fuel to achieve a distribution in accordance with the chart or rearrange the load.

Note : These tables are valid only when used with the following formulae for the index :

R

$$I = W \times (H - arm - 17.25) / 1000 + K \text{ or } I = [(CG - 25) \times W \times 0.000042] + K$$

R

(Weight in kg, H-arm in m)

Example

DATA :

Fuel in left inner fuel tank

= 4500 kg

Fuel in right inner fuel tank

= 4500 kg

Fuel in left outer fuel tank

= 200 kg

Fuel in right outer fuel tank

= FULL

Fuel in center tank

= 0 kg

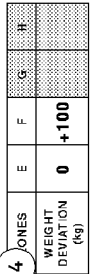
		Weight	Index	
Inner tank	Left	4500	–	3
	Right	4500	–	3
Outer tank	Left	200		0
	Right	691	+	2
Center tank		0		0
TOTAL		9891	–	4

Enter the trim sheet with a fuel index of – 4

AIRBUS

VERSION : 218 YC

DRY OPERATING WEIGHT		49 000
WEIGHT DEVIATION (PANTRY)	±	+ 100
CORRECTED DRY OPERATING WEIGHT	=	49 100
CARGO	+	8 500
PASSENGERS	1 0 0 x 8 4 =	+ 15 120
ZERO FUEL WEIGHT		72 720
TOTAL FUEL ONBOARD	+	17 000
TAKEOFF WEIGHT	=	89 720



5 INDEX CORRECTION		+1.70		CORRECTED INDEX		45.66		ALL WEIGHTS IN KILOGRAMS		
Nbr	WGT(kg)									
8	CARGO 1	1000								
	CARGO 2	1000								
	CARGO 3	3000								
	CARGO 4	3000								
	CARGO 5	500								
	CABIN OA	50								
	CABIN OB	70								
	CABIN OC	60								

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FUEL INDEX TABLE PER TANK

The fuel index table has been established assuming a fuel distribution in accordance with refuel distribution given in section 2.01.30 of this volume.
 If after refueling the actual distribution deviates from the chart values, the actual and the trim sheet CG will show a discrepancy. The following tables allow to determine the fuel index taking into account the actual fuel quantity in each tank. To determine the actual takeoff CG enter the tables with the actual fuel quantities in each tank, read the fuel index for each tank and use their sum to enter the trim sheet. Check that the actual CG is inside the operational limits. If the CG is outside the limits transfer fuel to achieve a distribution in accordance with the chart or rearrange the load.

Note : These tables are valid only when used with the following formulae for the index :
 $I = W \times (H - arm - 23.117) / 1000 + K$ or $I = [(CG - 25) \times W \times 0.000042] + K$
 (Weight in kg, H-arm in m)

Example

DATA : Fuel in left wing fuel tank = FULL
 Fuel in right wing fuel tank = 5500 kg
 Fuel in center tank = 0 kg

		Weight	Index	
Wing tank	Left	6080	–	1
	Right	5500	–	2
Center tank		0		0
TOTAL		11580	–	3

Enter the trim sheet with a fuel index of – 3

FUEL INDEX TABLES PER TANK

Note : These tables are valid only when used with the following formulae for the index :

R $I = W \times (H\text{-arm} - 18.85) / 1000 + K$ or $I = [(CG - 25) \times W \times 0.000042] + K$
 R (Weight in kg, H-arm in m)

Inner Tanks		Outer Tanks		Center Tank	
Weight	Index	Weight	Index	Weight	Index
500	– 1	250	1	500	– 1
1000	– 1	500	1	1000	– 1
1500	– 2	FULL	2	1500	– 2
2000	– 2			2000	– 3
2500	– 2			2500	– 3
3000	– 3			3000	– 4
3500	– 3			3500	– 5
4000	– 3			4000	– 6
4500	– 3			4500	– 7
5000	– 3			5000	– 7
FULL	– 2			5500	– 8
				6000	– 9
				FULL	– 10

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FUEL INDEX TABLES PER TANK

Note : These tables are valid only when used with the following formulae for the index :

R $I = W \times (H\text{-arm} - 23.117) / 100\ 000 + K$ or $I = [(CG - 25) \times W \times 0.000042] + K$
R (Weight in kg, H-arm in m)

Wing Tank		Center Tank	
Weight	Index	Weight	Index
500	– 1	500	– 1
1000	– 1	1000	– 1
1500	– 2	1500	– 2
2000	– 2	2000	– 3
2500	– 2	2500	– 4
3000	– 3	3000	– 4
3500	– 3	3500	– 5
4000	– 3	4000	– 6
4500	– 3	4500	– 7
5000	– 3	5000	– 7
5500	– 2	5500	– 8
6000	– 2	6000	– 9
FULL	– 1	FULL	– 10

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FUEL INDEX TABLES PER TANK

Note : These tables are valid only when used with the following formulae for the index :

R $I = W \times (H\text{-arm} - 17.25) / 1000 + K$ or $I = [(CG - 25) \times W \times 0.000042] + K$
 R (Weight in kg, H-arm in m)

Inner Tank		Outer Tank		Center Tank	
Weight	Index	Weight	Index	Weight	Index
400	0	200	0	400	0
800	– 1	400	1	800	– 1
1200	– 1	600	1	1200	– 1
1600	– 2	FULL	2	1600	– 2
2000	– 2			2000	– 3
2400	– 2			2400	– 3
2800	– 3			2800	– 4
3200	– 3			3200	– 5
3600	– 3			3600	– 5
4000	– 3			4000	– 6
4400	– 3			4400	– 6
4800	– 3			4800	– 7
5200	– 3			5200	– 8
FULL	– 2			5600	– 8
				6000	– 9
				6400	– 10
				FULL	– 10

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	02.05	INTRODUCTION	
	02.10	GENERAL (TEMPERATURE ENTRY)	
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		– TAKEOFF CHART DESCRIPTION	2
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	02.12	MTOW CALCULATION (TEMPERATURE ENTRY)	
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		– USE OF FLEXIBLE TAKEOFF	1
		– REQUIREMENTS	1
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	02.18	MTOW CALCULATION (WEIGHT ENTRY)	
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		– EXTRAPOLATION	6
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		– SUMMARY	7
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		– DEFINITION OF FLEXIBLE TAKEOFF	1
		– USE OF FLEXIBLE TAKEOFF	1
		– REQUIREMENTS	1
		– RECOMMENDATION	2
		– DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS	3
		– FLEXIBLE TAKEOFF NOT POSSIBLE	7
		– SUMMARY	8

02.24 QNH/BLEEDS CORRECTION

02.25 MINIMUM SPEEDS

- MINIMUM V1/VR/V2 LIMITED BY VMC 1
- MINIMUM V2 LIMITED BY VMU/VMCA 2

R **02.27 DERATED TAKEOFF** ◀

R – DEFINITION OF DERATED TAKEOFF 1

R – USE OF DERATED TAKEOFF 1

R – TAKEOFF PERFORMANCE IMPROVEMENT BY DERATING

R THE ENGINES 1

R – DETERMINATION OF THE MAXIMUM TAKEOFF WEIGHT AND

R ASSOCIATED SPEEDS 2

R – DETERMINATION OF DERATED TAKEOFF EPR 2

02.40 QUICK REFERENCE TABLES

- INTRODUCTION 1
- USE OF TABLES 1
- HOW TO PROCEED 1
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- CONF 2 7
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02.50 NET TAKEOFF FLIGHT PATH

- INTRODUCTION 1
- HOW TO PROCEED 1
- CLOSE OBSTACLE CLEARANCE CONF 1 + F 2
- REMOTE OBSTACLE CLEARANCE CONF 1 + F 3
- CLOSE OBSTACLE CLEARANCE CONF 2 4
- REMOTE OBSTACLE CLEARANCE CONF 2 5
- CLOSE OBSTACLE CLEARANCE CONF 3 6
- REMOTE OBSTACLE CLEARANCE CONF 3 7

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		SEQ 001	REV 22

TAKEOFF CHARTS

Takeoff charts are required to provide performance at takeoff. It is possible to present the charts in two different ways, one of which is selected by the airline. The different presentations are :

- temperature entry (temperature provided in the left column)
- weight entry (weight provided in the left column).

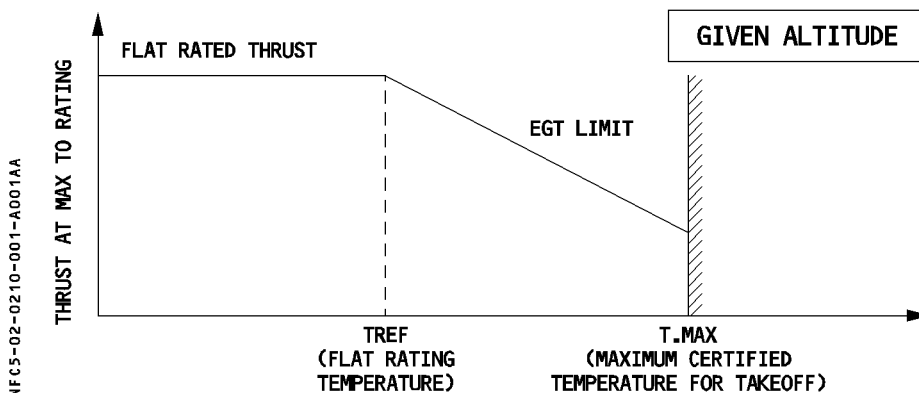
Both presentations are described here after. Sections 2.02.10, 2.02.12 and 2.02.14 are relative to temperature entry while 2.02.16, 2.02.18 and 2.02.20 are relative to weight entry.

The airline may request Airbus to delete anyone set of sections from the customized FCOM.

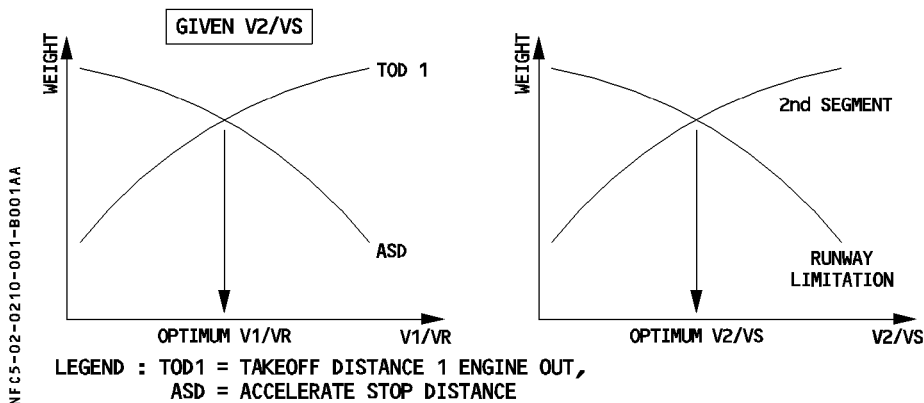
TAKEOFF PERFORMANCE

Takeoff optimization is calculated for a given runway and its obstacles and for given conditions of flap setting, temperature, wind and QNH. The calculation produces a maximum permissible takeoff weight (or a maximum takeoff temperature for an actual weight).

The takeoff thrust produced by the engine varies as follows :



The optimization process calculates the speeds which will produce the maximum takeoff weight. To do so, it takes into account the different takeoff limitations such as TOD, ASD, TOR, second segment..., as shown on the figure charts below.



On a typical runway, the performance of a twin engine aircraft, is generally limited by the one engine out operation at takeoff. The optimum V2/VS and optimum V1/VR are consequently unique.

TAKEOFF CHART DESCRIPTION

The takeoff chart (RTOW : Regulatory Takeoff Weight) is calculated for a specific aircraft version and for a particular runway specified at the top of the chart. The top of the chart also gives some information about the runway and lists the calculation assumptions.

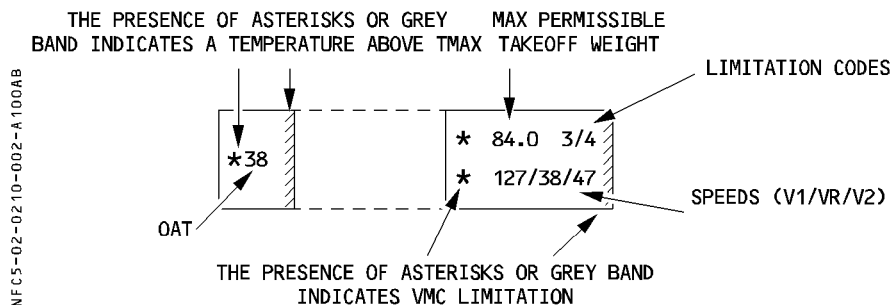
The chart is given for 2 different configurations and 5 wind values per configuration. This allows the crew to select the configuration that gives either :

- the highest permissible takeoff weight, or, for a given weight,
- the highest flexible temperature.

If different configurations give equivalent performance, the crew should select the configuration associated with the lowest takeoff speeds.

For each temperature value (and for a given configuration and wind), the chart provides the following information :

R



The available limitation codes are :

- First segment : 1
- Second segment : 2
- Runway length : 3
- Obstacles : 4
- Tire speed : 5
- Brake energy : 6
- Maximum computation weight : 7
- Final takeoff : 8
- VMU : 9

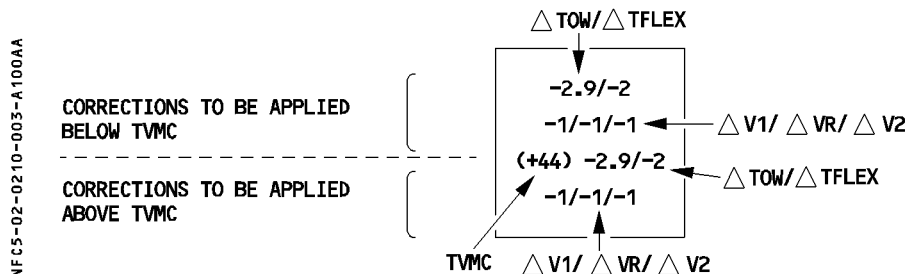
CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Each takeoff chart is computed for a given set of conditions (air conditioning, QNH, anti ice...) specified at the top of the chart. If the actual takeoff conditions are different, the crew must apply corrections. Two types of corrections are available :

- Conservative corrections on 2.02.24 p 1 (to be used when not provided on the chart).
- Corrections (less restrictive) listed on the chart, to be applied as explained below.

DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART

The corrections are presented on 4 lines :



TVMC is a temperature value given per column. This is a fictitious value that indicates the temperature above which the speeds are close to a VMC limitation or are VMC limited.

Note : The lower two lines may be shaded on certain chart formats.

R **MINIMUM SPEED**

- R Minimum V1/VR/V2 due to VMC are provided on the bottom right side of the takeoff chart.
- R They are only applicable in case of speed corrections.
- R These speeds are conservative. They may be slightly higher than V1/VR/V2 displayed on the takeoff chart.

R **FLEX TEMPERATURE INDICATOR**

- R On the temperature entry chart, the temperature column may display asterisks or have a gray band to indicate temperature values above TMAX and which are flex temperature.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.10	P 4
	GENERAL (TEMPERATURE ENTRY)		SEQ 100	REV 25

ADDITIONAL INFORMATION

ONE ENGINE OUT CLIMB PROCEDURE

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.

When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).

When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15° until the aircraft reaches 1500 feet or green dot.

The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 feet when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

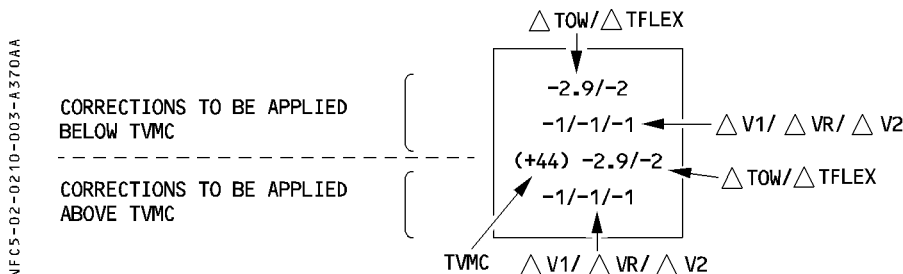
Takeoff charts computed for wet runway with a 15 feet screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

Note : The crew need not compare the charts if the top of the wet runway chart specifies "DRY CHECK". (The comparison has already been inserted in the WET runway calculation).

Note : If the RTOW chart is based on the CG being at 25 %, the crew can find the takeoff performance at a more forward CG by decreasing the takeoff weight by 1000 kg (2200 lb) and increasing V1, VR and V2 by 1 knot.

DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART

The corrections are presented on 4 lines :



TVMC is a temperature value given per column. This is a fictitious value that indicates the temperature above which the speeds are close to a VMC limitation or are VMC limited.

Note : The lower two lines may be shaded on certain chart formats.

MINIMUM SPEED

Minimum V1/VR/V2 due to VMC are provided on the bottom right side of the takeoff chart. They are only applicable in case of speed corrections. These speeds are conservative. They may be slightly higher than V1/VR/V2 displayed on the takeoff chart.

FLEX TEMPERATURE INDICATOR

On the temperature entry chart, the temperature column may display asterisks or have a gray band to indicate temperature values above TMAX and which are flex temperature.

ADDITIONAL INFORMATION

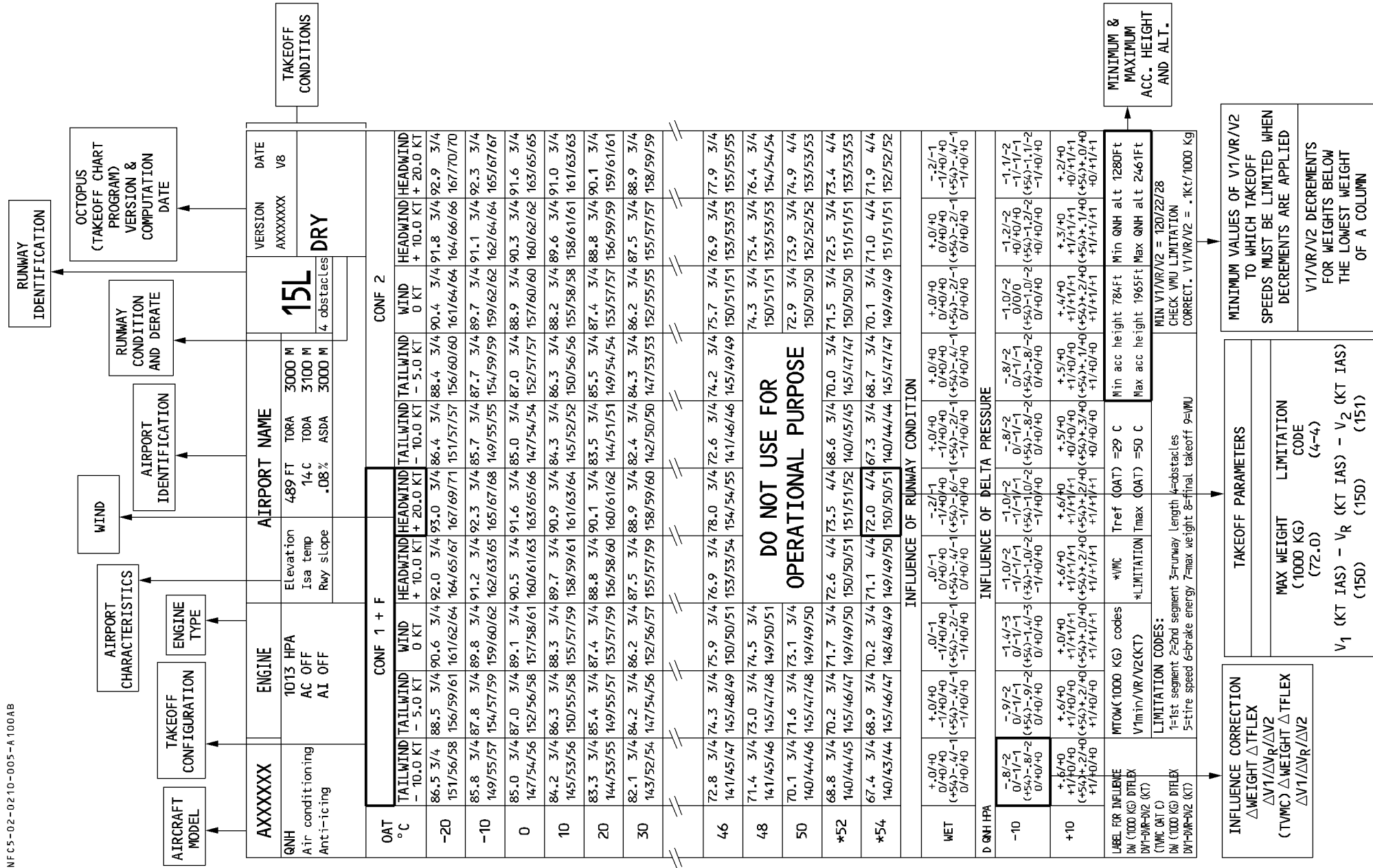
ONE ENGINE OUT CLIMB PROCEDURE

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.
When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).
When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15° until the aircraft reaches 1500 feet or green dot.
The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 feet when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

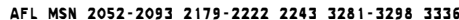
Takeoff charts computed for wet runway with a 15 feet screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

Note : The crew need not compare the charts if the top of the wet runway chart specifies "DRY CHECK". (The comparison has already been inserted in the WET runway calculation).



A321XXX		ENGINES		AIRPORT NAME					VERSION		DATE	
QNH		1013.00 HPA		Elevation	489	FT	TORA	3000	M	15L	AXXXXXXX **V 9	
Air cond.		AC OFF		Isla temp	14	C	TODA	3000	M		4 obstacles	DRY
Anti-icing		AI OFF		rvwy slope	.08	%	ASDA	3000	M			
All reversers operating												
No reversers on dry runway												
OAT		CONF 1+F					CONF 2					
C	TAILWIND	TAILWIND	WIND	HEADWIND	HEADWIND	TAILWIND	TAILWIND	WIND	HEADWIND	HEADWIND		
	-10 KT	-5 KT	0 KT	10 KT	20 KT	-10 KT	-5 KT	0 KT	10 KT	20 KT		
-20	86.5 3/4 151/56/58	88.5 3/4 156/59/61	90.6 3/4 161/62/64	92.0 3/4 164/65/67	93.0 3/4 167/69/71	86.4 3/4 151/57/57	88.4 3/4 156/60/60	90.4 3/4 161/64/64	91.8 3/4 164/66/66	92.9 3/4 167/70/70		
-10	85.8 3/4 149/55/57	87.8 3/4 154/57/59	89.8 3/4 159/60/62	91.2 3/4 162/63/65	92.3 3/4 165/67/68	85.7 3/4 149/55/55	87.7 3/4 154/59/59	89.7 3/4 159/62/62	91.1 3/4 162/64/64	92.3 3/4 165/67/67		
0	85.0 3/4 147/54/56	87.0 3/4 152/56/58	88.9 3/4 157/57/61	90.4 3/4 160/61/63	91.6 3/4 163/65/66	84.9 3/4 147/53/53	86.9 3/4 152/57/57	88.9 3/4 157/60/60	90.3 3/4 160/62/62	91.6 3/4 163/65/65		
10	84.2 3/4 145/53/56	86.3 3/4 150/55/58	88.3 3/4 155/58/60	89.7 3/4 158/59/61	91.0 3/4 161/63/64	84.2 3/4 145/52/52	86.2 3/4 150/55/55	88.2 3/4 155/58/58	89.6 3/4 158/61/61	91.0 3/4 161/63/63		
20	83.3 3/4 144/53/55	85.4 3/4 149/55/57	87.4 3/4 153/57/59	88.8 3/4 156/58/60	90.1 3/4 160/61/62	83.5 3/4 144/51/51	85.5 3/4 149/54/54	87.4 3/4 153/57/57	88.8 3/4 156/59/59	90.1 3/4 159/61/61		
30	82.1 3/4 143/52/54	84.2 3/4 147/54/56	86.2 3/4 152/56/57	87.5 3/4 155/57/59	88.9 3/4 158/59/60	82.4 3/4 142/50/50	84.3 3/4 147/53/53	86.2 3/4 152/55/55	87.5 3/4 155/57/57	88.9 3/4 158/59/59		
32	81.1 3/4 142/51/53	83.1 3/4 147/53/55	85.0 3/4 152/55/56	86.4 3/4 155/56/58	87.7 3/4 157/58/60	81.3 3/4 142/49/49	83.2 3/4 147/52/52	85.0 3/4 151/55/55	86.4 3/4 154/57/57	87.7 3/4 157/59/59		
34	80.1 3/4 142/50/52	82.1 3/4 147/52/54	83.9 3/4 151/54/55	85.3 3/4 154/55/57	86.6 3/4 157/58/59	80.2 3/4 142/48/48	82.1 3/4 146/52/52	83.9 3/4 151/54/54	85.2 3/4 154/56/56	86.5 3/4 157/58/58		
36	79.0 3/4 142/49/51	81.0 3/4 146/51/53	82.8 3/4 151/53/54	84.2 3/4 154/54/56	85.4 3/4 157/57/58	79.1 3/4 142/48/48	80.9 3/4 146/51/51	82.7 3/4 151/54/54	84.0 3/4 154/56/56	85.3 3/4 157/58/58		
38	78.0 3/4 141/48/50	79.9 3/4 146/50/52	81.7 3/4 151/52/53	83.0 3/4 153/54/55	84.2 3/4 156/57/58	78.0 3/4 141/48/48	79.8 3/4 146/51/51	81.6 3/4 151/53/53	82.8 3/4 154/55/55	84.1 3/4 157/57/57		
40	76.9 3/4 141/47/49	78.7 3/4 146/49/51	80.4 3/4 150/51/53	81.6 3/4 153/53/55	82.8 3/4 156/56/57	76.8 3/4 141/47/47	78.6 3/4 146/50/50	80.3 3/4 150/53/53	81.5 3/4 153/55/55	82.7 3/4 156/57/57		
42	75.6 3/4 141/46/48	77.3 3/4 146/49/50	DO NOT USE FOR OPERATIONAL PURPOSE							80.0 3/4 153/54/54	81.2 3/4 156/56/56	
44	74.2 3/4 141/46/47	75.8 3/4 146/48/50								78.4 3/4 153/54/54	79.5 3/4 156/56/56	
46	72.8 3/4 141/45/47	74.3 3/4 145/48/49	75.9 3/4 150/50/51	76.9 3/4 153/53/54	78.0 3/4 154/54/55	72.6 3/4 141/46/46	74.2 3/4 145/49/49	75.7 3/4 150/51/51	76.9 3/4 153/53/53	77.9 3/4 155/55/55		
48	71.4 3/4 141/45/46	73.0 3/4 145/47/48	74.5 3/4 149/50/51	75.5 3/4 152/52/53	76.5 4/4 153/53/54	71.3 3/4 141/46/46	72.8 3/4 145/48/48	74.3 3/4 150/51/51	75.4 3/4 153/53/53	76.4 4/4 154/54/54		
50	70.1 3/4 140/44/46	71.6 3/4 145/47/48	73.1 3/4 149/49/50	74.0 3/4 151/51/51	75.0 4/4 152/52/53	69.9 3/4 141/45/45	71.4 3/4 145/48/48	72.9 3/4 150/50/50	73.9 3/4 152/52/52	74.9 4/4 153/53/53		
* 52	68.8 3/4 140/44/45	70.2 3/4 145/46/47	71.7 3/4 149/49/50	72.6 4/4 150/50/51	73.5 4/4 151/51/52	68.6 3/4 140/45/45	70.0 3/4 145/47/47	71.5 3/4 150/50/50	72.5 3/4 151/51/51	73.4 4/4 153/53/53		
* 54	67.4 3/4 140/43/44	68.9 3/4 145/46/47	70.2 3/4 148/48/49	71.1 4/4 149/49/50	72.0 4/4 150/50/51	67.3 3/4 140/44/44	68.7 3/4 145/47/47	70.1 3/4 149/49/49	71.0 4/4 151/51/51	71.9 4/4 152/52/52		
INFLUENCE OF RUNWAY CONDITION												
WET	+0/+0	+0/+0	.0/-1	.0/-1	.0/-1	.0/-1	+0/+0	+0/+0	+0/+0	+0/+0	.-2/-1	
	0/+0/+0	-1/+0/+0	-1/+0/+0	0/+0/+0	-1/+0/+0	-1/+0/+0	0/+0/+0	0/+0/+0	0/+0/+0	0/+0/+0	-1/+0/+0	
	(+54) -.4/-1	(+54) -.4/-1	(+54) -.2/-1	(+54) -.4/-1	(+54) -.6/-1	(+54) -.2/-1	(+54) -.4/-1	(+54) -.2/-1	(+54) -.2/-1	(+54) -.2/-1	(+54) -.4/-1	
D QNH HPA		INFLUENCE OF DELTA PRESSURE										
-10	-.8/-2	-.9/-2	-1.4/-3	-1.0/-2	-1.0/-2	-.8/-2	-.8/-2	-1.0/-2	-1.2/-2	-1.1/-2		
	0/-1/-1	0/-1/-1	0/-1/-1	-1/-1/-1	-1/-1/-1	0/-1/-1	0/-1/-1	0/-1/-1	+0/+0/+0	+0/+0/+0		
	(+54) -.8/-2	(+54) -.9/-2	(+54) -1.4/-3	(+54) -1.0/-2	(+54) -1.0/-2	(+54) -.8/-2	(+54) -.8/-2	(+54) -1.0/-2	(+54) -1.2/-2	(+54) -1.1/-2		
+10	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0	+0/+0		
	+1/+0/+0	+1/+0/+0	+1/+1/+1	+1/+1/+1	+1/+1/+1	+1/+1/+1	+1/+1/+1	+1/+1/+1	+1/+1/+1	+1/+1/+1		
	(+54) +2/+0	(+54) +2/+0	(+54) +0/+0	(+54) +2/+0	(+54) +2/+0	(+54) +3/+0	(+54) +1/+0	(+54) +2/+0	(+54) +1/+0	(+54) +0/+0		
+1/+0/+0		+1/+0/+0	+1/+1/+1	+1/+1/+1	+1/+1/+1	+0/+0/+0	+1/+0/+0	+1/+1/+1	+1/+1/+1	+0/+1/+1		
LABEL FOR INFLUENCE		MTOW(1000 KG) codes			* VMC	Tref (OAT)	= 29 C		Min acc height 798 FT	Min QNH alt 1293 FT		
DW (1000 KG) DTFLEX		V1min/VR/V2 (kt)			* LIMITATION	Tmax (OAT)		= 50 C		Min acc height 1478 FT		
DV1-DVR-DV2 (KT)		LIMITATION CODES :										
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles										
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final takeoff 9=VMU										
DV1-DVR-DV2 (KT)												

NFC5-02-0210-005-A100AB



A319XXX		ENGINES		AIRPORT NAME					15L	VERSION	DATE
QNH		1013.00 HPA		Elevation	489 FT	TORA	3000 M	4 obstacles		AXXXXXXX	**V10
Air cond.		AC OFF		Isa temp	14 C	TODA	3000 M			DRY	
Anti-icing		AI OFF		rvwy slope	.08 %	ASDA	3000 M				
All reversers operating											
No reversers on dry runway											
OAT		CONF 1+F					CONF 2				
C	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT	
-20	70.4 4/4 153/53/56	71.4 4/4 155/55/58	DOT NOT USE FOR OPERATIONAL PURPOSE					72.7 4/4 156/56/58	73.5 2/4 157/57/60		
-10	70.1 4/4 153/53/56	71.1 4/4 154/54/57						72.5 4/4 155/55/57	73.2 2/4 156/56/58		
0	69.7 3/4 152/52/55	70.7 4/4 153/53/56	71.7 4/4 154/54/56	72.6 4/4 155/55/58	73.4 4/4 155/55/58	69.2 4/4 148/48/51	70.2 4/4 150/50/52	71.3 4/4 151/51/54	72.1 4/4 153/53/55	72.9 2/4 155/55/57	
10	69.3 3/4 152/52/55	70.3 4/4 153/53/56	71.3 4/4 153/53/56	72.1 4/4 154/54/57	72.9 4/4 155/55/58	68.8 4/4 148/48/50	69.7 4/4 149/49/51	70.8 4/4 150/50/53	71.6 4/4 151/51/53	72.4 2/4 153/53/55	
20	68.8 3/4 150/50/53	69.8 4/4 151/51/54	70.8 4/4 153/53/55	71.5 4/4 153/53/56	72.4 4/4 154/54/57	68.3 4/4 147/47/49	69.2 4/4 148/48/50	70.3 4/4 149/49/51	71.1 4/4 149/49/51	71.8 2/4 151/51/53	
30	68.3 3/4 148/48/51	69.3 3/4 150/50/53	70.4 4/4 151/51/54	71.0 4/4 152/52/55	71.8 4/4 153/53/55	67.8 3/4 147/47/49	68.8 4/4 147/47/49	69.7 4/4 148/48/51	70.5 4/4 148/48/50	71.3 2/4 150/50/52	
32	68.2 3/4 148/48/50	69.2 3/4 150/50/53	70.3 4/4 151/51/54	70.9 4/4 153/53/56	71.7 4/4 153/53/55	67.7 3/4 147/47/49	68.7 4/4 147/47/49	69.6 4/4 148/48/50	70.4 4/4 148/48/50	71.2 2/4 149/49/51	
34	68.1 3/4 147/47/50	69.1 3/4 150/50/53	70.2 4/4 151/51/54	70.8 4/4 152/52/55	71.6 4/4 152/52/55	67.7 4/4 145/45/47	68.6 4/4 146/46/48	69.5 4/4 148/48/50	70.3 4/4 148/48/50	71.1 2/4 149/49/51	
36	68.0 3/4 147/47/50	69.0 3/4 150/50/52	70.1 4/4 151/51/54	70.7 4/4 152/52/55	71.5 4/4 152/52/55	67.6 3/4 145/45/47	68.5 4/4 147/47/49	69.5 4/4 148/48/50	70.2 4/4 148/48/50	71.0 2/4 149/49/51	
38	67.9 3/4 147/47/49	69.0 3/4 150/50/53	70.0 4/4 151/51/53	70.7 4/4 152/52/55	71.4 4/4 152/52/55	67.6 3/4 146/46/48	68.5 4/4 147/47/49	69.4 4/4 148/48/50	70.1 4/4 148/48/50	70.9 2/4 148/48/50	
40	67.9 3/4 146/46/49	68.9 3/4 150/50/53	70.0 4/4 151/51/54	70.6 4/4 152/52/55	71.3 4/4 152/52/54	67.4 3/4 145/45/47	68.4 4/4 147/47/49	69.3 4/4 148/48/50	70.0 4/4 148/48/49	70.8 2/4 148/48/50	
42	67.8 3/4 146/46/49	68.8 3/4 150/50/52	69.9 4/4 151/51/54	70.5 4/4 152/52/55	71.3 4/4 152/52/55	67.4 3/4 145/45/47	68.3 4/4 147/47/49	69.3 4/4 148/48/50	69.9 4/4 148/48/50	70.7 4/4 148/48/50	
44	67.6 3/4 146/46/48	68.7 3/4 150/50/52	69.8 4/4 151/51/54	70.4 4/4 152/52/55	71.1 4/4 152/52/54	67.2 3/4 146/46/48	68.2 4/4 147/47/49	69.1 4/4 148/48/50	69.7 4/4 148/48/50	70.5 4/4 148/48/50	
46	66.5 3/4 145/45/48	67.4 3/4 148/48/51	68.5 4/4 149/49/52	69.1 4/4 151/51/53	69.9 4/4 150/50/53	66.0 3/4 145/45/47	66.9 4/4 145/45/47	67.8 4/4 146/46/48	68.5 4/4 146/46/48	69.3 4/4 147/47/48	
48	65.2 3/4 145/45/48	66.2 4/4 146/46/49	67.2 4/4 148/48/50	67.8 4/4 149/49/52	68.6 4/4 149/49/52	64.7 4/4 143/43/45	65.7 4/4 143/43/45	66.5 4/4 145/45/47	67.2 4/4 144/44/46	68.1 2/4 145/45/47	
* 50	64.0 3/4 144/44/47	64.9 4/4 145/45/47	65.9 4/4 147/47/49	66.5 4/4 147/47/49	67.3 4/4 147/47/50	63.5 4/4 141/41/43	64.4 4/4 142/42/44	65.2 4/4 143/43/45	66.0 4/4 143/43/45	66.8 2/4 144/44/46	
* 52	62.7 4/4 142/42/45	63.7 4/4 144/44/46	64.6 4/4 146/46/48	65.2 4/4 146/46/48	66.1 4/4 146/46/49	62.3 4/4 139/39/41	63.1 4/4 141/41/43	64.0 4/4 142/42/43	64.7 4/4 142/42/44	65.5 2/4 143/43/45	
* 54	61.5 4/4 141/41/43	62.4 4/4 143/43/45	63.3 4/4 144/44/46	64.0 4/4 144/44/46	64.8 4/4 146/46/48	61.0 4/4 138/38/40	61.8 4/4 140/40/42	62.7 4/4 140/40/42	63.5 4/4 141/41/42	64.3 2/4 142/42/44	
INFLUENCE OF RUNWAY CONDITION											
WET	-4/-1	-7/-2	.0/-1	.0/0	.0/0	-9/-2	-2/-1	.0/0	.0/-1	.0/-1	
	-10/-3/-3	-8/-1/-1	-4/-1/-1	-4/-1/-1	-1/0/0	-9/-2/-2	-4/0/0	-2/0/0	0/0/0	0/0/0	
	(+54) -8/-2	(+54) -7/-2	(+54) 0/-1	(+54) 0/0	(+54) 0/0	(+54) -9/-2	(+54) -2/-1	(+54) 0/0	(+54) 0/-1	(+54) -2/-1	
D QNH HPA											
	-6/-1	-6/-1	-7/-2	-7/-2	-7/-2	-8/-2	-8/-2	-9/-2	-8/-2	-8/-2	
	0/0/0	-1/0/0	0/0/0	0/0/0	0/0/0	-1/-1/-1	0/0/0	0/0/0	-2/-1/-1	-2/-2/-2	
+10	(+54) -6/-1	(+54) -6/-1	(+54) -7/-2	(+54) -7/-2	(+54) -9/-2	(+54) -7/-2	(+54) -8/-2	(+54) -8/-2	(+54) -9/-2	(+54) -8/-2	
	0/0/0	-1/0/0	0/0/0	0/0/0	0/0/0	-1/0/0	0/0/0	0/0/0	-2/0/0	-2/0/0	
	+3/0	+1/0	+1/0	+1/0	+1/0	+1/0	+1/0	+1/0	.0/0	.0/0	
LABEL FOR INFLUENCE	0/+1/+1	+1/+1/+1	+1/+1/+1	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/+1/+1	0/0/0	
	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) +1/0	(+54) .0/0	(+54) .0/0	
	0/+1/+1	+1/+1/+1	+1/+1/+1	0/0/0	0/0/0	0/0/0	0/0/0	0/0/0	0/+1/+1	0/0/0	
MTOW(1000 KG) codes		* VMC		Tref (OAT) = 44 C		Min acc height 810 FT		Min QNH alt 1306 FT			
DW (1000 KG) DTFLEX		V1min/VR/V2 (kt)		* LIMITATION		Tmax (OAT) = 50 C		Max acc height 1992 FT			
DV1-DVR-DV2 (KT)		LIMITATION CODES								Min V1/VR/V2 = 107/13/17	
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles								CHECK VMU LIMITATION	
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU								Correct. V1/VR/V2 = .2 KT/1000 KG	
DV1-DVR-DV2 (KT)											

RTOW CHARTS – COMPLEMENTARY INFORMATION

AIRCRAFT MODEL

TAKEOFF CONFIGURATION

ENGINE TYPE

AIRPORT CHARACTERISTICS

WIND

RUNWAY IDENTIFICATION

OCTOPUS (TAKEOFF CHART PROGRAM) VERSION & COMPUTATION DATE

AXXXXX

ENGINE

AIRPORT NAME

VERSION DATE

AXXXXX V8

15L

DRY

4 obstacles

TAKEOFF CONDITIONS

QNH

1013 HPA

489 FT

3000 M

Isa temp

3100 M

Run slope

3000 M

CONF 1 + F

CONF 2

TAILWIND
- 10.0 KT

WIND
0 KT

HEADWIND
+ 10.0 KT

TAILWIND
- 5.0 KT

WIND
0 KT

HEADWIND
+ 10.0 KT

TAILWIND
- 5.0 KT

WIND
0 KT

HEADWIND
+ 10.0 KT

-20

86.5 3/4

88.5 3/4

90.6 3/4

93.0 3/4

95.0 3/4

98.4 3/4

92.9 3/4

151/56/58

156/59/61

161/62/64

164/65/67

167/69/71

151/57/57

156/60/60

161/64/64

164/66/66

167/70/70

-10

85.8 3/4

87.8 3/4

89.8 3/4

91.2 3/4

92.3 3/4

95.7 3/4

89.7 3/4

149/55/58

159/60/62

162/63/65

165/67/68

167/69/71

151/57/57

156/60/60

161/64/64

164/66/66

167/70/70

0

85.0 3/4

87.0 3/4

89.1 3/4

90.5 3/4

91.6 3/4

95.0 3/4

88.9 3/4

147/54/56

152/56/58

157/58/61

160/61/63

163/65/66

167/69/71

151/57/57

156/60/60

161/64/64

164/66/66

167/70/70

10

84.2 3/4

86.3 3/4

88.3 3/4

89.7 3/4

90.9 3/4

94.3 3/4

88.2 3/4

145/53/55

150/55/58

155/57/59

158/59/61

161/63/64

164/66/66

167/69/71

151/57/57

156/60/60

161/64/64

164/66/66

167/70/70

20

83.3 3/4

85.4 3/4

87.4 3/4

88.8 3/4

90.1 3/4

93.5 3/4

87.4 3/4

144/53/55

149/55/58

154/57/59

157/59/61

160/61/63

163/65/66

166/68/68

169/70/70

172/71/71

175/72/72

178/73/73

30

82.1 3/4

84.2 3/4

86.2 3/4

87.5 3/4

88.9 3/4

92.4 3/4

86.2 3/4

143/52/54

147/54/56

152/56/58

157/58/61

160/61/63

163/65/66

166/68/68

169/70/70

172/71/71

175/72/72

178/73/73

46

72.8 3/4

74.3 3/4

75.9 3/4

76.9 3/4

78.0 3/4

81.4 3/4

75.7 3/4

141/45/47

145/48/49

150/50/51

153/53/54

156/56/57

159/59/61

162/62/62

165/65/65

168/68/68

171/69/69

174/71/71

48

71.4 3/4

73.0 3/4

74.5 3/4

75.5 3/4

76.6 3/4

79.9 3/4

74.3 3/4

140/44/46

144/47/48

149/49/50

152/52/52

155/55/55

158/58/58

161/61/61

164/64/64

167/67/67

170/70/70

173/71/71

50

70.1 3/4

71.6 3/4

73.1 3/4

74.1 3/4

75.2 3/4

78.5 3/4

72.9 3/4

140/44/46

144/47/48

149/49/50

152/52/52

155/55/55

158/58/58

161/61/61

164/64/64

167/67/67

170/70/70

173/71/71

*52

68.8 3/4

70.2 3/4

71.7 3/4

72.6 3/4

73.5 3/4

76.8 3/4

71.5 3/4

140/44/46

144/47/48

149/49/50

152/52/52

155/55/55

158/58/58

161/61/61

164/64/64

167/67/67

170/70/70

173/71/71

*54

67.4 3/4

68.9 3/4

70.2 3/4

71.1 3/4

72.0 3/4

75.3 3/4

70.1 3/4

140/43/44

144/46/47

148/48/49

151/51/51

154/54/54

157/57/57

160/60/60

163/63/63

166/66/66

169/69/69

172/70/70

WET

70/70

71/71

72/72

73/73

74/74

75/75

76/76

77/77

78/78

79/79

80/80

81/81

82/82

83/83

84/84

85/85

86/86

87/87

88/88

89/89

90/90

INFLUENCE OF DELTA PRESSURE

INFLUENCE OF RUNWAY CONDITION

MINIMUM & MAXIMUM ACC. HEIGHT AND ALT.

MINIMUM VALUES OF V1/VR/V2 TO WHICH TAKEOFF SPEEDS MUST BE LIMITED WHEN DECREMENTS ARE APPLIED

V1/VR/V2 DECREMENTS FOR WEIGHTS BELOW THE LOWEST WEIGHT OF A COLUMN

NFC5-02-0210-005-A100AB

AFL MSN 2106-2163 2233 2875 2920-2947 3052-3157 3373-3631

R

A320XXX		ENGINES		AIRPORT NAME						VERSION	DATE								
QNH	1013.25 HPA			Elevation	489	FT	TORA	3000	M	15L	AXXXXXXX	**V20							
Air cond.	AC OFF			Isa temp	14	C	TODA	3000	M	4 obstacles	DRY								
Anti-icing	AI OFF			rvwy slope	.08	%	ASDA	3000	M										
All reversers operating																			
No reversers on dry runway																			
OAT	CONF 1+F						CONF 2												
C	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT									
-20	80.2 4/6 156/56/58	82.0 4/6 162/62/64	83.6 3/4 167/67/69	84.8 3/4 170/70/72	85.8 3/4 173/73/75	80.4 4/6 154/54/59	81.9 3/4 159/59/64	83.4 3/4 164/64/69	84.4 3/4 167/67/72	85.2 2/4 169/69/74									
-10	79.5 4/6 153/56/58	81.3 4/6 159/59/62	83.1 4/6 164/64/66	84.3 3/4 167/67/69	85.3 3/4 171/71/72	79.7 4/6 151/52/57	81.4 4/6 156/56/62	82.9 3/4 161/61/66	84.0 3/4 164/64/69	84.9 3/4 167/67/72									
0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70	79.0 4/6 149/51/56	80.8 4/6 154/54/60	82.4 3/4 159/59/64	83.5 4/6 162/62/67	84.5 3/4 165/65/70									
10	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67	78.4 4/6 147/50/54	80.2 4/6 152/52/58	81.9 3/4 156/56/62	83.0 3/4 159/59/65	83.9 3/4 162/63/68									
20	77.6 4/6 146/51/53	79.3 4/6 151/55/57	81.1 4/6 157/57/60	82.5 4/6 160/60/62	83.6 4/6 163/63/65	77.7 4/6 145/48/52	79.5 4/6 150/51/56	81.3 4/6 154/54/60	82.4 3/4 157/57/63	83.4 3/4 160/61/66									
30	76.9 4/6 144/50/52	78.7 4/6 149/54/56	80.5 4/6 154/57/60	81.8 4/6 158/58/60	83.0 4/6 161/61/63	77.1 4/6 143/46/50	78.9 4/6 148/50/55	80.7 4/6 153/53/58	81.9 3/4 155/56/61	82.9 3/4 158/59/64									
32	76.8 4/6 144/50/52	78.6 4/6 149/53/55	80.4 4/6 154/56/58	81.7 4/6 157/58/60	82.9 4/6 161/61/63	77.0 4/6 142/45/50	78.7 4/6 147/50/55	80.6 4/6 152/53/58	81.8 4/6 155/55/60	82.8 3/4 157/59/64									
34	76.7 4/6 143/50/52	78.4 4/6 148/53/55	80.2 4/6 154/56/58	81.5 4/6 157/57/60	82.8 4/6 160/60/62	76.9 4/6 142/45/50	78.6 4/6 147/50/55	80.5 4/6 152/52/57	81.7 4/6 154/55/60	82.7 3/4 157/58/64									
36	76.6 4/6 143/49/52	78.4 4/6 148/52/54	80.1 4/6 153/56/58	81.4 4/6 156/57/59	82.7 4/6 160/60/62	76.8 4/6 141/45/50	78.5 4/6 146/50/55	80.3 4/6 151/52/57	81.6 4/6 154/55/60	82.6 3/4 157/58/63									
38	76.5 4/6 142/49/52	78.3 4/6 147/52/54	80.0 4/6 153/56/58	81.3 4/6 156/58/60	82.6 4/6 159/60/62	76.7 4/6 141/45/50	78.4 4/6 146/48/53	80.2 4/6 151/52/57	81.5 4/6 154/54/59	82.5 3/4 156/58/63									
40	76.4 4/6 142/49/52	78.2 4/6 147/52/54	79.9 4/6 152/56/58	81.2 4/6 156/58/60	82.5 4/6 159/59/61	76.6 4/6 141/45/50	78.3 4/6 146/48/53	80.1 4/6 150/51/56	81.4 4/6 153/54/59	82.4 3/4 156/57/63									
42	76.3 4/6 142/49/51	78.0 4/6 147/52/54	DO NOT USE FOR OPERATIONAL PURPOSE							81.3 4/6 153/54/59	82.3 3/4 156/57/62								
44	76.1 4/6 142/49/51	77.9 4/6 146/51/53								81.1 4/6 153/53/58	82.1 3/4 155/57/62								
46	75.5 4/6 142/48/51	77.2 4/6 147/51/53								80.2 4/6 152/55/57	81.5 4/6 155/56/58	80.7 2/4 154/56/58	75.7 4/6 141/45/49	77.3 4/6 145/47/52	79.1 4/6 150/50/55	80.3 3/4 152/53/58	80.7 2/4 152/55/60		
48	74.5 4/6 143/48/50	76.2 4/6 148/50/52								77.9 4/6 153/53/55	79.1 4/6 155/56/57	79.3 2/4 153/55/57	74.7 4/6 141/44/48	76.4 4/6 146/47/51	78.0 3/4 150/50/55	79.1 3/4 152/53/57	79.5 4/8 155/58/63		
50	73.6 4/6 143/47/49	75.3 4/6 148/49/51	76.9 4/6 153/53/55	77.9 4/8 154/54/56	77.9 2/4 151/54/55	73.8 4/6 142/42/46	75.4 4/6 146/47/51	76.9 3/4 150/50/54	78.0 3/4 152/52/57	78.0 2/4 149/52/57									
52	72.7 4/6 144/46/48	74.4 4/6 149/49/51	75.8 3/4 153/53/54	76.3 2/4 152/52/53	76.3 2/4 147/52/53	72.9 4/6 142/44/48	74.3 3/4 146/46/50	75.8 3/4 150/50/54	76.4 2/4 150/50/55	76.4 2/4 146/50/55									
54	71.8 4/6 145/46/47	73.3 3/4 149/49/51	74.8 3/4 152/52/54	75.0 2/4 150/50/52	75.0 2/4 145/50/52	71.9 3/4 142/43/47	73.3 3/4 146/46/50	74.7 3/4 149/49/54	75.1 2/4 148/49/54	75.1 2/4 144/49/54									
INFLUENCE OF RUNWAY CONDITION																			
WET	-20/-5	-15/-4	-12/-3	-11/-2	-10/-2	-9/-4	-15/-4	-12/-3	-12/-2	-10/-1	-4/-2								
	-169/-1/1	-15/2/-2	-13/-4/-4	-11/-3/3	-10/2/-2	-14/0/-	-13/0/-	-12/-2/-2	-10/-1/-1	-4/-2/-2									
	(+54) -2.0/-5	(+54) -1.5/-4	(+54) -1.3/-3	(+54) -1.1/-2	(+54) -0.8/-2	(+54) -0.9/-4	(+54) -1.5/-4	(+54) -1.3/-3	(+54) -1.2/-2	(+54) -1.5/-3									
		-16/0/0	-15/0/0	-13/0/0	-11/0/0	-10/0/0	-14/0/0	-13/0/0	-11/0/0	-10/0/0	-4/0/0								
D QNH HPA		INFLUENCE OF DELTA PRESSURE																	
-10.0	-0.8/-2	-0.7/-2	-0.7/-2	-1.3/-3	-0.7/-2	-0.7/-2	-1.2/-3	-0.8/-2	-0.8/-2	-0.8/-2	-0.8/-2								
	0/0/0	0/0/0	0/0/0	-1/0/0	0/0/0	0/0/0	0/0/0	-1/-1/-2	-1/0/0	-1/-1/-1									
	(+54) -0.8/-2	(+54) -0.7/-2	(+54) -0.7/-2	(+54) -1.3/-3	(+54) -0.7/-2	(+54) -0.7/-2	(+54) -1.2/-3	(+54) -0.8/-2	(+54) -0.8/-2	(+54) -0.8/-2									
+10.0	+0.2/0	+0.2/0	0.0/0	+0.2/0	+0.2/0	+0.2/0	+0.2/0	+0.2/0	+0.2/0	+0.2/0	+0.2/0								
	0/0/0	0/0/0	0.0/0	0/0/0	+1/+1/+1	0/+1/+1	0/0/0	+1/+1/+1	+1/+1/+1	+1/+1/+1									
	(+54) +0.2/0	(+54) +0.2/0	(+54) 0.0/0	(+54) +0.2/0	(+54) +0.2/0	(+54) +0.2/0	(+54) +0.2/0	(+54) +0.2/0	(+54) +0.2/0	(+54) +0.2/0									
		0/0/0	0/0/0	0/0/0	0/0/0	+1/+1/+1	0/+1/+1	0/0/0	+1/+1/+1	+1/+1/+1									
LABEL FOR INFLUENCE		MTOW(1000 KG) codes			* VMC	Trof (OAT)	= 44 C	Min acc height	464 FT	Min QNH alt	953 FT								
DW (1000 KG) DTFLEX		V1min/VR/V2 (kt)			*LIMITATION	Tmax (OAT)	= 54 C	Max acc height	1917 FT	Max QNH alt	2406 FT								
DV1-DVR-DV2 (KT)		LIMITATION CODES :																	
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles																	
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU																	
DV1-DVR-DV2 (KT)																			
</																			

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

DIRECT CHART READING

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight. In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

For a given configuration, enter the chart with the OAT and wind value to determine the maximum permissible weight. For an OAT or wind value not presented on the chart, interpolate between two consecutive temperature rows and/or two consecutive wind columns. Conservative OAT or wind values can also be considered. No extrapolation is allowed.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

- For the given wind and temperature conditions, read the maximum takeoff weight (choose the configuration giving the highest weight).
- Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
- Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and wind value.

Example 1

DATA : OAT

= 25°C

Head Wind

= 10 kt

Air conditioning ON

QNH

= 1013 hPa

- R Use the chart from 2.02.10 p 6.
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
- Maximum takeoff weight (1000 kg) air conditioning OFF 88.1
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
- Maximum takeoff weight (1000 kg) air conditioning OFF 88.1

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.12	P 2
	MTOW CALCULATION (TEMP. ENTRY)		SEQ 030	REV 25

For equivalent TO performance retain CONF 2 as takeoff speeds are lower.

Maximum TO weight (1000 kg) air conditioning OFF 88.1

Air conditioning correction (FCOM 2.02.24 p1) - 3.2

Maximum permissible TO weight (1000 kg) air conditioning ON 84.9

Determine takeoff speeds for 84.9 (1000 kg) in the 10 kt head wind column (CONF2)

V1 = 154 kt, VR = 156 kt, V2 = 156 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

R CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

1. Enter the chart with given OAT and wind to determine the maximum takeoff weight before correction.
2. Apply the first correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
3. To combine a second (and third, as applicable) correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
 If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.

– When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.

– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet correction first.

– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

– No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.

R

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

DIRECT CHART READING

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight. In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

For a given configuration, enter the chart with the OAT and wind value to determine the maximum permissible weight. For an OAT or wind value not presented on the chart, interpolate between two consecutive temperature rows and/or two consecutive wind columns. Conservative OAT or wind values can also be considered. No extrapolation is allowed.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

- For the given wind and temperature conditions, read the maximum takeoff weight (choose the configuration giving the highest weight).
- Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
- Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and wind value.

Example 1

DATA : OAT

= 25°C

Head Wind

= 10 kt

Air conditioning ON

QNH

= 1013 hPa

- R Use the chart from 2.02.10 p 6.
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
- Maximum takeoff weight (1000 kg) air conditioning OFF 71.2
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
- Maximum takeoff weight (1000 kg) air conditioning OFF 70.9

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- Retain CONF 1+F as takeoff configuration.
 Maximum TO weight (1000 kg) air conditioning OFF 71.2
 R Air conditioning correction (FCOM 2.02.24 p1) - 2.1
 R Maximum permissible TO weight (1000 kg) air conditioning ON 69.1
 R Determine takeoff speeds for 69.1 (1000kg) in the 10kt head wind column (CONF1+F)
 V1 = 151 kt, VR = 151 kt, V2 = 153 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

- Enter the chart with given OAT and wind to determine the maximum takeoff weight before correction.
- Apply the first correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
- To combine a second (and third, as applicable) correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
 If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.

– When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.

– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet correction first.

– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

– No speed check is required for the first correction. However, if the first influence correction follows a conversative FCOM correction, a speed check is required.

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

DIRECT CHART READING

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight. In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

For a given configuration, enter the chart with the OAT and wind value to determine the maximum permissible weight. For an OAT or wind value not presented on the chart, interpolate between two consecutive temperature rows and/or two consecutive wind columns. Conservative OAT or wind values can also be considered. No extrapolation is allowed.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

1. For the given wind and temperature conditions, read the maximum takeoff weight (choose the configuration giving the highest weight).
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and wind value.

Example 1

DATA : OAT

= 25°C

Head Wind

= 10 kt

Air conditioning ON

QNH

= 1013 hPa

Use the chart from 2.02.10 p 6.

Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,

R Maximum takeoff weight (1000 kg) air conditioning OFF .82.1

Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,

R Maximum takeoff weight (1000 kg) air conditioning OFF .82.1

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- Retain CONF 2 as takeoff configuration.
- R Maximum TO weight (1000 kg) air conditioning OFF 82.1
- Air conditioning correction (FCOM 2.02.24 p1)− 2.2
- R Maximum permissible TO weight (1000 kg) air conditioning ON 79.9
- Determine takeoff speeds for 79.9 (1000 kg) in the 10 kt head wind column (CONF 2)
- V1 = 152 kt, VR = 153kt, V2 = 158 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

1. Enter the chart with given OAT and wind to determine the maximum takeoff weight before correction.
2. Apply the first correction :
If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
3. To combine a second (and third, as applicable) correction :
If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : − *QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.*

− *When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.*

− *Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet correction first.*

− *If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.*

− *No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.*

Example 2

DATA : OAT = 25°C
 Head wind = 10 kt
 QNH = 1028 hPa
 WET runway

R Use the chart from 2.02.10 p 6.

- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
 max TO weight (1000 kg) 88.1
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
 max TO weight (1000 kg) 88.1
- Retain CONF 2 for takeoff (takeoff speeds are lower).
- Read associated speeds as V1 = 155 kt, VR = 158 kt, V2 = 158 kt
- Apply WET correction
 For OAT < TVMC (54°), ΔW = ... 0.0
 Intermediate weight (1000 kg) 88.1
 Associated speeds,
 $V1 = 155 \text{ kt} - 0 = 155 \text{ kt}$
 $VR = 158 \text{ kt} - 0 = 158 \text{ kt}$
 $V2 = 158 \text{ kt} - 0 = 158 \text{ kt}$
 (No speed check required for first correction)
- Apply QNH correction
 For OAT < TVMC (54°), $\Delta W = 0.3 \times 15/10 =$ + 0.4
 Maximum permissible takeoff weight (1000 kg) 88.5
 Associated speeds,
 $V1 = 155 \text{ kt} + 1 \times 15/10 = 156 \text{ kt}$
 $VR = 158 \text{ kt} + 1 \times 15/10 = 160 \text{ kt}$
 $V2 = 158 \text{ kt} + 1 \times 15/10 = 160 \text{ kt}$
- Check that the speeds are higher than minimum speeds from the chart and from VMU table.

	Takeoff Configuration : 2			
	TOW	V1	VR	V2
TOW (RTOW)	88.1	155	158	158
FCOM correction(s)				
Intermediate value	88.1	155	158	158
WET Correction	0.0	0	0	0
Intermediate value	88.1	155	158	158
QNH Correction	+ 0.4	+ 1	+ 2	+ 2
Final value	88.5	156	160	160

COMBINING CORRECTIONS FROM FCOM AND CHART

Proceed as follows :

1. Enter the chart with selected configuration, OAT and wind to read the maximum takeoff weight.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

Example 3

DATA : OAT = 25°C
Head wind = 10 kt
Air conditioning ON
QNH = 1028 hPa
WET runway

- R 1. Use the chart from 2.02.10 p 6.
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
Max TO weight (1000 kg) air conditioning OFF 88.1
Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
Max TO weight (1000 kg) air conditioning OFF 88.1
Retain CONF 2 for takeoff configuration (Takeoff speeds are lower).
2. First, apply the correction from FCOM page 2.02.24 p 1.
- Max TO weight (1000 kg) air conditioning OFF 88.1
Air conditioning correction - 3.2
Intermediate weight 84.9
Interpolate takeoff speeds for 84.9 (1000 kg) in the 10 kt head wind column,
V1 = 154 kt, VR = 156 kt, V2 = 156 kt
3. Apply WET correction
- For OAT < TVMC (54°), ΔW = ... 0.0
Intermediate weight 84.9
Associated speeds,
V1 = 154 kt - 0 = 154 kt
VR = 156 kt - 0 = 156 kt
V2 = 156 kt - 0 = 156 kt
Check that the speeds are higher than minimum speeds from the chart and from VMU table.
- Apply QNH correction
- For OAT < TVMC (54°), ΔW = 0.3 × 15/10 = ... + 0.4
Maximum permissible takeoff weight 85.3
Associated speed,
V1 = 154 kt + 1 × 15/10 = 155 kt
VR = 156 kt + 1 × 15/10 = 158 kt
V2 = 156 kt + 1 × 15/10 = 158 kt

Example 2

DATA : OAT = 25°C
 Head wind = 10 kt
 QNH = 1028 hPa
 WET runway

R Use the chart from 2.02.10 p 6.

- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
 max TO weight (1000 kg) 71.2
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
 max TO weight (1000 kg) 70.9
- Retain CONF 1+F for takeoff
- Read associated speeds as V1 = 152 kt, VR = 152 kt, V2 = 155 kt
- Apply WET correction
 For OAT < TVMC (54°), ΔW = ... 0.0
 Intermediate weight (1000 kg) 71.2
 Associated speeds,
 $V1 = 152 \text{ kt} - 4 = 148 \text{ kt}$
 $VR = 152 \text{ kt} - 1 = 151 \text{ kt}$
 $V2 = 155 \text{ kt} - 1 = 154 \text{ kt}$
 (No speed check required for first correction)
- Apply QNH correction
 For OAT < TVMC (54°), $\Delta W = 0.1 \times 15/10 = \dots\dots\dots + 0.1$
 Maximum permissible takeoff weight (1000 kg) 71.3
 Associated speeds,
 $V1 = 148 \text{ kt} + 0 \times 15/10 = 148 \text{ kt}$
 $VR = 151 \text{ kt} + 0 \times 15/10 = 151 \text{ kt}$
 $V2 = 154 \text{ kt} + 0 \times 15/10 = 154 \text{ kt}$
- Check that the speeds are higher than minimum speeds from the chart and from VMU table.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	71.2	152	152	155
FCOM correction(s)				
Intermediate value	71.2	152	152	155
WET Correction	0.0	- 4	- 1	- 1
Intermediate value	71.2	148	151	154
QNH Correction	+ 0.1	0	0	0
Final value	71.3	148	151	154

COMBINING CORRECTIONS FROM FCOM AND CHART

Proceed as follows :

1. Enter the chart with selected configuration, OAT and wind to read the maximum takeoff weight.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

Example 3

DATA : OAT = 25°C
Head wind = 10 kt
Air conditioning ON
QNH = 1028 hPa
WET runway

1. Use the chart from 2.02.10 p 6.
Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
Max TO weight (1000 kg) air conditioning OFF 71.2
Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
Max TO weight (1000 kg) air conditioning OFF 70.9
Retain CONF 1+F for takeoff configuration.
2. First, apply the correction from FCOM page 2.02.24 p 1.
Max TO weight (1000 kg) air conditioning OFF 71.2
R Air conditioning correction - 2.1
R Intermediate weight 69.1
R Interpolate takeoff speeds for 69.1 (1000 kg) in the 10 kt head wind column,
V1 = 151 kt, VR = 151 kt, V2 = 153 kt
3. Apply WET correction
For OAT < TVMC (54°C), ΔW = ... 0.0
R Intermediate weight 69.1
Associated speeds,
V1 = 151 kt – 4 = 147 kt
VR = 151 kt – 1 = 150 kt
V2 = 153 kt – 1 = 152 kt
Check that the speeds are higher than minimum speeds from the chart and from VMU table
Apply QNH correction
For OAT < TVMC (54°C), ΔW = 0.1 × 15/10 = ... + 0.1
R Maximum permissible takeoff weight 69.2
Associated speed,
V1 = 147 kt + 0 × 15/10 = 147 kt
VR = 150 kt + 0 × 15/10 = 150 kt
V2 = 152 kt + 0 × 15/10 = 152 kt

Example 2

DATA : OAT = 25°C
 Head wind = 10 kt
 QNH = 1028 hPa
 WET runway

Use the chart from 2.02.10 p 6.

- Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
 R max TO weight (1000 kg) 82.1
- Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
 R max TO weight (1000 kg) 82.1
- Retain CONF 2 for takeoff as the speeds are lower.
- Read associated speeds as V1 = 156 kt, VR = 157 kt, V2 = 162 kt
- Apply WET correction
 R For OAT < TVMC (54°C), $\Delta W =$ - 1.2
- R Intermediate weight (1000 kg) 80.9
- Associated speeds,
 R V1 = 156 kt - 10 = 146 kt
 R VR = 157 kt - 1 = 156 kt
 R V2 = 162 kt - 1 = 161 kt
 (No speed check required for first correction)
- Apply QNH correction
 For OAT < TVMC (54°C), $\Delta W = 0.2 \times 15/10 =$ + 0.3
- R Maximum permissible takeoff weight (1000 kg) 81.2
- Associated speeds,
 R V1 = 146 kt + 1 $\times$ 15/10 = 147 kt
 R VR = 156 kt + 1 $\times$ 15/10 = 158 kt
 R V2 = 161 kt + 1 $\times$ 15/10 = 163 kt
- Check that the speeds are higher than minimum speeds from the chart and from VMU table.

R

	Takeoff Configuration : 2			
	TOW	V1	VR	V2
TOW (RTOW)	82.1	156	157	162
FCOM correction(s)				
Intermediate value	82.1	156	157	162
WET Correction	- 1.2	- 10	- 1	- 1
Intermediate value	80.9	146	156	161
QNH Correction	+ 0.3	+ 1	+ 2	+ 2
Final value	81.2	147	158	163

COMBINING CORRECTIONS FROM FCOM AND CHART

Proceed as follows :

1. Enter the chart with selected configuration, OAT and wind to read the maximum takeoff weight.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

Example 3

DATA : OAT = 25°C
Head wind = 10 kt
Air conditioning ON
QNH = 1028 hPa
WET runway

1. Use the chart from 2.02.10 p 6.
Enter the 10 kt head wind column and interpolate for 25°C, CONF 1+F,
R Max TO weight (1000 kg) air conditioning OFF 82.1
Enter the 10 kt head wind column and interpolate for 25°C, CONF 2,
R Max TO weight (1000 kg) air conditioning OFF 82.1
Retain CONF 2 for takeoff configuration.
2. First, apply the correction from FCOM page 2.02.24 p 1.
R Max TO weight (1000 kg) air conditioning OFF 82.1
Air conditioning correction- 2.2
R Intermediate weight 79.9
R Interpolate takeoff speeds for 79.9 (1000 kg) in the 10 kt head wind column,
V1 = 152 kt, VR = 153 kt, V2 = 158 kt
3. Apply WET correction
R For OAT < TVMC (54°C), ΔW = ...- 1.2
R Intermediate weight 78.7
Associated speeds,
R V1 = 152 kt – 10 = 142 kt
VR = 153 kt – 1 = 152 kt
V2 = 158 kt – 1 = 157 kt
Check that the speeds are higher than minimum speeds from the chart and from VMU table
Apply QNH correction
For OAT < TVMC (54°C), ΔW = 0.2 × 15/10 = ...+ 0.3
R Maximum permissible takeoff weight 79.0
Associated speed,
R V1 = 142 kt + 1 × 15/10 = 143 kt
R VR = 152 kt + 1 × 15/10 = 154 kt
R V2 = 157 kt + 1 × 15/10 = 159 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).

Since the speed check is fulfilled :

Max permissible takeoff weight = 85.3 (1000 kg)

V1 = 155 kt, VR = 158 kt, V2 = 158 kt.

	Takeoff Configuration : 2			
	TOW	V1	VR	V2
TOW (RTOW)	88.1			
FCOM correction(s)	- 3.2			
Intermediate value	84.9	154	156	156
WET Correction	0.0	0	0	0
Intermediate value	84.9	154	156	156
QNH Correction	+ 0.4	+ 1	+ 2	+ 2
Final value	85.3	155	158	158

EXTRAPOLATION

For a takeoff weight lower than those displayed on the chart, associated speeds are calculated as follows :

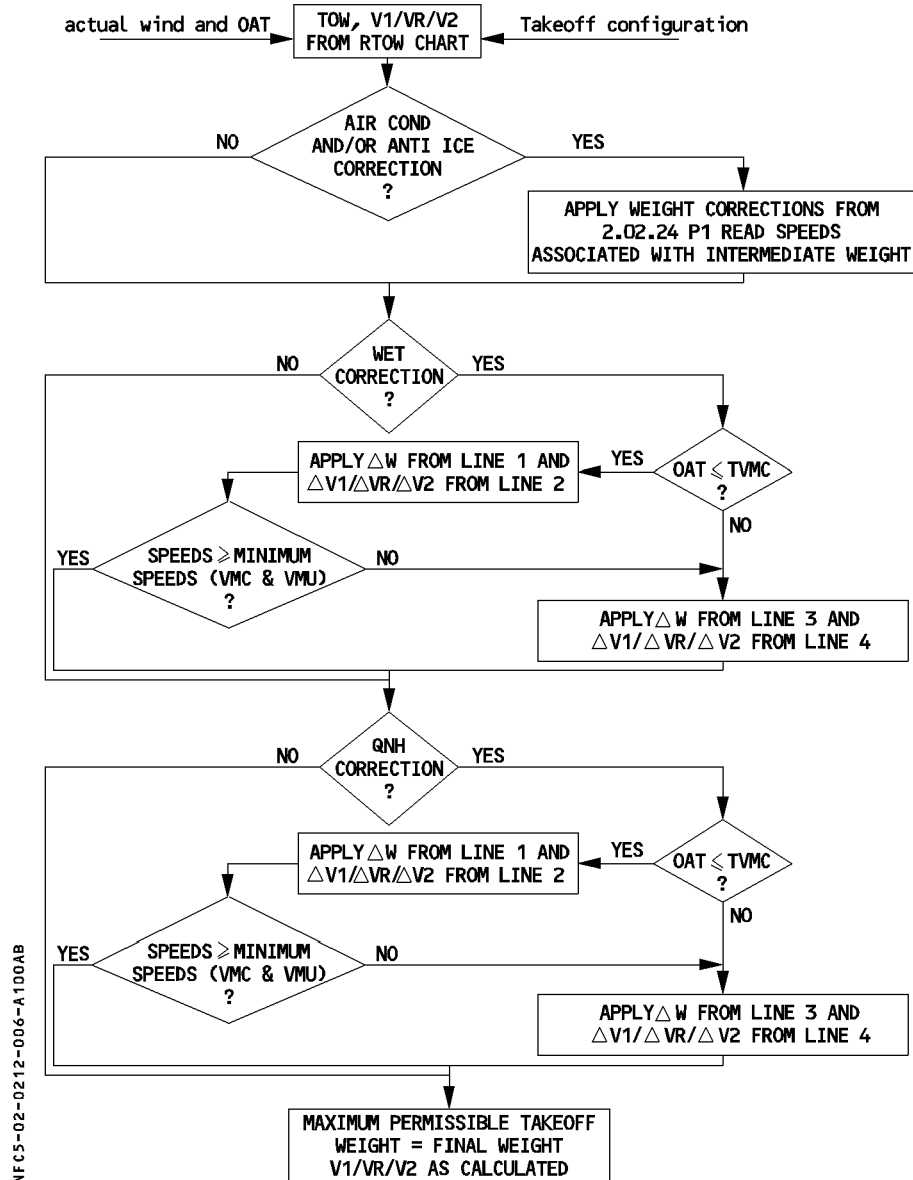
1. For given configuration and wind, note the speeds associated with the takeoff weight in the row displaying the highest permissible temperature.
2. Apply speed corrections provided at the bottom of the RTOW chart to V1, VR and V2 limited to the minimum speeds.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

SUMMARY

The following flow diagram gives the different steps to follow.



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Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).

Since the speed check is fulfilled :

R Max permissible takeoff weight = 69.2 (1000 kg)

V1 = 147 kt, VR = 150 kt, V2 = 152 kt.

R

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	71.2			
FCOM correction(s)	- 2.1			
Intermediate value	69.1	151	151	153
WET Correction	0.0	- 4	- 1	- 1
Intermediate value	69.1	147	150	152
QNH Correction	+ 0.1	0	0	0
Final value	69.2	147	150	152

EXTRAPOLATION

For a takeoff weight lower than those displayed on the chart, associated speeds are calculated as follows :

1. For given configuration and wind, note the speeds associated with the takeoff weight in the row displaying the highest permissible temperature.
2. Apply speed corrections provided at the bottom of the RTOW chart to V1, VR and V2 limited to the minimum speeds.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).

Since the speed check is fulfilled :

R Max permissible takeoff weight = 79.0 (1000 kg)

R V1 = 143 kt, VR = 154 kt, V2 = 159 kt.

R

	Takeoff Configuration : 2			
	TOW	V1	VR	V2
TOW (RTOW)	82.1			
FCOM correction(s)	- 2.2			
Intermediate value	79.9	152	153	158
WET Correction	- 1.2	- 10	- 1	- 1
Intermediate value	78.7	142	152	157
QNH Correction	+ 0.3	+ 1	+ 2	+ 2
Final value	79.0	143	154	159

EXTRAPOLATION

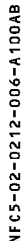
For a takeoff weight lower than those displayed on the chart, associated speeds are calculated as follows :

1. For given configuration and wind, note the speeds associated with the takeoff weight in the row displaying the highest permissible temperature.
2. Apply speed corrections provided at the bottom of the RTOW chart to V1, VR and V2 limited to the minimum speeds.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

The following flow diagram gives the different steps to follow.



DEFINITION OF FLEXIBLE TAKEOFF

In many cases the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

REQUIREMENTS

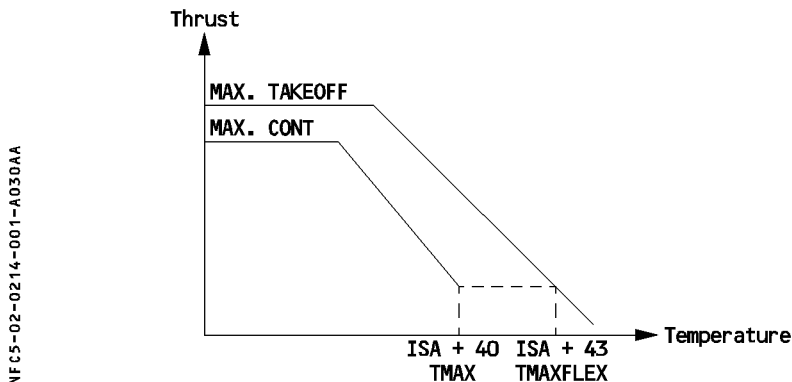
- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max climb N1 at the same flight conditions.

R The FADEC takes the above two constraints into account to determine flexible N1.

- The flexible takeoff thrust cannot be lower than the Max Continuous thrust used for the final takeoff flight path computation (at ISA + 40).

This constraint limits the maximum flexible temperature at ISA + 43 (58° C at sea level).

- The flexible temperature cannot be lower than the flat rating temperature, TREF (ISA + 15), or the actual temperature (OAT).



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- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

- R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- R · However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side (tailwind) of the takeoff chart while remaining within the same configuration and looking for the same actual takeoff weight at lower temperature. This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DEFINITION OF FLEXIBLE TAKEOFF

In many cases, the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

REQUIREMENTS

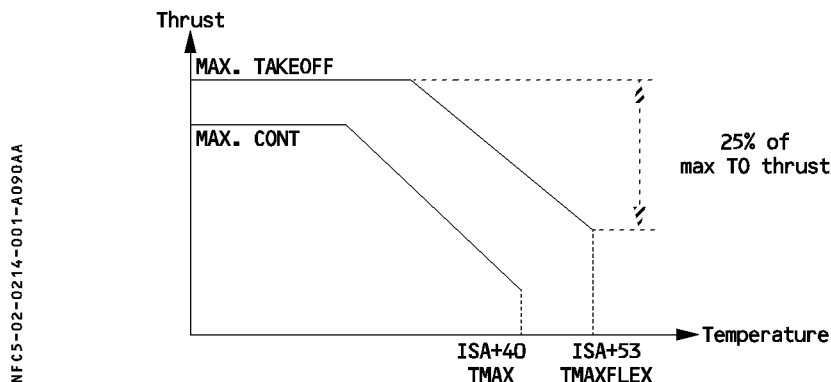
- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max Climb N1 at the same flight conditions.

The FADEC takes the above two constraints into account to determine flexible N1.

The above two constraints also limit the maximum flexible temperature at ISA + 53 (68°C at sea level).

- The flexible takeoff thrust cannot be lower than the Max Continuous thrust used for the final takeoff flight path computation (at ISA + 40).

- R – The flexible temperature cannot be lower than the flat rating temperature, TREF* (ISA
 R + 29 up to 2000 feet), or the actual temperature (OAT).



R *Note : *TREF being a function of pressure altitude, read it on the takeoff chart.*

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	FLEXIBLE TAKEOFF (TEMP. ENTRY)		SEQ 100	REV 38

- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.

- However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side (tailwind) of the takeoff chart while remaining within the same configuration and looking for the same actual takeoff weight at lower temperature. This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

R

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DEFINITION OF FLEXIBLE TAKEOFF

In many cases the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

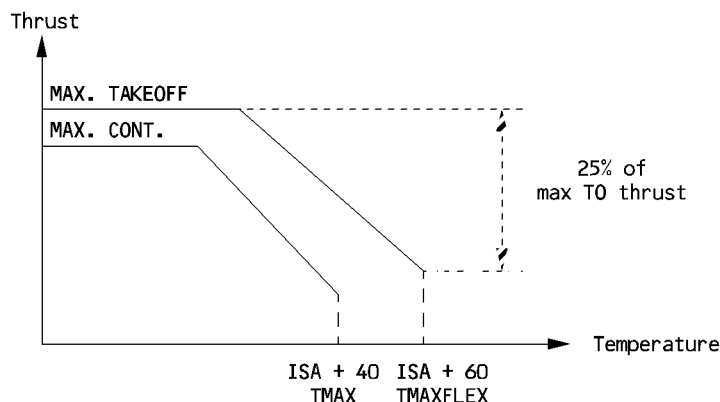
REQUIREMENTS

- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max climb N1 at the same flight conditions.

The FADEC takes the above two constraints into account to determine flexible N1.

The above two constraints also limit the maximum flexible temperature at ISA + 60 (75° C at sea level).

- The flexible temperature cannot be lower than the flat rating temperature, TREF (ISA + 30), or the actual temperature (OAT).



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A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.14	P 2
	FLEXIBLE TAKEOFF (TEMP. ENTRY)		SEQ. 100	REV 38

- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

- R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- R · However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side (tailwind) of the takeoff chart while remaining within the same configuration and looking for the same actual takeoff weight at lower temperature. This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

- Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.
- Enter the RTOW chart with the wind condition and selected configuration to interpolate for the actual takeoff weight. Read the flexible temperature in the temperature column corresponding to the actual weight.
 - Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

- Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.
1. For a given takeoff weight, wind condition and selected configuration, determine the flexible temperature. Retain the takeoff speeds associated with the actual weight.
 2. Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
(No speed corrections required).

Example 4

DATA : Actual takeoff weight = 75 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 1013 hPa

- R Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example1). The actual weight being lower than the maximum one, flexible takeoff is possible.
 Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 1+F,
 Flexible temperature 48° C
 Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 2,
 Flexible temperature 48° C

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.14	P 4
	FLEXIBLE TAKEOFF (TEMP. ENTRY)		SEQ 045	REV 30

Equivalent performance is obtained from the two different configurations.
 Retain CONF 1 + F as the speeds are lower.

Takeoff speeds are V1 = 152 kt, VR = 152 kt, V2 = 153 kt

Flexible temperature with air conditioning OFF 48° C

R Air conditioning correction (FCOM 2.02.24 p 1) - 5° C

R Maximum flexible temperature 43° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with wind and selected configuration. Interpolate for actual takeoff weight. Read flexible temperature associated with this weight.

2. Apply the first correction :

If the flexible temperature is less than or equal to TVMC (line 3), apply ΔTflex correction from line 1 and apply speed corrections (ΔV1/ΔVR/ΔV2) from line 2.

Else, (flexible temperature greater than TVMC), apply ΔTflex from line 3 and ΔV1/ ΔVR/ ΔV2 corrections from line 4.

Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU, flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart of the actual weight if they are all lower.

No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).

3. To combine a second and/or a third correction, proceed as per point 2.

4. Check that the final flexible temperature is :

- higher than OAT and TREF
- limited to TMAXFLEX

If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.

If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.

Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.14 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
 – Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet influence first.

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

- Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.
- Enter the RTOW chart with the wind condition and selected configuration to interpolate for the actual takeoff weight. Read the flexible temperature in the temperature column corresponding to the actual weight.
 - Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

- Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.
1. For a given takeoff weight, wind condition and selected configuration, determine the flexible temperature. Retain the takeoff speeds associated with the actual weight.
 2. Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
(No speed corrections required).

Example 4

DATA : Actual takeoff weight = 65 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 1013 hPa

- R Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example1). The actual weight being lower than the maximum one, flexible takeoff is possible.
 Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 1+F,
 Flexible temperature 52° C
 Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 2,
 Flexible temperature 51° C

Retain CONF 1+F for takeoff configuration.
 Takeoff speeds are V1 = 146 kt, VR = 146 kt, V2 = 148 kt
 Flexible temperature with air conditioning OFF 52° C
 Air conditioning correction (FCOM 2.02.24 p 1)- 4° C
 Maximum flexible temperature 48° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

R CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with wind and selected configuration. Interpolate for actual takeoff weight. Read flexible temperature associated with this weight.

2. Apply the first correction :

If the flexible temperature is less than or equal to TVMC (line 3), apply ΔT_{flex} correction from line 1 and apply speed corrections ($\Delta V1/\Delta VR/\Delta V2$) from line 2.

Else, (flexible temperature greater than TVMC), apply ΔT_{flex} from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.

R Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU,
 R flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with
 R maximum permissible takeoff weight or the speeds read in the chart of the actual weight
 R if they are all lower.

No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).

3. To combine a second and/or a third correction, proceed as per point 2.

4. Check that the final flexible temperature is :

- higher than OAT and TREF
- limited to TMAXFLEX

If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.

If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.

Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.14 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.

– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet influence first.

R

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.

- Enter the RTOW chart with the wind condition and selected configuration to interpolate for the actual takeoff weight. Read the flexible temperature in the temperature column corresponding to the actual weight.
- Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

Note : If the RTOW chart is based on the CG being at 25 %, the crew can determine the flexible temperature at a more forward CG by decreasing the flexible temperature by 2°C. V1, VR and V2 must be increased by 1 knot.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

1. For a given takeoff weight, wind condition and selected configuration, determine the flexible temperature. Retain the takeoff speeds associated with the actual weight.
2. Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
 (No speed corrections required).

Example 2

DATA : Actual takeoff weight = 76 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 1013 hPa

Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example1). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 1 + F,
 Flexible temperature 52° C
 Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 2,
 Flexible temperature 52° C

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.14	P 4
	FLEXIBLE TAKEOFF (TEMP. ENTRY)		SEQ 280	REV 34

Retain CONF 2 for takeoff configuration.
 Takeoff speeds are V1 = 150 kt, VR = 150 kt, V2 = 155 kt
 Flexible temperature with air conditioning OFF 52° C
 Air conditioning correction (FCOM 2.02.24 p 1)- 7° C
 Maximum flexible temperature 45° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.10 P 6)

A description of this correction is given on 2.02.10 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with wind and selected configuration. Interpolate for actual takeoff weight. Read flexible temperature associated with this weight.
2. Apply the first correction :
 If the flexible temperature is less than or equal to TVMC (line 3), apply ΔT_{flex} correction from line 1 and apply speed corrections ($\Delta V1/\Delta VR/\Delta V2$) from line 2.
 Else, (flexible temperature greater than TVMC), apply ΔT_{flex} from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
 Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU, flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart of the actual weight if they are all lower.
No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).
3. To combine a second and/or a third correction, proceed as per point 2.
4. Check that the final flexible temperature is :
 – higher than OAT and TREF
 – limited to TMAXFLEX
 If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.
 If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.
 Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.14 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
 – Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.10 p 6, apply the wet influence first.

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example 5

DATA : Actual takeoff weight = 75 000 kg
Head wind = 10 kt
QNH = 1028 hPa
WET runway
Air conditioning OFF

- R Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 2). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 1+F,
Flexible temperature 48° C
Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 2,
Flexible temperature 48° C
Equivalent performance is obtained from the two different configurations.

Retain CONF 1+F as the speeds are lower.
Takeoff speeds are V1 = 152 kt, VR = 152 kt, V2 = 153 kt
Apply WET correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ – 1° C
Intermediate flex temperature 47° C
Associated speeds,
V1 = 152 kt – 0 = 152 kt
VR = 152 kt – 0 = 152 kt
V2 = 153 kt – 0 = 153 kt

- R Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.
Apply QNH correction
For flex temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
Maximum flexible temperature 47° C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
No speed correction.
Takeoff speeds are V1 = 152 kt, VR = 152 kt, V2 = 153 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	48	152	152	153
FCOM correction(s)				
Intermediate value	48	152	152	153
WET Correction	– 1	0	0	0
Intermediate value	47	152	152	153
QNH Correction	0	0	0	0
Final value	47	152	152	153

COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
Apply speed corrections except for QNH and bleed influences.

Example 6

DATA : Actual takeoff weight = 75 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1028 hPa
WET runway

Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 3). The actual weight being lower than the maximum one, flexible takeoff is possible.

- Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 1+F,
Flexible temperature 48° C
- Enter the 10 kt head wind column and interpolate for 75 000 kg, CONF 2,
Flexible temperature 48° C
- Equivalent performance is obtained from the two different configurations.
Retain CONF 1 + F as the speeds are lower.
Takeoff speeds are V1 = 152 kt, VR = 152 kt, V2 = 153 kt
- First, apply the correction from FCOM page 2.02.24 p 1.
Flexible temperature with air conditioning OFF 48° C
- R Air conditioning correction – 5° C
- R Intermediate flexible temperature 43° C
- No speed correction.
- Apply WET correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ – 1° C
- R Intermediate flex temperature 42° C
- Associated speeds,
V1 = 152 kt – 0 = 152 kt
VR = 152 kt – 0 = 152 kt
V2 = 153 kt – 0 = 153 kt
Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.
- Apply QNH correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
- R Maximum flexible temperature 42° C
- Check that OAT/TREF < flex temperature ≤ TMAXFLEX
- No speed correction.
- Takeoff speeds are V1 = 152 kt, VR = 152 kt, V2 = 153 kt

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example 5

DATA : Actual takeoff weight = 65 000 kg
Head wind = 10 kt
QNH = 1028 hPa
WET runway
Air conditioning OFF

- R Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 2). The actual weight being lower than the maximum one, flexible takeoff is possible.
Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 1+F,
Flexible temperature 52° C
Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 2,
Flexible temperature 51° C
Retain CONF 1+F as the flexible temperature is higher.
Takeoff speeds are V1 = 146 kt, VR = 146 kt, V2 = 148 kt
Apply WET correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
Intermediate flex temperature 52° C
Associated speeds,
V1 = 146 kt – 4 = 142 kt
VR = 146 kt – 1 = 145 kt
V2 = 148 kt – 1 = 147 kt
- R Check V2 against VMU limitation on FCOM 2.02.25.
Apply QNH correction
For flex temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
Maximum flexible temperature 52° C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
No speed correction.
Takeoff speeds are V1 = 142 kt, VR = 145 kt, V2 = 147 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	52	146	146	148
FCOM correction(s)				
Intermediate value	52	146	146	148
WET Correction	0	– 4	– 1	– 1
Intermediate value	52	142	145	147
QNH Correction	0	0	0	0
Final value	52	142	145	147

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	FLEXIBLE TAKEOFF (TEMP. ENTRY)		SEQ. 030	REV 25

COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
Apply speed corrections except for QNH and bleed influences.

Example 6

DATA : Actual takeoff weight = 65 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1028 hPa
WET runway

- R Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 3). The actual weight being lower than the maximum one, flexible takeoff is possible.
- Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 1+F,
Flexible temperature 52° C
 - Enter the 10 kt head wind column and interpolate for 65 000 kg, CONF 2,
Flexible temperature 51° C
 - Retain CONF 1+F for takeoff configuration.
Takeoff speeds are V1 = 146 kt, VR = 146 kt, V2 = 148 kt
 - First, apply the correction from FCOM page 2.02.24 p 1.
Flexible temperature with air conditioning OFF 52° C
Air conditioning correction – 4° C
Intermediate flexible temperature 48° C
No speed correction.
 - Apply WET correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
Intermediate flex temperature 48° C
Associated speeds,
V1 = 146 kt – 4 = 142 kt
VR = 146 kt – 1 = 145 kt
V2 = 148 kt – 1 = 147 kt
 - R Check V2 against VMU limitation on FCOM 2.02.25.
 - Apply QNH correction
For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
Maximum flexible temperature 48° C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
No speed correction.
Takeoff speeds are V1 = 142 kt, VR = 145 kt, V2 = 147 kt

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example 5

DATA : Actual takeoff weight = 76 000 kg
Head wind = 10 kt
QNH = 1028 hPa
WET runway
Air conditioning OFF

Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 2). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 1+F,
Flexible temperature 52° C

Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 2,
Flexible temperature 52° C

Equivalent performance is obtained from the two different configurations.

Retain CONF 2 as the speeds are lower.

Takeoff speeds are V1 = 150 kt, VR = 150 kt, V2 = 155 kt

Apply WET correction

R For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ – 2° C

R Intermediate flex temperature 50° C

Associated speeds,

R V1 = 150 kt – 10 = 140 kt

VR = 150 kt – 1 = 149 kt

V2 = 155 kt – 1 = 154 kt

R Check V2 against VMU limitation on FCOM 2.02.25.

Apply QNH correction

For flex temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C

R Maximum flexible temperature 50° C

Check that OAT/TREF < flex temperature ≤ TMAXFLEX

No speed correction.

R Takeoff speeds are V1 = 140 kt, VR = 149 kt, V2 = 154 kt

R

	Takeoff Configuration : 2			
	Tflex	V1	VR	V2
Chart temperature	52	150	150	155
FCOM correction(s)				
Intermediate value	52	150	150	155
WET Correction	– 2	– 10	– 1	– 1
Intermediate value	50	140	149	154
QNH Correction	0	0	0	0
Final value	50	150	149	154

COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
 Apply speed corrections except for QNH and bleed influences.

Example 6

DATA : Actual takeoff weight = 76 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 1028 hPa
 WET runway

Use the chart from 2.02.10 p 6. Determine the maximum permissible takeoff weight (see example 3). The actual weight being lower than the maximum one, flexible takeoff is possible.

- Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 1+F,
 Flexible temperature 52° C
- Enter the 10 kt head wind column and interpolate for 76 000 kg, CONF 2,
 Flexible temperature 52° C
- Retain CONF 2 for takeoff configuration.
 Takeoff speeds are V1 = 150 kt, VR = 150 kt, V2 = 155 kt
- First, apply the correction from FCOM page 2.02.24 p 1.
 Flexible temperature with air conditioning OFF 52° C
 Air conditioning correction – 7° C
 Intermediate flexible temperature 45° C
 No speed correction.
- Apply WET correction
 For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ – 1
 Intermediate flex temperature 44° C
 Associated speeds,
 V1 = 150 kt – 5 = 145 kt
 VR = 150 kt – 1 = 149 kt
 V2 = 155 kt – 1 = 154 kt
 Check V2 against VMU limitation on FCOM 2.02.25.
- Apply QNH correction
 For flexible temperature < TVMC (54° C), $\Delta T_{flex} =$ 0° C
 Maximum flexible temperature 44° C
 Check that OAT/TREF < flex temperature ≤ TMAXFLEX
 No speed correction.
 Takeoff speeds are V1 = 145 kt, VR = 149 kt, V2 = 154 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	52	146	146	148
FCOM correction(s)	– 4	0	0	0
Intermediate value	48	146	146	148
WET Correction	0	– 4	– 1	– 1
Intermediate value	48	142	145	147
QNH Correction	0	0	0	0
Final value	48	142	145	147

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight;

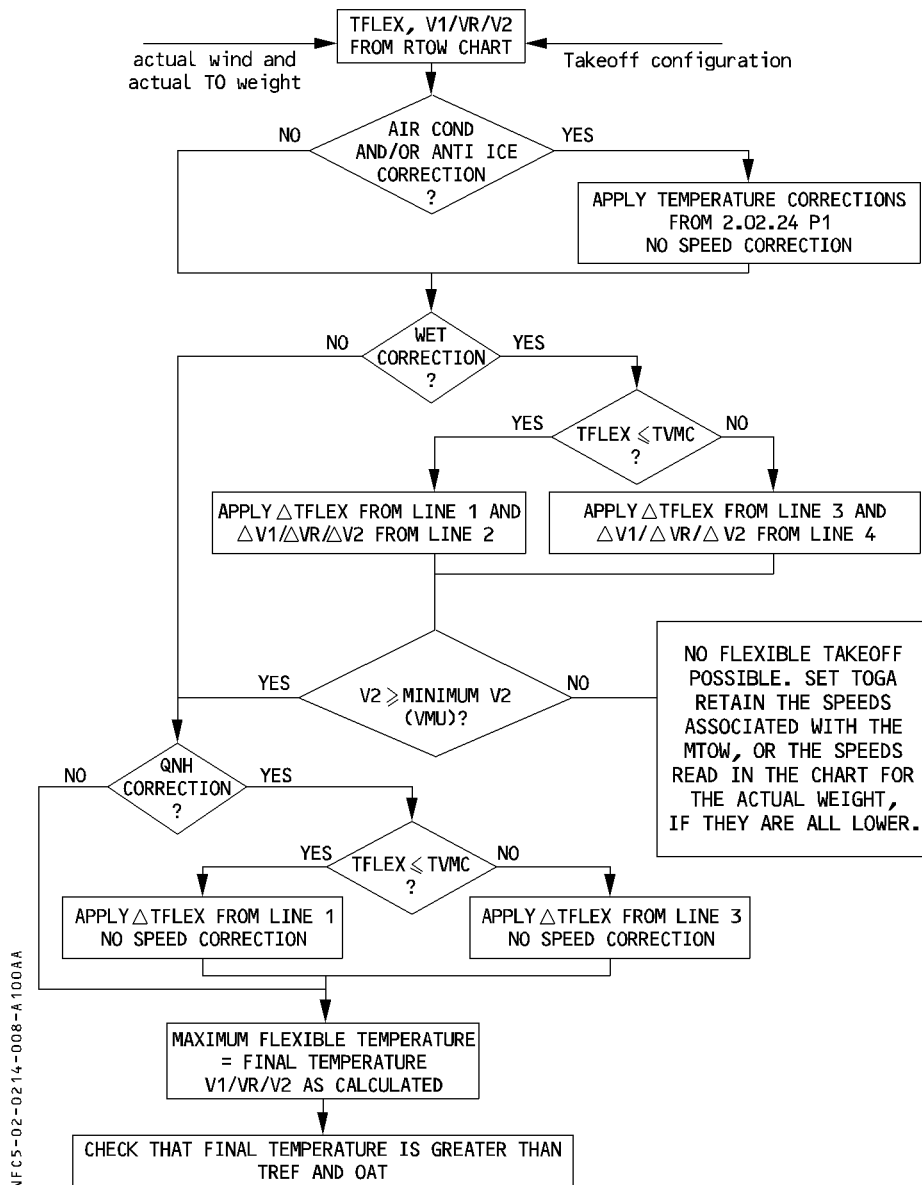
R OR

- R – You can retain the speeds associated with the actual takeoff weight provided they are
- R all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

The flow diagram gives the different steps to follow.

R



	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	48	152	152	153
FCOM correction(s)	– 5	0	0	0
Intermediate value	43	152	152	153
WET Correction	– 1	0	0	0
Intermediate value	42	152	152	153
QNH Correction	0	0	0	0
Final value	42	152	152	153

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight;

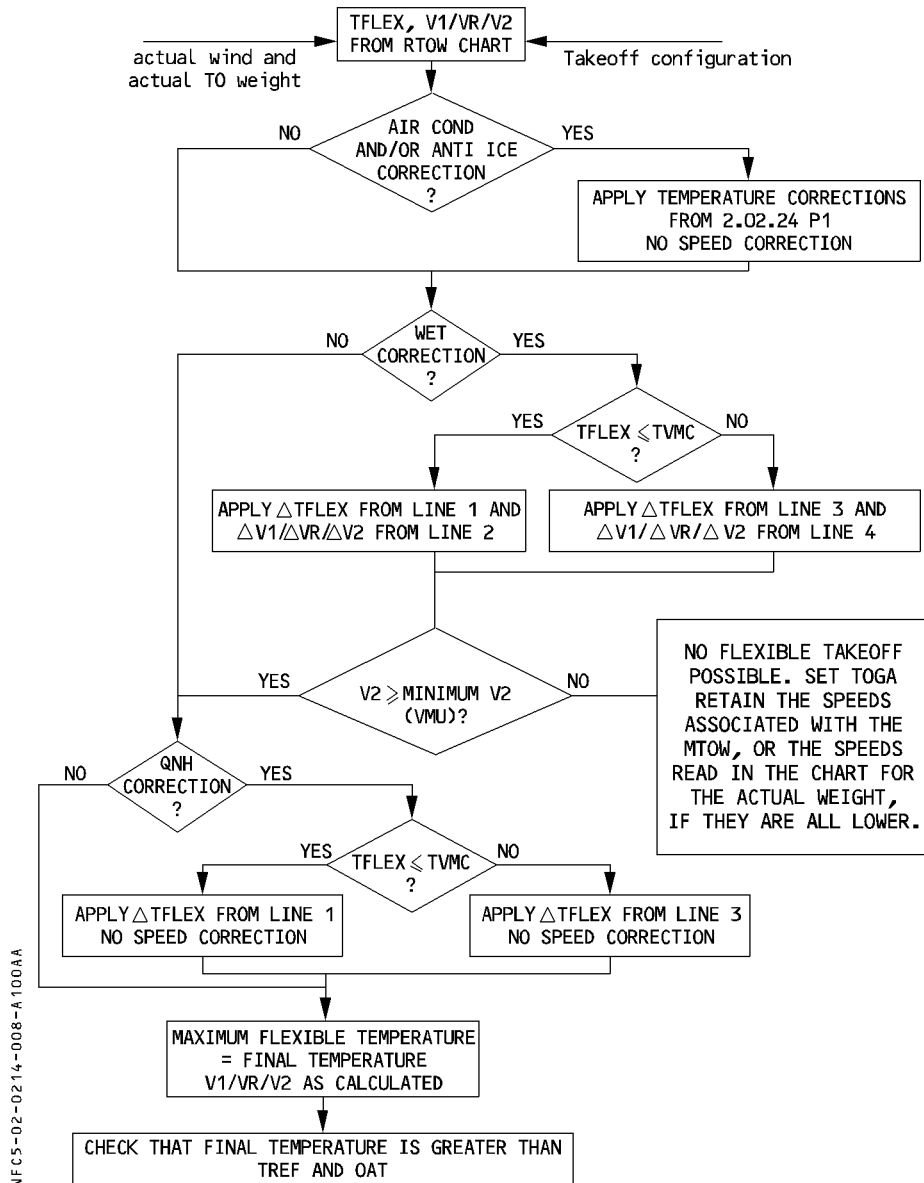
R OR

- R – You can retain the speeds associated with the actual takeoff weight provided they are
- R all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

The flow diagram gives the different steps to follow.

R



	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	52	150	150	155
FCOM correction(s)	– 7	0	0	0
Intermediate value	45	150	150	155
WET Correction	– 1	– 5	– 1	– 1
Intermediate value	44	145	149	154
QNH Correction	0	0	0	0
Final value	44	145	149	154

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight;

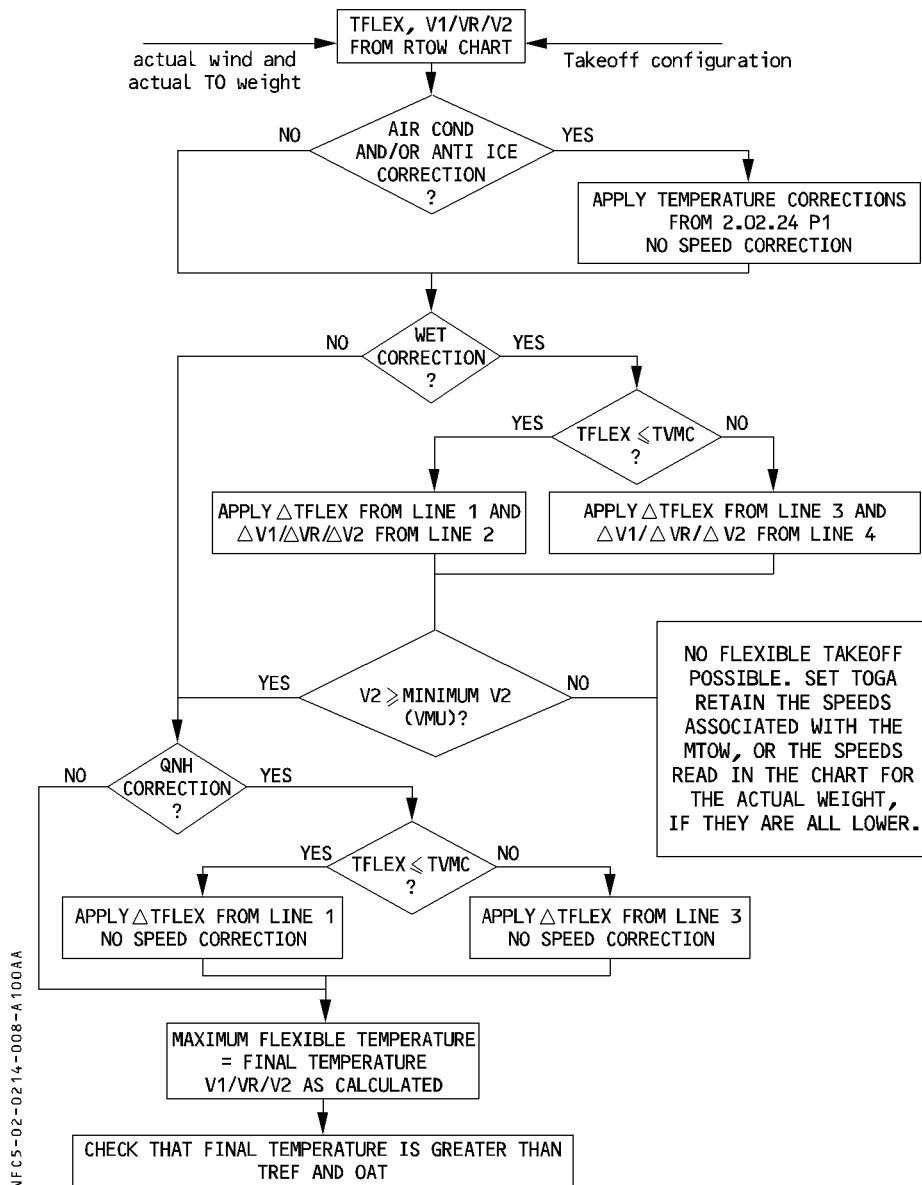
OR

- You can retain the speeds associated with the actual takeoff weight provided they are all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

The flow diagram gives the different steps to follow.

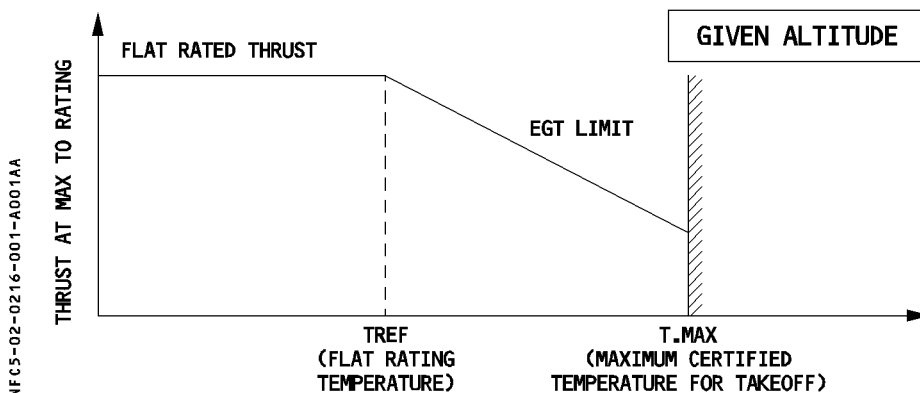
R



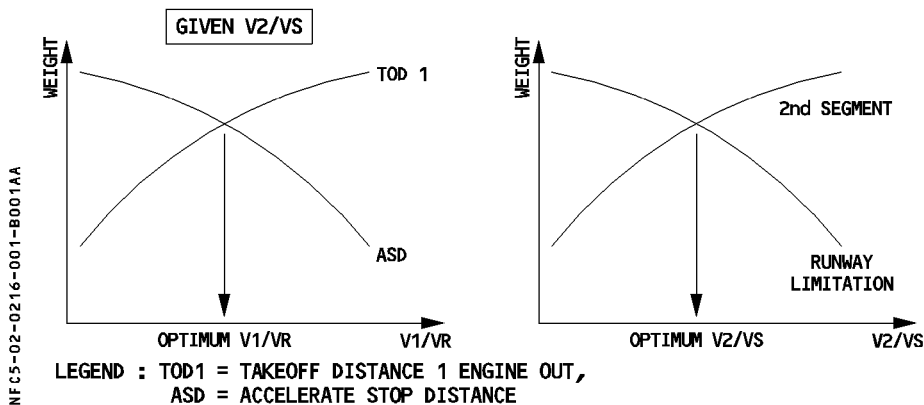
TAKEOFF PERFORMANCE

Takeoff optimization is calculated for a given runway and its obstacles and for given conditions of flap setting, temperature, wind and QNH. The calculation produces a maximum permissible takeoff weight (or a maximum takeoff temperature for an actual weight).

The takeoff thrust produced by the engine varies as follows :



The optimization process calculates the speeds which will produce the maximum takeoff weight. To do so, it takes into account the different takeoff limitations such as TOD, ASD, TOR, second segment..., as shown on the charts below.



On a typical runway, the performance of a twin engine aircraft, is generally limited by the one engine out operation at takeoff. The optimum V2/VS and optimum V1/VR are consequently unique.

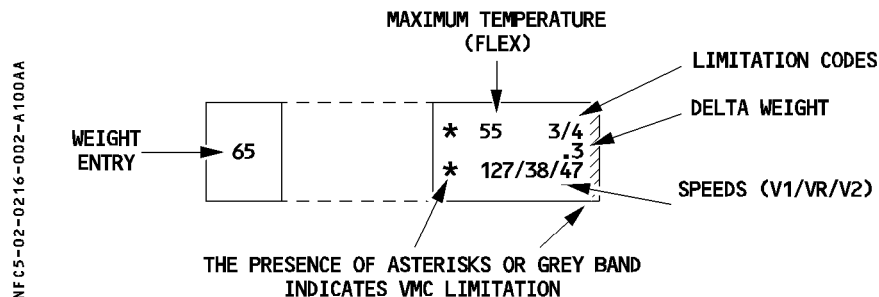
TAKEOFF CHART DESCRIPTION

The takeoff chart (RTOW : Regulatory Takeoff Weight) is calculated for a specific aircraft version and for a particular runway specified at the top of the chart. The top of the chart also gives some information about the runway and lists the calculation assumptions.

- R The chart is given for 2 different configurations and 4 wind values per configuration. This allows the crew to select the configuration that gives either :
- the highest permissible takeoff weight, or, for a given weight,
 - the highest flexible temperature.

If different configurations give equivalent performance, the crew should select the configuration associated with the lowest takeoff speeds.

The left column of the chart contains weight entry. For each weight entry (and for a given configuration and wind), the chart provides the following information :



Note : The takeoff weight is the sum of the weight entry and the delta weight.

The available limitation codes are :

- First segment : 1
- Second segment : 2
- Runway length : 3
- Obstacles : 4
- Tire speed : 5
- Brake energy : 6
- Maximum computation weight : 7
- Final takeoff : 8
- VMU : 9

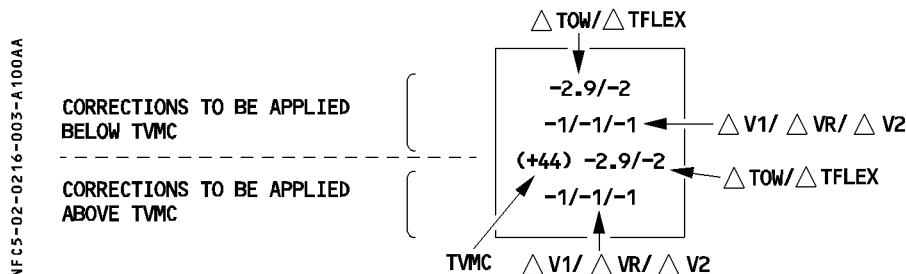
CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Each takeoff chart is computed for a given set of conditions (air conditioning, QNH, anti ice...) specified at the top of the chart. If the actual takeoff conditions are different, the crew must apply corrections. Two types of corrections are available :

- Conservative corrections on 2.02.24 p 1 (to be used when not provided on the chart).
- Corrections (less restrictive) listed on the chart, to be applied as explained below.

DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART

The corrections are presented on 4 lines :



TVMC is a temperature value given per column. This is a fictitious value that indicates the temperature above which the speeds are close to a VMC limitation or are VMC limited.

Note : The lower two lines may be shaded on certain chart formats.

R MINIMUM SPEED

- R Minimum V1/VR/V2 due to VMC are provided on the bottom right side of the takeoff chart.
- R They are only applicable in case of speed corrections.
- R These speeds are conservative. They may be slightly higher than V1/VR/V2 displayed on the takeoff chart.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.16	P 4
	GENERAL (WEIGHT ENTRY)		SEQ 100	REV 25

ADDITIONAL INFORMATION

ONE ENGINE OUT CLIMB PROCEDURE

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.

When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).

When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15° until the aircraft reaches 1500 feet or green dot.

The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 feet when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

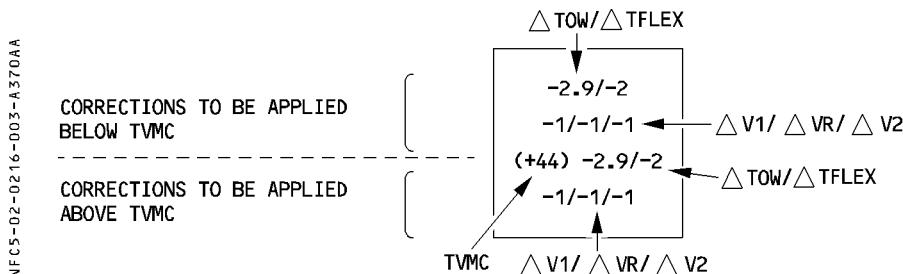
Takeoff charts computed for wet runway with a 15 feet screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

Note : The crew need not compare the charts if the top of the wet runway chart specifies "DRY CHECK". (The comparison has already been inserted in the WET runway calculation).

Note : If the RTOW chart is based on the CG being at 25 %, the crew can find the takeoff performance at a more forward CG by decreasing the takeoff weight by 1000 kg (2200 lb) and increasing V1, VR and V2 by 1 knot.

R **DESCRIPTION OF THE CORRECTIONS ON TAKEOFF CHART**

R The corrections are presented on 4 lines :
R



R TVMC is a temperature value given per column. This is a fictitious value that indicates the
R temperature above which the speeds are close to a VMC limitation or are VMC limited.

R Note : The lower two lines may be shaded on certain chart formats.

R **MINIMUM SPEED**

R Minimum V1/VR/V2 due to VMC are provided on the bottom right side of the takeoff chart.
R They are only applicable in case of speed corrections.
R These speeds are conservative. They may be slightly higher than V1/VR/V2 displayed on
R the takeoff chart.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.16	P 4
	GENERAL (WEIGHT ENTRY)		SEQ 100	REV 25

ADDITIONAL INFORMATION

ONE ENGINE OUT CLIMB PROCEDURE

The performance given in the chart is consistent with the flight path specified for the aircraft with one engine out and takes into account significant obstacles.

When the procedure to be followed is not the standard instrument departure, the chart describes a specific procedure (EOSID).

When the specified procedure requires a turn, except if otherwise stated on the RTOW chart, the turn should be performed with a maximum bank of 15° until the aircraft reaches 1500 feet or green dot.

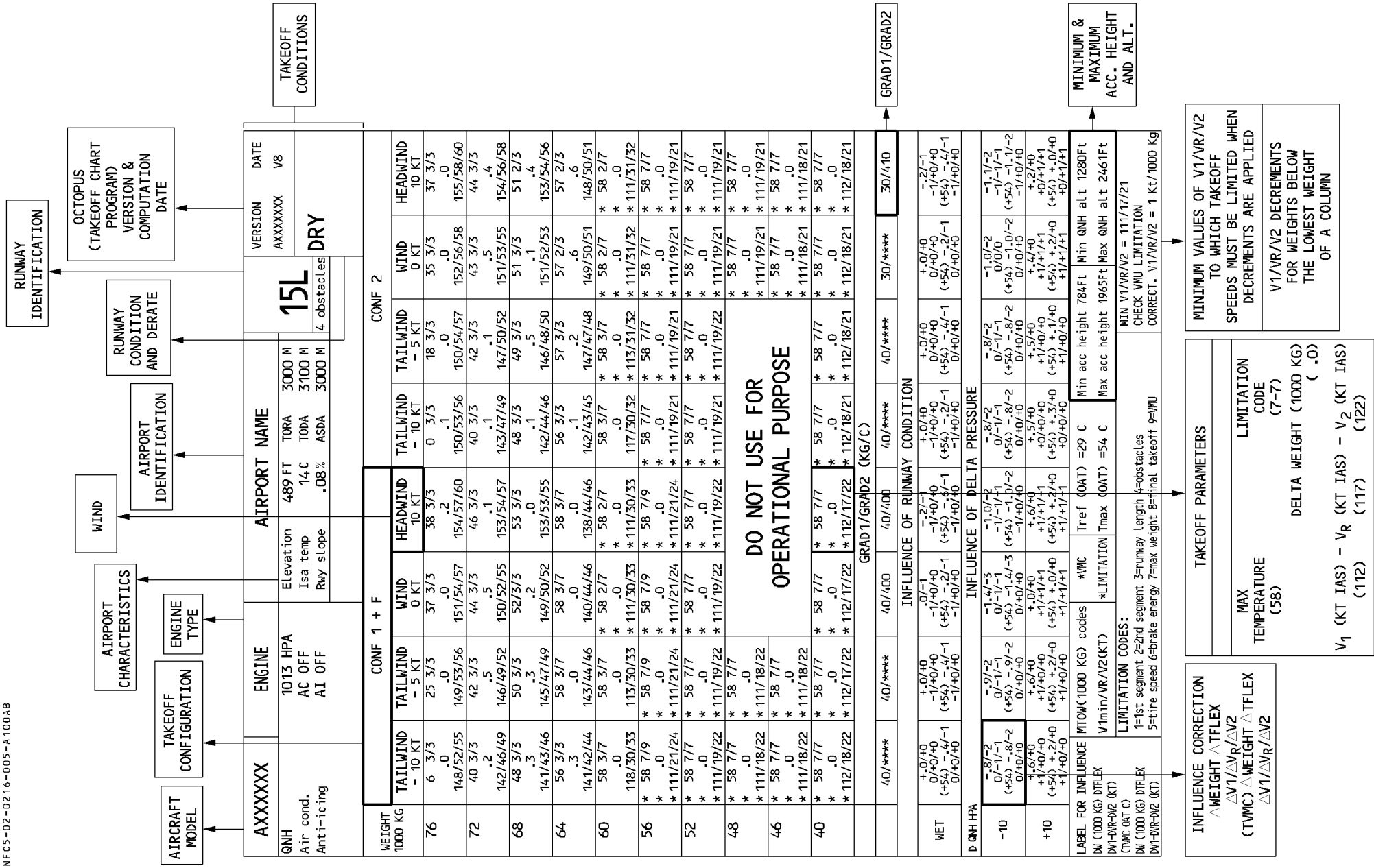
The acceleration height (or altitude) ensures that the net flight path clears the highest obstacle by at least 35 feet when accelerating in level flight to green dot speed after an engine failure, in the most adverse conditions.

TAKEOFF ON A WET RUNWAY

Takeoff charts computed for wet runway with a 15 feet screen height and/or use of reverse thrust may produce, in some conditions, a maximum takeoff weight (or flexible temperature) higher than that obtained for a dry runway. It is thus mandatory to compare both charts (dry and wet) and retain the lower of the two weights (or flexible temperature) and the associated speeds determined for a wet runway.

Note : The crew need not compare the charts if the top of the wet runway chart specifies "DRY CHECK". (The comparison has already been inserted in the WET runway calculation).

A321XXX		ENGINES		AIRPORT NAME					15L	VERSION DATE	
QNH		1013.00 HPA		Elevation	489	FT	TORA	3000		M	AXXXXXX **V10
Air cond.		AC OFF		Isa temp	14	C	TODA	3100		M	4 obstacles
Anti-icing		AI OFF		rwy slope	.08	%	ASDA	3000		M	
All reversers operating				DRY							
No reversers on dry runway											
WEIGHT 1000 KG	CONF 1+F				CONF 2						
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT			
92	-2 3/3	18 3/3	31 3/3	32 3/3	11 3/3	29 3/3	31 3/3	32 3/3			
	.0	.0	.3	.6	.0	.1	.2	.4			
	148/60/63	149/60/63	151/61/63	154/63/65	151/60/60	144/55/55	147/57/57	154/63/63			
88	29 3/3	33 3/3	37 3/3	38 3/3	33 3/3	35 3/3	37 3/3	38 3/3			
	.1	.5	.4	.5	.2	.3	.3	.3			
	144/57/59	146/58/60	150/59/61	153/62/63	150/59/59	141/52/52	145/55/55	153/61/61			
84	36 3/3	41 3/3	42 3/3	43 3/3	39 3/3	41 3/3	42 3/3	43 3/3			
	.5	.2	.8	.7	.4	.2	.6	.5			
	142/54/56	144/54/56	149/58/59	152/60/61	149/57/57	140/50/50	144/53/53	152/60/60			
80	43 3/3	46 3/3	47 3/3	48 3/3	44 3/3	46 3/3	47 3/3	48 3/3			
	.5	.4	.6	.4	.7	.3	.4	.1			
	140/51/52	144/52/53	148/56/57	151/59/59	148/56/56	139/49/49	144/52/52	152/58/58			
76	50 3/3	51 3/3	52 3/3	53 3/3	49 3/3	51 3/3	52 3/3	52 3/3			
	.1	.3	.5	.3	.7	.2	.3	.8			
	138/47/48	143/51/52	147/55/55	151/57/58	148/54/54	138/47/47	143/50/50	151/57/57			
72	55 3/3	56 3/3	57 2/7	57 3/7	55 3/3	56 3/3	57 2/7	57 3/7			
	.4	.6	.0	.0	.2	.3	.0	.0			
	138/46/46	142/49/50	141/50/51	138/50/51	145/51/51	138/45/45	143/49/49	143/52/52			
68	57 3/7	57 7/9	57 7/9	57 7/9	* 57 3/7	* 57 2/7	* 57 2/7	* 57 2/7			
	.0	.0	.0	.0	* .0	* .0	* .0	* .0			
	121/39/40	118/39/40	118/39/40	118/39/40	* 114/35/35	* 114/35/35	* 115/35/35	* 114/35/35			
64	* 57 7/9	* 57 7/9	* 57 7/9	* 57 7/9	* 57 7/9	* 57 7/9	* 57 7/9	* 57 7/9			
	* .0	* .0	* .0	* .0	* .0	* .0	* .0	* .0			
	* 114/35/36	* 114/35/36	* 114/35/36	* 114/35/36	* 114/29/29	* 114/29/29	* 114/29/29	* 114/29/29			
60	* 57 7/9	* 57 7/9	DO NOT USE FOR OPERATIONAL PURPOSE				* 57 7/9	* 57 7/9			
	* .0	* .0					* .0	* .0			
	* 114/30/32	* 114/30/32					* 114/25/25	* 114/25/25			
* 57 7/9	* 57 7/9	* 57 7/7					* 57 7/7				
56	* .0	* .0					* .0	* .0			
	* 114/25/27	* 114/25/27					* 114/24/24	* 114/23/24			
	* 57 7/7	* 57 7/7	* 57 7/7	* 57 7/7	* 57 7/7	* 57 7/7	* 57 7/7	* 57 7/7			
52	* .0	* .0	* .0	* .0	* .0	* .0	* .0	* .0			
	* 114/22/25	* 114/22/25	* 114/22/25	* 114/22/25	* 114/23/24	* 114/23/24	* 114/23/24	* 114/23/24			
	GRAD1/GRAD2 (KG/C)										
90/****		90/****		70/ 500		50/ 540		60/****		50/ 540	
INFLUENCE OF RUNWAY CONDITION											
WET	-2/ -1	.0/ -1	-2/ -1	-2/ -1	-3/ -1	-2/ -1	-3/ -1	-4/ -1			
	-8/ -1/ -1	-7/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0	-8/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0	-7/ -1/ -1			
	(+57)-2/ -1	(+57)-4/ -1	(+57)-4/ -1	(+57)-2/ -1	(+57)-5/ -1	(+57)-4/ -1	(+57)-5/ -1	(+57)-6/ -1			
D QNH HPA	-8/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0	-8/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0	-7/ 0/ 0			
	INFLUENCE OF DELTA PRESSURE										
-10	-8/ -2	-1.0/ -2	-1.2/ -2	-9/ -2	-9/ -2	-1.4/ -2	-9/ -2	-9/ -2			
	-1/ -1/ -1	-2/ -1/ -1	-3/ -2/ -2	-1/ -1/ -1	-1/ -1/ -1	-3/ -2/ -2	-1/ -1/ -1	-1/ -1/ -1			
	(+50)-8/ -2	(+50)-1.0/ -2	(+50)-1.2/ -2	(+50)-9/ -2	(+50)-9/ -2	(+50)-1.4/ -2	(+50)-9/ -2	(+50)-9/ -2			
+10	-1/ 0/ 0	-2/ 0/ 0	-3/ 0/ 0	-1/ 0/ 0	-1/ 0/ 0	-3/ 0/ 0	-1/ 0/ 0	-1/ 0/ 0			
	+6/ 0	+6/ 0	+6/ 0	.0/ 0	+6/ 0	+6/ 0	+6/ 0	+3/ 0			
	+1/ +1/ +1	+1/ 0/ 0	+1/ +1/ +1	0/ +1/ +1	0/ +1/ +1	0/ 0/ 0	+1/ +1/ +1	0/ 0/ 0			
LABEL FOR INFLUENCE	OAT C DW CODES		* VMC		Tref (OAT) = 29 C		Min acc height 505 FT		Min QNH alt 996 FT		
	DW (1000 KG) DTFLEX		V1min/Vr/V2 (kt)		Tmax (OAT) = 54 C		Max acc height 1676 FT		Max QNH alt 2168 FT		
	DV1-DVR-DV2 (KT)		LIMITATION CODES :				Min V1/Vr/V2 = 114/22/24				
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles				CHECK VMU LIMITATION					
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU				Correct. V1/Vr/V2 = 1.0 KT/1000 KG					
DV1-DVR-DV2 (KT)											



A319XXX		ENGINES		AIRPORT NAME						15L	VERSION DATE			
QNH		1013.00 HPA		Elevation	489	FT	TORA	3000	M		AXXXXXXX V10			
Air cond.		AC OFF		Isa temp	14	C	TODA	3100	M		4 obstacles			
Anti-icing		AI OFF		rwy slope	.08	%	ASDA	3000	M					
All reversers operating										DRY				
No reversers on dry runway														
WEIGHT 1000 KG	CONF 1 + F				CONF 2									
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT						
76	6 3/3 .0 148/52/55	25 3/3 .0 149/53/56	37 3/3 .0 151/54/57	38 3/3 .2 154/57/60	0 3/3 .1 150/53/56	18 3/3 .0 150/54/57	35 3/3 .0 152/56/58	37 3/3 .0 155/58/60						
72	40 3/3 .2 142/46/49	42 3/3 .5 146/49/52	44 3/3 .5 150/52/55	46 3/3 .1 153/54/57	40 3/3 .1 143/47/49	42 3/3 .1 147/50/52	43 3/3 .5 151/53/55	44 3/3 .4 154/56/58						
68	48 3/3 .3 141/43/46	50 3/3 .3 145/47/49	52 3/3 .2 149/50/52	53 3/3 .0 153/53/55	48 3/3 .1 142/44/46	49 3/3 .5 146/48/50	51 3/3 .1 151/52/53	51 2/3 .4 153/54/56						
64	56 3/3 .3 141/42/44	58 3/7 .0 143/44/46	58 3/7 .0 140/44/46	58 3/7 .0 138/44/46	56 3/3 .1 142/43/45	57 3/3 .2 147/47/48	57 2/3 .6 149/50/51	57 2/3 .6 148/50/51						
60	58 3/7 .0 118/30/33	* 58 3/7 .0 * 113/30/33	* 58 2/7 .0 * 111/30/33	* 58 2/7 .0 * 111/30/33	58 3/7 .0 117/30/32	* 58 3/7 .0 * 113/31/32	* 58 2/7 .0 * 111/31/32	* 58 2/7 .0 * 111/31/32						
56	* 58 7/9 .0 * 111/21/24	* 58 7/9 .0 * 111/21/24	* 58 7/9 .0 * 111/21/24	* 58 7/9 .0 * 111/21/24	* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/21						
52	* 58 7/7 .0 * 111/19/22	* 58 7/7 .0 * 111/19/22	* 58 7/7 .0 * 111/19/22	* 58 7/7 .0 * 111/19/22	* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/22	* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/21						
48	* 58 7/7 .0 * 111/18/22	* 58 7/7 .0 * 111/18/22	DO NOT USE FOR OPERATIONAL PURPOSE				* 58 7/7 .0 * 111/19/21	* 58 7/7 .0 * 111/19/21						
46	* 58 7/7 .0 * 111/18/22	* 58 7/7 .0 * 111/18/22					* 58 7/7 .0 * 111/18/21	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21			
40	* 58 7/7 .0 * 112/18/22	* 58 7/7 .0 * 112/17/22					* 58 7/7 .0 * 112/17/22	* 58 7/7 .0 * 112/17/22	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21	* 58 7/7 .0 * 112/18/21		
GRAD1/GRAD2 (KG/C)														
40/****		40/****		40/ 400		40/ 400		40/****		30/****	30/ 410			
INFLUENCE OF RUNWAY CONDITION														
WET	-5/- -2	-5/- -1	-5/- -1	-3/- -1	-7/- -2	-6/- -2	-4/- -1	-1/- -1						
	-9/- -1/- -1	-9/- -1/- -1	-8/- -1/- -1	-6/ 0/ 0	-11/- -1/- -1	-10/- -1/- -1	-7/ 0/ 0	-4/ 0/ 0						
	(+58)-.5/- -2	(+58)-.5/- -1	(+58)-.5/- -1	(+58)-.3/- -1	(+58)-.7/- -2	(+58)-.6/- -2	(+58)-.4/- -1	(+58)-.3/- -1						
-9/ 0/ 0														
D QNH HPA														
INFLUENCE OF DELTA PRESSURE														
-10	-9/- -2	-5/- -1	-6/- -2	-5/- -1	-5/- -1	-6/- -2	-6/- -2	-5/- -1						
	0/ 0/ 0	0/ 0/ 0	-1/- -1/- -1	-1/- -1/- -1	-1/ 0/ 0	-2/- -1/- -1	-1/- -1/- -1	-1/ 0/ 0						
	(+54)-.9/- -2	(+54)-.5/- -1	(+54)-.6/- -2	(+54)-.5/- -1	(+54)-.5/- -1	(+54)-.6/- -2	(+54)-.6/- -2	(+54)-.5/- -1						
0/ 0/ 0														
+10	+3/ 0	+2/ 0	.0/ 0	.0/ 0	+1/ 0	+1/ 0	+2/ 0	+2/ 0						
	+1/+1/+1	+1/+1/+1	0/ 0/ 0	0/+1/+1	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0						
	(+58)+.3/ 0	(+58)+.2/ 0	(+58)0/ 0	(+58)0/ 0	(+58)+.1/ 0	(+58)+.1/ 0	(+58)+.2/ 0	(+58)0/ 0						
+1/+1/+1														
LABEL FOR INFLUENCE		OAT C DW CODES		* VMC	Tref (OAT) = 36 C		Min acc height 515 FT		Min QNH alt 1011 FT					
DW (1000 KG) DTFLEX		V1min/VR/V2 (kt)		* LIMITATION	Tmax (OAT) = 54 C		Max acc height 1725 FT		Max QNH alt 2220 FT					
DV1-DVR-DV2 (KT)		LIMITATION CODES :												
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles												
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU												
DV1-DVR-DV2 (KT)		CHECK VMU LIMITATION												
		Correct. V1/VR/V2 = 1.0 KT/1000 KG												

CONF 1 + F					CONF 2				
WEIGHT 1000 KG	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND - 10 KT	TAILWIND - 5 KT	WIND 0 KT	HEADWIND 10 KT	
76	6 3/3 .0	25 3/3 .0	37 3/3 .0	38 3/3 .2	0 3/3 .1	18 3/3 .0	35 3/3 .0	37 3/3 .0	
72	148/52/55 40 3/3 -2	149/53/56 42 3/3 5	151/54/57 44 3/3 -5	154/57/60 46 3/3 -1	150/53/56 40 3/3 -1	152/56/58 42 3/3 -1	152/56/58 43 3/3 5	155/58/60 44 3/3 -4	
68	142/46/49 48 3/3 -3	146/49/52 50 3/3 -3	150/52/55 52/3/3	153/54/57 53 3/3	143/47/49 48 3/3 -1	147/50/52 49 3/3 -5	151/53/55 51 3/3 -1	154/56/58 51 2/3 -4	
64	141/43/46 56 3/3 -3	145/47/49 58 3/7	149/50/52 58 3/7	153/53/55 58 3/7	142/44/46 56 3/7	146/48/50 57 3/3	151/52/53 57 2/3	153/54/56 57 2/3 -6	
60	141/42/44 58 3/7 .0	143/44/46 58 3/7 .0	140/44/46 58 2/7	138/44/46 58 2/7	142/43/45 58 3/7 .0	147/47/48 58 3/7 .0	149/50/51 58 2/7 .0	148/50/51 58 2/7 .0	
56	118/30/33 58 7/9 .0	113/30/33 58 7/9 .0	* 111/30/33	* 111/30/33	117/30/32 58 7/7 .0	* 113/31/32	* 111/31/32	* 111/31/32	
52	* 111/21/24 58 7/7 .0	* 111/21/24 58 7/7 .0	* 111/21/24	* 111/21/24	* 111/19/21 58 7/7 .0	* 111/19/21	* 111/19/21	* 111/19/21	
48	* 111/19/22 58 7/7 .0	* 111/19/22 58 7/7 .0	* 111/19/22	* 111/19/22	* 111/19/21 58 7/7 .0	* 111/19/21	* 111/19/21	* 111/19/21	
46	* 111/18/22 58 7/7 .0	* 111/18/22 58 7/7 .0	* 111/18/22	* 111/18/22	* 111/18/21 58 7/7 .0	* 112/18/21	* 112/18/21	* 112/18/21	
40	* 112/18/22 58 7/7 .0	* 112/17/22 58 7/7 .0	* 112/17/22	* 112/17/22	* 112/18/21 58 7/7 .0	* 112/18/21	* 112/18/21	* 112/18/21	
GRAD1/GRAD2 (KG/C)					GRAD1/GRAD2 (KG/C)				
	40/****	40/****	40/400	40/400	40/****	40/****	30/****	30/4/10	GRAD1/GRAD2

DO NOT USE FOR OPERATIONAL PURPOSE				
WET	INFLUENCE OF RUNWAY CONDITION	INFLUENCE OF DELTA PRESSURE	INFLUENCE OF DELTA PRESSURE	INFLUENCE OF DELTA PRESSURE
-10	-8/-2 0/-1/-1 0/+0/+0 (+54) -4/-1 0/+0/+0	-9/-2 0/-1/-1 0/+0/+0 (+54) -9/-2 0/+0/+0	-10/-2 0/-1/-1 0/+0/+0 (+54) -10/-2 0/+0/+0	-11/-2 0/-1/-1 0/+0/+0 (+54) -11/-2 0/+0/+0
+10	+6/+0 +1/+0/+0 (+54) +2/+0 +1/+0/+0	+7/+0 +1/+1/+1 (+54) +3/+0 +1/+1/+1	+8/+0 +1/+1/+1 (+54) +4/+0 +1/+1/+1	+9/+0 +1/+1/+1 (+54) +5/+0 +1/+1/+1
LABEL FOR INFLUENCE MTOW(1000 KG) codes				
DW (1000 KG) DTFLX	V1min/VR/V2(KT)	*VMC	Tref (OAT) =29 C	Min acc height 784ft Min QNH alt 1280ft
DW1+VR-W2 (KT)	*LIMITATION	Tmax (OAT) =54 C	Max acc height 1965ft Max QNH alt 2461ft	
LIMITATION CODES:				
1=1st segment 2=2nd segment 3=runway length 4=obstacles	CHECK VMU LIMITATION			
5=tire speed 6=brake energy 7=max weight 8=final takeoff 9=VMU	CORRECT. V1/VR/V2 = 1 Kt/1000 Kg			

INFLUENCE CORRECTION
ΔWEIGHT ΔTFLEX
ΔV1/ΔVR/ΔV2
(TVMC) ΔWEIGHT ΔTFLEX
ΔV1/ΔVR/ΔV2

TAKEOFF PARAMETERS

MAX TEMPERATURE (58)

LIMITATION CODE (7-7)

DELTA WEIGHT (1000 KG) (.0)

V1 (KT IAS) - VR (KT IAS) - V2 (KT IAS)
(112) (117) (122)

MINIMUM VALUES OF V1/VR/V2 TO WHICH TAKEOFF SPEEDS MUST BE LIMITED WHEN DECREMENTS ARE APPLIED

V1/VR/V2 DECREMENTS FOR WEIGHTS BELOW THE LOWEST WEIGHT OF A COLUMN

R

A320XXX		ENGINES		AIRPORT NAME						15L	VERSION DATE
QNH		1013.25 HPA		Elevation	489	FT	TORA	3000	M		AXXXXXX **V20
Air cond.		AC OFF		Isa temp	14	C	TODA	3100	M	4 obstacles	DRY
Anti-icing		AI OFF		rvwy slope	.08	%	ASDA	3000	M		
All reversers operating											
No reversers on dry runway											
WEIGHT 1000 KG	CONF 1 + F				CONF 2						
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT			
80	-18 4/6	9 4/6	37 4/6	45 4/6	-15 4/6	12 4/6	40 4/6	46 3/4			
	0.0	0.0	0.0	0.6	0.0	0.0	0.1	0.3			
	155/56/58	154/57/59	153/55/57	155/56/58	153/53/58	151/52/57	150/51/56	152/53/58			
76	44 4/6	48 4/6	51 3/4	52 2/4	44 4/6	48 4/6	51 3/4	52 2/4			
	0.1	0.2	0.4	0.3	0.3	0.4	0.4	0.4			
	141/49/51	148/50/52	153/53/55	152/52/53	140/45/49	146/47/51	150/50/54	150/50/55			
72	53 4/6	56 3/4	59 3/4	60 3/4	53 3/4	56 3/4	58 3/4	60 3/4			
	0.3	0.2	0.0	0.4	0.4	0.2	0.5	0.3			
	145/46/48	148/48/50	152/52/53	154/54/55	142/43/47	146/46/50	149/49/53	151/51/55			
68	61 3/4	63 3/4	65 3/4	67 3/4	61 3/4	63 3/4	65 3/4	66 4/4			
	0.3	0.5	0.6	0.3	0.3	0.5	0.4	0.6			
	144/44/45	148/48/49	151/51/52	153/53/54	142/42/45	145/45/48	148/48/52	149/49/53			
64	68 3/4	69 3/4	69 3/4	69 3/4	68 3/4	69 3/4	69 4/4	69 4/4			
	0.5	1.1	2.2	3.0	0.6	1.0	2.0	2.7			
	143/43/44	147/47/48	151/51/52	153/53/54	141/41/44	144/44/47	147/47/50	147/47/50			
60	69 3/4	* 69 7/9	* 69 7/9	* 69 7/9	69 3/4	* 69 7/9	* 69 7/9	* 69 7/9			
	4.0	* 0.0	* 0.0	* 0.0	4.0	* 0.0	* 0.0	* 0.0			
	143/43/44	* 114/32/33	* 114/32/33	* 114/32/33	141/41/44	* 112/26/29	* 112/26/29	* 112/26/29			
56	* 69 7/9	* 69 7/9	DO NOT USE FOR OPERATIONAL PURPOSE						* 69 7/9	* 69 7/9	
	* 0.0	* 0.0							* 0.0	* 0.0	
	* 114/27/29	* 114/27/29							* 112/21/24	* 112/21/24	
52	* 69 7/9	* 69 7/9							* 69 7/7	* 69 7/7	
	* 0.0	* 0.0							* 0.0	* 0.0	
	* 114/22/24	* 114/22/24							* 112/19/22	* 112/19/22	
48	* 69 7/7	* 69 7/7	* 69 7/7	* 69 7/7	* 69 7/7	* 69 7/7	* 69 7/7	* 69 7/7			
	* 0.0	* 0.0	* 0.0	* 0.0	* 0.0	* 0.0	* 0.0	* 0.0			
	* 115/20/22	* 115/20/22	* 115/20/22	* 115/20/22	* 113/18/22	* 113/18/22	* 113/18/22	* 113/18/22			
GRAD1/GRAD2 (KG/C)											
	50/****	50/****	60/****	60/ 460	50/****	50/****	60/****	50/ 470			
INFLUENCE OF RUNWAY CONDITION											
WET	-1.4/ -3	-1.1/ -3	-0.7/ -2	-0.7/ -2	-1.3/ -3	-1.3/ -3	-0.4/ -1	-0.2/ -1			
	-11/ -1/ -1	-10/ -1/ -1	-9/ -2/ -2	-8/ -2/ -2	-10/ 0/ 0	-9/ -4/ -4	-7/ -2/ -2	-5/ 0/ 0			
	(+69) -1.4/ -3	(+69) -1.1/ -3	(+69) -0.7/ -2	(+69) -0.7/ -2	(+69) -1.3/ -3	(+69) -1.3/ -3	(+69) -0.4/ -1	(+69) -0.2/ -1			
	-11/ 0/ 0	-10/ 0/ 0	-9/ 0/ 0	-8/ 0/ 0	-10/ 0/ 0	-9/ 0/ 0	-7/ 0/ 0	-5/ 0/ 0			
D QNH HPA											
-10.0	-0.8/ -2	-1.2/ -3	-0.7/ -2	-0.7/ -2	-0.7/ -2	-0.7/ -2	-0.7/ -2	-0.7/ -2			
	0/ 0/ -1	0/ 0/ -1	-1/ -1/ -1	-1/ -1/ -1	0/ 0/ 0	0/ 0/ -1	0/ 0/ -1	0/ 0/ -1			
	(+61) -0.8/ -2	(+61) -1.2/ -3	(+61) -0.7/ -2	(+61) -0.7/ -2	(+61) -0.7/ -2	(+61) -0.7/ -2	(+61) -0.7/ -2	(+61) -0.7/ -2			
+10.0	0/ 0/ 0	0/ 0/ 0	-1/ 0/ 0	-1/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0			
	+0.2/ 0	+0.2/ 0	0.0/ 0	+0.2/ 0	+0.2/ 0	+0.2/ 0	+0.2/ 0	+0.2/ 0			
	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0			
	(+69) +0.2/ 0	(+69) +0.2/ 0	(+69) 0.0/ 0	(+69) +0.2/ 0	(+69) +0.2/ 0	(+69) +0.2/ 0	(+69) +0.2/ 0	(+69) +0.2/ 0			
	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0	0/ 0/ 0			
	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1	+1/ +1/ +1			
LABEL FOR INFLUENCE		OAT C DW CODES		* VMC	Tref (OAT) = 44 C		Min acc height 515 FT		Min QNH alt 1004 FT		
DW (1000 KG) DTFLEX		V1min/VR/V2 (kt)		* LIMITATION	Tmax (OAT) = 54 C		Max acc height 1934 FT		Max QNH alt 2423 FT		
DV1-DVR-DV2 (KT)		LIMITATION CODES				Min V1/VR/V2 = 115/20/22		CHECK VMU LIMITATION			
(TVMC OAT C)		1=1st segment 2=2nd segment 3=runway length 4=obstacles				Correct. V1/VR/V2 = 1.0 KT/1000 KG					
DW (1000 KG) DTFLEX		5=tire speed 6=brake energy 7=max weight 8=final take-off 9=VMU									
DV1-DVR-DV2 (KT)											

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

GENERAL

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight.

In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

MTOW DETERMINATION

Enter the chart with the first configuration and actual wind column reading the temperature value. This temperature value stands for the OAT. Read the maximum takeoff weight corresponding to the actual OAT. Note that it is allowed to interpolate between two consecutive lines to obtain the maximum takeoff weight.

It is reminded that the takeoff weight is the sum of the weight entry and the delta weight. Similarly determine the takeoff speeds associated with the maximum takeoff weight.

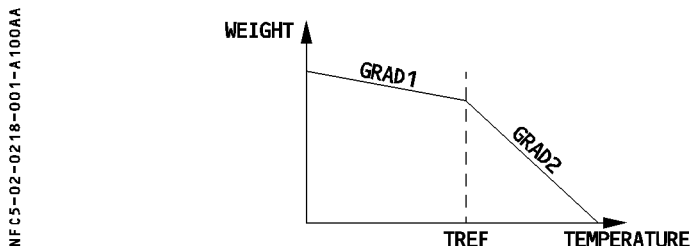
- R In some cases, it may happen that the first temperature value (displayed for the highest weight entry) is higher than OAT. In this case, it is allowed to extrapolate the weight value to avoid unnecessary penalty. Use the Grad 1/Grad 2 gradients provided at the bottom of the corresponding column.

Correction to weight

Grad 1/Grad 2 are gradients provided for both sides of the flat rating temperature (TREF).

Grad 1 applies to temperatures below TREF and Grad 2 applies above TREF.

Read the lowest temperature of the column (corresponding to the highest weight entry).



- If the lowest temperature and OAT are above TREF.
 Obtain weight increment by multiplying Grad 2 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.18	P 2
	MTOW CALCULATION (WEIGHT ENTRY)		SEQ 100	REV 25

- If the lowest temperature and OAT are below TREF.
Obtain weight increment by multiplying Grad 1 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.
- If OAT is below TREF and lowest temperature is above TREF.
The weight increment is calculated in two steps. Step one is multiplying Grad 2 by temperature difference between lowest temperature and TREF. Step two is multiplying Grad 1 by temperature difference between TREF and OAT. Add results from step one and two to maximum takeoff weight calculated for lowest temperature.

Note : Use the weight gradients only to extrapolate above the maximum weight shown in the RTOW chart. They are not valid for interpolation between two boxes, between filled boxes or between one filled and one blank box.

- Repeat the above process for the other available configuration and retain the configuration giving the highest takeoff weight.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

1. For the given wind and temperature conditions, determine the maximum takeoff weight (choose the configuration giving the highest weight).
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and weight value.

Example A

DATA : OAT = 25°C
Head Wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

- R Use the chart from 2.02.16 p 6.
Enter the 10 kt head wind column CONF 1+F, to read for 25°C
The lowest temperature of the column is 38°C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.
Max TO weight (1000 kg) air conditioning OFF = $76.2 + 0.4 \times 2 + 0.04 \times 11 = 77.4$
Enter the 10 kt head wind column CONF 2, to read for 25°C
The lowest temperature of the column is 37°C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

GENERAL

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight.

In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

MTOW DETERMINATION

Enter the chart with the first configuration and actual wind column reading the temperature value. This temperature value stands for the OAT. Read the maximum takeoff weight corresponding to the actual OAT. Note that it is allowed to interpolate between two consecutive lines to obtain the maximum takeoff weight.

It is reminded that the takeoff weight is the sum of the weight entry and the delta weight. Similarly determine the takeoff speeds associated with the maximum takeoff weight.

- R In some cases, it may happen that the first temperature value (displayed for the highest weight entry) is higher than OAT. In this case, it is allowed to extrapolate the weight value to avoid unnecessary penalty. Use the Grad 1/Grad 2 gradients provided at the bottom of the corresponding column.

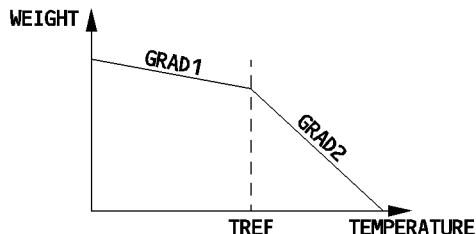
Correction to weight

Grad 1/Grad 2 are gradients provided for both sides of the flat rating temperature (TREF).

Grad 1 applies to temperatures below TREF and Grad 2 applies above TREF.

Read the lowest temperature of the column (corresponding to the highest weight entry).

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- If the lowest temperature and OAT are above TREF.
 Obtain weight increment by multiplying Grad 2 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.18	P 2
	MTOW CALCULATION (WEIGHT ENTRY)		SEQ 110	REV 25

- If the lowest temperature and OAT are below TREF.
Obtain weight increment by multiplying Grad 1 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.
- If OAT is below TREF and lowest temperature is above TREF.
The weight increment is calculated in two steps. Step one is multiplying Grad 2 by temperature difference between lowest temperature and TREF. Step two is multiplying Grad 1 by temperature difference between TREF and OAT. Add results from step one and two to maximum takeoff weight calculated for lowest temperature.

Note : Use the weight gradients only to extrapolate above the maximum weight shown in the RTOW chart. They are not valid for interpolation between two boxes, between filled boxes or between one filled and one blank box.

- Repeat the above process for the other available configuration and retain the configuration giving the highest takeoff weight.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

1. For the given wind and temperature conditions, determine the maximum takeoff weight (choose the configuration giving the highest weight).
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and weight value.

Example A

DATA : OAT = 25°C
Head Wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

- R Use the chart from 2.02.16 p 6.
Enter the 10 kt head wind column CONF 1+F, to read for 25°C
The lowest temperature of the column is 32°C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.
Max TO weight (1000 kg) air conditioning OFF = $92.6 + 0.54 \times 3 + 0.05 \times 4 = 94.4$
Enter the 10 kt head wind column CONF 2, to read for 25°C
The lowest temperature of the column is 32°C, use Grad 1/Grad 2 to extrapolate the maximum takeoff weight.

DETERMINATION OF MAXIMUM TAKEOFF WEIGHT AND SPEEDS

GENERAL

The takeoff chart is computed for a given runway under a set of conditions, which are :

- OAT
- Wind
- Configuration
- QNH, air conditioning, anti ice...

Two configurations are produced on the chart. This enables the crew to select that giving the highest permissible takeoff weight.

In case of equivalent performance, retain the configuration giving the lower takeoff speeds.

MTOW DETERMINATION

Enter the chart with the first configuration and actual wind column reading the temperature value. This temperature value stands for the OAT. Read the maximum takeoff weight corresponding to the actual OAT. Note that it is allowed to interpolate between two consecutive lines to obtain the maximum takeoff weight.

It is reminded that the takeoff weight is the sum of the weight entry and the delta weight. Similarly determine the takeoff speeds associated with the maximum takeoff weight.

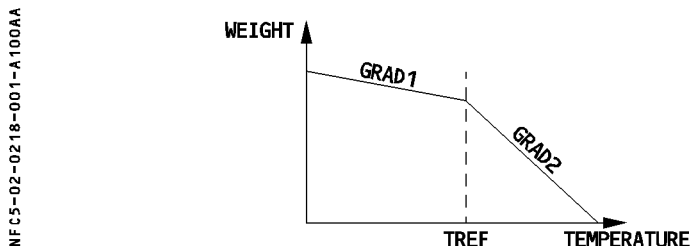
- R In some cases, it may happen that the first temperature value (displayed for the highest weight entry) is higher than OAT. In this case, it is allowed to extrapolate the weight value to avoid unnecessary penalty. Use the Grad 1/Grad 2 gradients provided at the bottom of the corresponding column.

Correction to weight

Grad 1/Grad 2 are gradients provided for both sides of the flat rating temperature (TREF).

Grad 1 applies to temperatures below TREF and Grad 2 applies above TREF.

Read the lowest temperature of the column (corresponding to the highest weight entry).



- If the lowest temperature and OAT are above TREF.
 Obtain weight increment by multiplying Grad 2 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.18	P 2
	MTOW CALCULATION (WEIGHT ENTRY)		SEQ 270	REV 34

- If the lowest temperature and OAT are below TREF.
Obtain weight increment by multiplying Grad 1 by the difference in temperature between OAT and lowest temperature. Add this weight increment to the maximum takeoff weight calculated for the lowest temperature.
- If OAT is below TREF and lowest temperature is above TREF.
The weight increment is calculated in two steps. Step one is multiplying Grad 2 by temperature difference between lowest temperature and TREF. Step two is multiplying Grad 1 by temperature difference between TREF and OAT. Add results from step one and two to maximum takeoff weight calculated for lowest temperature.

Note : Use the weight gradients only to extrapolate above the maximum weight shown in the RTOW chart. They are not valid for interpolation between two boxes, between filled boxes or between one filled and one blank box.

- R — Repeat the above process for the other available configuration and retain the
R configuration giving the highest takeoff weight.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

- R Retain the maximum takeoff weight, associated configuration and speeds from above.
For conditions different from those of the chart, apply relevant corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 p 1

Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.

- R 1. For the given wind and temperature conditions, determine the maximum takeoff weight
R (choose the configuration giving the highest weight).
2. Apply the published weight correction(s) to the maximum takeoff weight (for each correction) to determine the maximum permissible takeoff weight.
3. Read the speeds associated with the maximum permissible takeoff weight by entering the chart with the retained configuration and weight value.

Example A

DATA : OAT = 25°C
Head Wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

Use the chart from 2.02.16 p 6.

- R Enter the 10 kt head wind column CONF 1+F, to read for 25°C
R The lowest temperature of the column is 45°C, use Grad 1/Grad 2 to extrapolate the
R maximum takeoff weight.
R Max TO weight (1000 kg) air conditioning OFF = $80.6 + 0.46 \times 1 + 0.06 \times 19 =$
R 82.2
R Enter the 10 kt head wind column CONF 2, to read for 25°C
R The lowest temperature of the column is 46°C, use Grad 1/Grad 2 to extrapolate the
R maximum takeoff weight.

Max TO weight (1000 kg) air conditioning OFF = $76.0 + 0.41 \times 1 + 0.03 \times 11 = 76.7$
 Retain CONF 1+F as takeoff configuration.
 Maximum TO weight (1000 kg) air conditioning OFF 77.4
 R Air conditioning correction (FCOM 2.02.24 p1)- 2.1
 R Maximum permissible TO weight (1000 kg) air conditioning ON 75.3
 R Determine takeoff speeds for 75.3 (1000kg) in the 10 kt head wind column (CONF1+F)
 $V1 = 154 \text{ kt}, VR = 157 \text{ kt}, V2 = 160 \text{ kt}$

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

1. Determine the maximum takeoff weight before correction for the given OAT and wind condition.
2. Apply the first correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
3. To combine a second (and third, as applicable) correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
 If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : — QNH correction is given for $\pm 10 \text{ hPa}$. It is allowed to extrapolate linearly for greater QNH deviation.
 — When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.
 — Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet correction first.
 — If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.
 — No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.

Example B

DATA : OAT = 40°C
Head wind = 10 kt
QNH = 998 hPa
WET runway

Use the chart from 2.02.16 p 6.

- Enter the 10 kt head wind column CONF 1+F, to read for 40°C
max TO weight (1000 kg) 75.2
· Enter the 10 kt head wind column CONF 2, to read for 40°C
max TO weight (1000 kg) 74.4
· Retain CONF 1+F for takeoff
· Read associated speeds as V1 = 154 kt, VR = 157 kt, V2 = 160 kt
· Apply WET correction

R For OAT < TVMC (58°C), ΔW = ... – 0.3
Intermediate weight (1000 kg) 74.9
Associated speeds,
V1 = 154 kt – 6 = 148 kt
VR = 157 kt – 0 = 157 kt
V2 = 160 kt – 0 = 160 kt

(No speed check required for first correction)

- Apply QNH correction

R For OAT < TVMC (54°C), ΔW = – 0.5 × 15/10 = ... – 0.8
Maximum permissible takeoff weight (1000 kg) 74.1
Associated speeds,
V1 = 148 kt – 1 × 15/10 = 146 kt
VR = 157 kt – 1 × 15/10 = 156 kt
V2 = 160 kt – 1 × 15/10 = 159 kt

- Check that the speeds are higher than minimum speeds from the chart and from VMU table.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	75.2	154	157	160
FCOM correction(s)				
Intermediate value	75.2	154	157	160
WET Correction	– 0.3	– 6	0	0
Intermediate value	74.9	148	157	160
QNH Correction	– 0.8	– 2	– 1	– 1
Final value	74.1	146	156	159

Max TO weight (1000 kg) air conditioning OFF = $92.4 + 0.54 \times 3 + 0.05 \times 4 = 94.2$.
 Retain CONF 1+F as takeoff configuration.
 Maximum TO weight (1000 kg) air conditioning OFF 94.4
 Air conditioning correction (FCOM 2.02.24 p1)- 3.2
 Maximum permissible TO weight (1000 kg) air conditioning ON 91.2
 Determine takeoff speeds for 91.2 (1000kg) in the 10 kt head wind column (CONF1+F)
 V1 = 154 kt, VR = 163 kt, V2 = 165 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

R CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

1. Determine the maximum takeoff weight before correction for the given OAT and wind condition.
2. Apply the first correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
3. To combine a second (and third, as applicable) correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
 If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : — QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
 — When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.
 — Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet correction first.
 — If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.
 — No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.

R

Example B

DATA : OAT = 40°C

Head wind = 10 kt

QNH = 998 hPa

WET runway

Use the chart from 2.02.16 p 6.

- Enter the 10 kt head wind column CONF 1+F, to read for 40°C
 max TO weight (1000 kg) 87.0
- Enter the 10 kt head wind column CONF 2, to read for 40°C
 max TO weight (1000 kg) 86.8
- Retain CONF 1+F for takeoff
- Read associated speeds as V1 = 153 kt, VR = 161 kt, V2 = 161 kt
- Apply WET correction

R For OAT < TVMC (57°C), ΔW = ... − 0.2

Intermediate weight (1000 kg) 86.8

Associated speeds,

V1 = 153 kt − 7 = 146 kt

VR = 161 kt − 0 = 161 kt

V2 = 161 kt − 0 = 161 kt

(No speed check required for first correction)

- Apply QNH correction

R For OAT < TVMC (50°C), ΔW = − 0.9 × 15/10 = ... − 1.4

Maximum permissible takeoff weight (1000 kg) 85.4

Associated speeds,

V1 = 146 kt − 1 × 15/10 = 144 kt

VR = 161 kt − 1 × 15/10 = 160 kt

V2 = 161 kt − 1 × 15/10 = 160 kt

- Check that the speeds are higher than minimum speeds from the chart and from VMU table.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	87.0	153	161	161
FCOM correction(s)				
Intermediate value	87.0	153	161	161
WET Correction	−0.2	− 7	0	0
Intermediate value	86.8	146	161	161
QNH Correction	− 1.4	− 2	− 1	− 1
Final value	85.4	144	160	160

A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.18	P 3
	MTOW CALCULATION (WEIGHT ENTRY)		SEQ 255	REV 34

Max TO weight (1000 kg) air conditioning OFF = $80.3 + 0.47 \times 2 + 0.05 \times 19 = 82.2$
 Retain CONF 1+F as takeoff configuration.
 Maximum TO weight (1000 kg) air conditioning OFF 82.2
 Air conditioning correction (FCOM 2.02.24 p1)- 2.2
 Maximum permissible TO weight (1000 kg) air conditioning ON 80.0
 Determine takeoff speeds for 80.0 (1000kg) in the 10 kt head wind column (CONF1+F)
 V1 = 155 kt, VR = 156 kt, V2 = 158 kt

CORRECTIONS FOR WET OR CONTAMINATED RUNWAYS FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti ice. A maximum of three corrections can be produced on one chart.

To apply the corrections, proceed as follows :

1. Determine the maximum takeoff weight before correction for the given OAT and wind condition.
2. Apply the first correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Else, (for OAT greater than TVMC), apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.
3. To combine a second (and third, as applicable) correction :
 If OAT is less than or equal to TVMC (line 3), apply ΔW correction from line 1 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 2.
 Check that the resulting speeds are higher than the minimum speeds displayed on the RTOW chart and that V2 is higher than the VMU limited speed (FCOM 2.02.25).
 If OAT is higher than TVMC (line 3) or if the above speed check is not fulfilled, apply ΔW correction from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4. No speed check is required.

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
– When using a takeoff chart with failure cases, it is not allowed to combine two failure cases.
– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet correction first.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.
– No speed check is required for the first correction. However, if the first influence correction follows a conservative FCOM correction, a speed check is required.

Example B

DATA : OAT = 45°C

Head wind = 10 kt

QNH = 998 hPa

WET runway

Use the chart from 2.02.16 p 6.

- Enter the 10 kt head wind column CONF 1+F, to read for 45°C
 max TO weight (1000 kg) 80.6
- Enter the 10 kt head wind column CONF 2, to read for 45°C
 max TO weight (1000 kg) 80.3
- Retain CONF 1+F for takeoff
- Read associated speeds as V1 = 155 kt, VR = 156 kt, V2 = 158 kt
- Apply WET correction
 For OAT < TVMC (69°C), ΔW = ... – 0.7
 Intermediate weight (1000 kg) 79.9
 Associated speeds,
 V1 = 155 kt – 8 = 147 kt
 VR = 156 kt – 2 = 154 kt
 V2 = 158 kt – 2 = 156 kt
 (No speed check required for first correction)

- R
- Apply QNH correction
 For OAT < TVMC (61°C), ΔW = – 0.7 × 15/10 = ... – 1
 Maximum permissible takeoff weight (1000 kg) 78.9
 Associated speeds,
 V1 = 147 kt – 1 × 15/10 = 145 kt
 VR = 154 kt – 1 × 15/10 = 153 kt
 V2 = 156 kt – 1 × 15/10 = 155 kt
 - Check that the speeds are higher than minimum speeds from the chart and from VMU table.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	80.6	155	156	158
FCOM correction(s)				
Intermediate value	80.6	155	156	158
WET Correction	– 0.7	– 8	– 2	– 2
Intermediate value	79.9	147	154	156
QNH Correction	– 1	– 2	– 1	– 1
Final value	78.9	145	153	155

COMBINING CORRECTIONS FROM FCOM AND CHART

- Proceed as follows :
- Determine the maximum takeoff weight by entering the chart with selected configuration, OAT and wind.
 - Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
 - Apply corrections from RTOW chart as explained above.

Example C

DATA : OAT = 25°C
Head wind = 10 kt
Air conditioning ON
QNH = 998 hPa
WET runway

- Use the chart from 2.02.16 p 6.
Enter the 10 kt head wind column CONF 1+F, to read for 25°C
Max TO weight (1000 kg) air conditioning OFF = 76.2 + 0.4 × 2 + 0.04 × 11 = 77.4
Enter the 10 kt head wind column CONF 2, to read for 25°C
Max TO weight (1000 kg) air conditioning OFF = 76.0 + 0.41 × 1 + 0.03 × 11 = 76.7
Retain CONF 1+F for takeoff configuration.
- First, apply the correction from FCOM page 2.02.24 p 1.
Max TO weight (1000 kg) air conditioning OFF 77.4
R Air conditioning correction – 2.1
R Intermediate weight 75.3
R Interpolate takeoff speeds for 75.3 (1000 kg) in the 10 kt head wind column,
V1 = 154 kt, VR = 157 kt, V2 = 160 kt
- Apply WET correction
For OAT < TVMC (58°C), ΔW = ... – 0.3
R Intermediate weight 75.0
Associated speeds,
V1 = 154 kt – 6 = 148 kt
VR = 157 kt – 0 = 157 kt
V2 = 160 kt – 0 = 160 kt
Apply QNH correction
For OAT < TVMC (54°C), ΔW = – 0.5 × 15/10 = ... – 0.8
R Maximum permissible takeoff weight 74.2
Associated speed,
V1 = 148 kt – 1 × 15/10 = 146 kt
VR = 157 kt – 1 × 15/10 = 156 kt
V2 = 160 kt – 1 × 15/10 = 159 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).

Since the speed check is fulfilled :

R

Max permissible takeoff weight = 74.2 (1000 kg)
 V1 = 146 kt, VR = 156 kt, V2 = 159 kt.

R

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	77.4			
FCOM correction(s)	– 2.1			
Intermediate value	75.3	154	157	160
WET Correction	– 0.3	– 6	0	0
Intermediate value	75.0	148	157	160
QNH Correction	– 0.8	– 2	– 1	– 1
Final value	74.2	146	156	159

EXTRAPOLATION

For OAT lower than the lowest temperature value of a wind column, it is possible to obtain a higher maximum permissible takeoff weight by using Grad 1/Grad 2 values. See page 1 for more details.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

COMBINING CORRECTIONS FROM FCOM AND CHART

Proceed as follows :

1. Determine the maximum takeoff weight by entering the chart with selected configuration, OAT and wind.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

Example C

DATA : OAT = 25°C
 Head wind = 10 kt
 Air conditioning ON
 QNH = 998 hPa
 WET runway

1. Use the chart from 2.02.16 p 6.
 Enter the 10 kt head wind column CONF 1+F, to read for 25°C
 Max TO weight (1000 kg) air conditioning OFF = $92.6 + 0.54 \times 3 + 0.05 \times 4 = 94.4$
 Enter the 10 kt head wind column CONF 2, to read for 25°C
 Max TO weight (1000 kg) air conditioning OFF = $92.4 + 0.54 \times 3 + 0.05 \times 4 = 94.2$
 Retain CONF 1+F for takeoff configuration.
2. First, apply the correction from FCOM page 2.02.24 p 1.
 Max TO weight (1000 kg) air conditioning OFF 94.4
 Air conditioning correction - 3.2
 Intermediate weight 91.2
 Interpolate takeoff speeds for 91.2 (1000 kg) in the 10 kt head wind column,
 V1 = 154 kt, VR = 163 kt, V2 = 165 kt

3. Apply WET correction
 R For OAT < TVMC (57°C), $\Delta W = \dots\dots\dots - 0.2$
 Intermediate weight 91.0
 Associated speeds,
 V1 = 154 kt - 7 = 147 kt
 VR = 163 kt - 0 = 163 kt
 V2 = 165 kt - 0 = 165 kt
 Apply QNH correction
 R For OAT < TVMC (50°C), $\Delta W = - 0.9 \times 15/10 = \dots\dots\dots - 1.4$
 Maximum permissible takeoff weight 89.6
 Associated speed,
 V1 = 147 kt - 1 $\times$ 15/10 = 145 kt
 VR = 163 kt - 1 $\times$ 15/10 = 162 kt
 V2 = 165 kt - 1 $\times$ 15/10 = 164 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).
 Since the speed check is fulfilled :
 Max permissible takeoff weight = 89.6 (1000 kg)
 V1 = 145 kt, VR = 162 kt, V2 = 164 kt.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	94.4			
FCOM correction(s)	– 3.2			
Intermediate value	91.2	154	163	165
WET Correction	– 0.2	– 7	0	0
Intermediate value	91.0	147	163	165
QNH Correction	– 1.4	– 2	– 1	– 1
Final value	89.6	145	162	164

EXTRAPOLATION

For OAT lower than the lowest temperature value of a wind column, it is possible to obtain a higher maximum permissible takeoff weight by using Grad 1/Grad 2 values. See page 1 for more details.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

COMBINING CORRECTIONS FROM FCOM AND CHART

Proceed as follows :

1. Determine the maximum takeoff weight by entering the chart with selected configuration, OAT and wind.
2. Apply corrections from FCOM to determine an intermediate weight. Interpolate associated speeds for intermediate weight in the same column (same wind and configuration).
3. Apply corrections from RTOW chart as explained above.

Example C

DATA : OAT = 25°C
 Head wind = 10 kt
 Air conditioning ON
 QNH = 998 hPa
 WET runway

1. Use the chart from 2.02.16 p 6.
 Enter the 10 kt head wind column CONF 1+F, to read for 25°C
 Max TO weight (1000 kg) air conditioning OFF = $80.6 + 0.46 \times 1 + 0.06 \times 19 = 82.2$
 Enter the 10 kt head wind column CONF 2, to read for 25°C
 Max TO weight (1000 kg) air conditioning OFF = $80.3 + 0.47 \times 2 + 0.05 \times 19 = 82.2$
 Retain CONF 1+F for takeoff configuration.
2. First, apply the correction from FCOM page 2.02.24 p 1.
 Max TO weight (1000 kg) air conditioning OFF 82.2
 Air conditioning correction - 2.2
 Intermediate weight 80.0
 Interpolate takeoff speeds for 80.0 (1000 kg) in the 10 kt head wind column,
 V1 = 155 kt, VR = 156 kt, V2 = 158 kt
3. Apply WET correction
 For OAT < TVMC (69°C), $\Delta W = \dots\dots\dots - 0.7$
 Intermediate weight 79.3
 Associated speeds,
 V1 = 155 kt - 8 = 147 kt
 VR = 156 kt - 2 = 154 kt
 V2 = 158 kt - 2 = 156 kt
 Apply QNH correction
 R For OAT < TVMC (61°C), $\Delta W = - 0.7 \times 15/10 = \dots\dots\dots - 1$
 Maximum permissible takeoff weight 78.3
 Associated speed,
 R V1 = 147 kt - 1 $\times 15/10$ = 145 kt
 VR = 154 kt - 1 $\times 15/10$ = 153 kt
 V2 = 156 kt - 1 $\times 15/10$ = 155 kt

Check that the speeds are higher than minimum speeds from the chart and from VMU table.
 (It is reminded that if the speed checks are not fulfilled, the corrections must be recalculated using those provided on lines 3 and 4).
 Since the speed check is fulfilled :
 Max permissible takeoff weight = 78.3 (1000 kg)
 V1 = 145 kt, VR = 153 kt, V2 = 155 kt.

	Takeoff Configuration : 1+F			
	TOW	V1	VR	V2
TOW (RTOW)	82.2			
FCOM correction(s)	– 2.2			
Intermediate value	80.0	155	156	158
WET Correction	– 0.7	– 8	– 2	– 2
Intermediate value	79.3	147	154	156
QNH Correction	– 1	– 2	– 1	– 1
Final value	78.3	145	153	155

EXTRAPOLATION

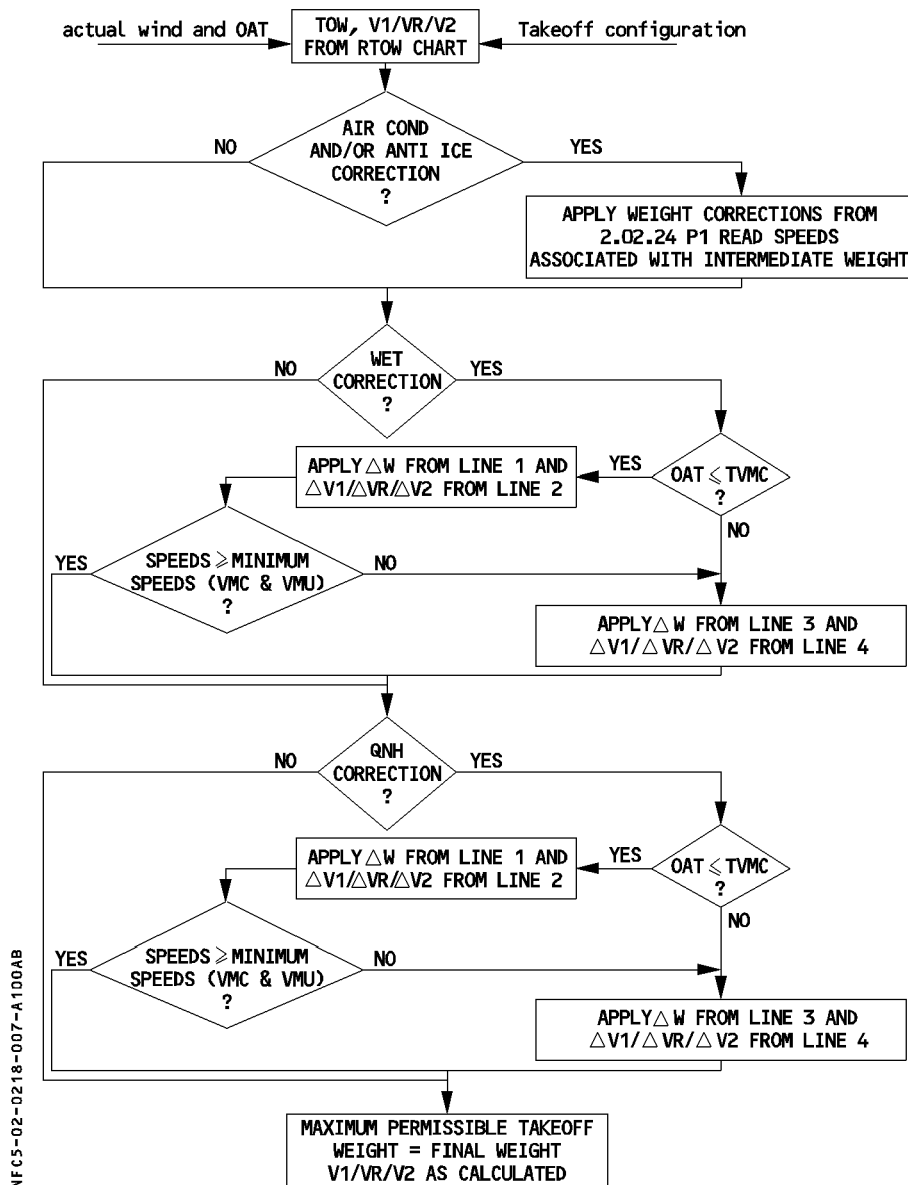
For OAT lower than the lowest temperature value of a wind column, it is possible to obtain a higher maximum permissible takeoff weight by using Grad 1/Grad 2 values. See page 1 for more details.

MAXIMUM STRUCTURAL TAKEOFF WEIGHT

The maximum structural takeoff weight is a weight limitation depending on the aircraft. This limitation is provided in the Flight Manual and in the chapter limitation of the FCOM3. Compare the maximum structural takeoff weight to the maximum permissible takeoff weight computed for given conditions and retain the lower of the two values.

SUMMARY

The following flow diagram gives the different steps to follow.



DEFINITION OF FLEXIBLE TAKEOFF

In many cases the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

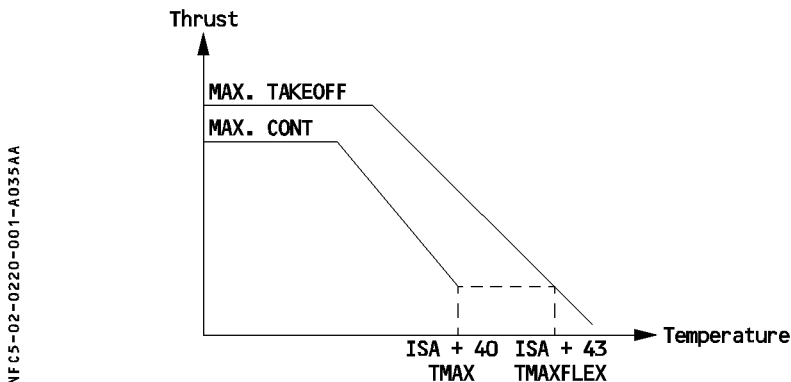
The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

REQUIREMENTS

- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
 - The flexible takeoff N1 cannot be lower than the Max climb N1 at the same flight conditions.
- The FADEC takes the above two constraints into account to determine flexible N1.
- The flexible takeoff thrust cannot be lower than the Max Continuous thrust used for the final takeoff flight path computation (at ISA + 40).
- This constraint limits the maximum flexible temperature at ISA + 43 (58° C at sea level).
- The flexible temperature cannot be lower than the flat rating temperature, TREF (ISA + 15), or the actual temperature (OAT).



A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i> FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.20	P 2
	FLEXIBLE TAKEOFF (WEIGHT ENTRY)		SEQ 100	REV 38

- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

- R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- R · However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side of the takeoff chart (tailwind) while remaining with the same configuration and looking for the same actual takeoff weight.

This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DEFINITION OF FLEXIBLE TAKEOFF

In many cases, the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

REQUIREMENTS

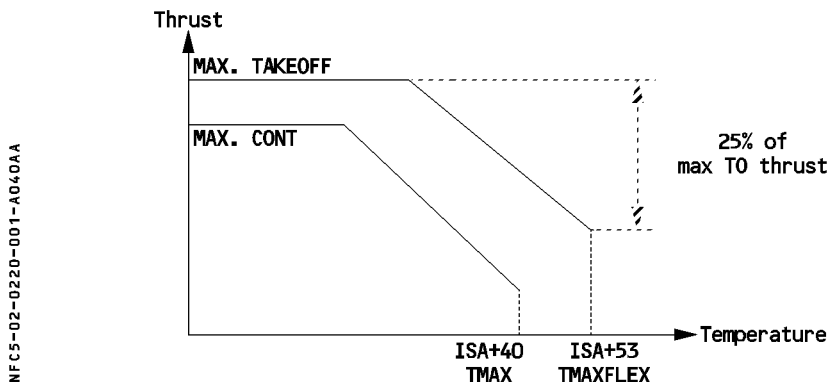
- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max Climb N1 at the same flight conditions.

The FADEC takes the above two constraints into account to determine flexible N1.

The above two constraints also limit the maximum flexible temperature at ISA + 53 (68°C at sea level).

- The flexible takeoff thrust cannot be lower than the Max Continuous thrust used for the final takeoff flight path computation (at ISA + 40).

- R – The flexible temperature cannot be lower than the flat rating temperature, TREF* (ISA
R + 29 up to 2000 feet), or the actual temperature (OAT).



R *Note : *TREF being a function of pressure altitude, read it on the takeoff chart.*

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i> FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.20	P 2
	FLEXIBLE TAKEOFF (WEIGHT ENTRY)		SEQ 100	REV 38

- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

- R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- R · However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side of the takeoff chart (tailwind) while remaining with the same configuration and looking for the same actual takeoff weight.

This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DEFINITION OF FLEXIBLE TAKEOFF

In many cases the aircraft takes off with a weight lower than the maximum permissible takeoff weight. When this happens, it can meet the required performance (runway, second segment, obstacle,...) with a decreased thrust that is adapted to the weight : this is called FLEXIBLE TAKEOFF and the thrust is called FLEXIBLE TAKEOFF THRUST.

The use of flexible takeoff thrust saves engine life.

USE OF FLEXIBLE TAKEOFF

The pilot can use flexible takeoff when the actual takeoff weight is lower than the maximum permissible takeoff weight for the actual temperature. The maximum permissible takeoff weight decreases when temperature increases, so it is possible to assume a temperature at which the actual takeoff weight would be the limiting one. This temperature is called FLEXIBLE TEMPERATURE or assumed temperature and is entered in the FADEC via the MCDU PERF TO page in order to get the adapted thrust.

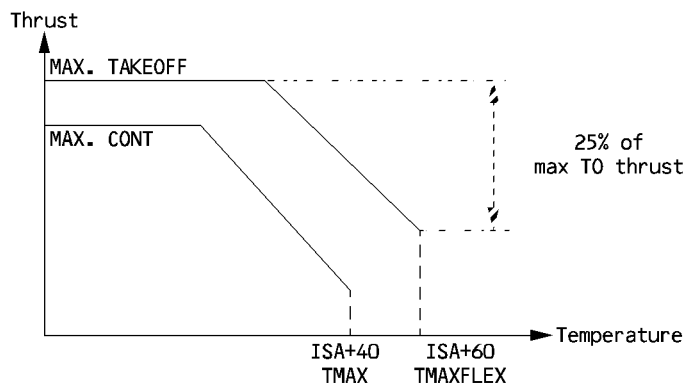
REQUIREMENTS

- Thrust must not be reduced by more than 25 % of the full rated takeoff thrust.
- The flexible takeoff N1 cannot be lower than the Max climb N1 at the same flight conditions.

The FADEC takes the above two constraints into account to determine flexible N1.

The above two constraints also limit the maximum flexible temperature at ISA + 60 (75° C at sea level).

- The flexible temperature cannot be lower than the flat rating temperature, TREF (ISA + 30), or the actual temperature (OAT).



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A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i> FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.20	P 2
	FLEXIBLE TAKEOFF (WEIGHT ENTRY)		SEQ 100	REV 38

- Flexible takeoff is not permitted on contaminated runways.
- The operator should check the maximum thrust (TOGA) at regular intervals in order to detect any engine deterioration, or maintain an adequate engine performance monitoring program to follow up the engine parameters.

RECOMMENDATION

- R · In order to extend engine life and save maintenance costs, it is recommended to use flexible thrust reduction.
- R · However, to improve the takeoff performance, the thrust can be increased by selecting a lower flexible temperature.

Using the same takeoff chart, for a given weight it is possible to :

- Select a temperature lower than the maximum determined one and keep the speeds defined at maximum temperature or,
- Move towards the left side of the takeoff chart (tailwind) while remaining with the same configuration and looking for the same actual takeoff weight.

This produces a lower flexible temperature and, in general, lower takeoff speeds (V1/VR/V2).

Using one of the two above possibilities, check that the selected temperature is greater than the actual temperature (OAT) and greater than the flat rating temperature (TREF).

TAKEOFF PROCEDURE

Depending on environmental takeoff conditions, the following procedure is recommended.

CONDITIONS	PROCEDURE	REASON
Dry or wet well paved runway	– Use the flap setting giving the highest flexible temperature. – When flexible temperature difference between two flap settings is low, use the highest flap setting.	Extend engine life and save maintenance costs.
High altitude takeoff	– Use CONF2/CONF3	Improve comfort
Badly paved runway or Accelerate stop distance limited runway	– Use CONF2/CONF3 - or – Move towards left side of the takeoff chart	Improve comfort Improve stopping distance
Windshear expected along takeoff path	– Use maximum thrust	Maintain acceleration capability
Contaminated runway	– Use maximum thrust (flex forbidden)	Improve stopping distance Decrease time on runway. Required by regulations.

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

- Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.
- For a given configuration and wind value, enter the RTOW chart with the actual takeoff weight to read the flexible temperature and associated speeds. It is reminded that the takeoff weight is the sum of the weight entry and the delta weight displayed in each box. It is allowed to interpolate between two consecutive rows and/or columns for weight and for wind values not displayed on the chart.
 - Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

- Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.
- For a given takeoff weight, wind condition and selected configuration, read the flexible temperature. Retain the takeoff speeds associated with the actual weight.
 - Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
(No speed corrections required).

Example D

DATA : Actual takeoff weight = 68 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example A). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 53° C
Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 51° C

Retain CONF 1+F for takeoff configuration.
 Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 155 kt
 Flexible temperature with air conditioning OFF 53° C
 Air conditioning correction (FCOM 2.02.24 p 1)- 4° C
 Maximum flexible temperature 49° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

R CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with selected configuration, wind and actual takeoff weight to read the flexible temperature associated with this weight.
2. Apply the first correction :

If the flexible temperature is less than or equal to TVMC (line 3), apply ΔT_{flex} correction from line 1 and apply speed corrections ($\Delta V1/\Delta VR/\Delta V2$) from line 2.

Else, (flexible temperature greater than TVMC), apply ΔT_{flex} from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.

- R Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU,
 R flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with
 R maximum permissible takeoff weight or the speeds read in the chart for the actual
 R weight if they are all lower.

No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).

3. To combine a second and/or a third correction, proceed as per point 2.

4. Check that the final flexible temperature is :

- higher than OAT and TREF
- limited to TMAXFLEX

If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.

If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.

Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.20 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.

– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet influence first.

R

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

- Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.
- For a given configuration and wind value, enter the RTOW chart with the actual takeoff weight to read the flexible temperature and associated speeds. It is reminded that the takeoff weight is the sum of the weight entry and the delta weight displayed in each box. It is allowed to interpolate between two consecutive rows and/or columns for weight and for wind values not displayed on the chart.
 - Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

- Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.
- For a given takeoff weight, wind condition and selected configuration, read the flexible temperature. Retain the takeoff speeds associated with the actual weight.
 - Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
(No speed corrections required).

Example D

DATA : Actual takeoff weight = 72 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

- R
- Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example A). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 1+F,
Flexible temperature 57° C

Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 2,
Flexible temperature 57° C

Equivalent performance is obtained from the two different configurations.

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	Retain CONF 1+F as the speeds are lower.	
	Takeoff speeds are V1 = 138 kt, VR = 150 kt, V2 = 151 kt	
	Flexible temperature with air conditioning OFF	.57° C
R	Air conditioning correction (FCOM 2.02.24 p 1)	– 5° C
R	Maximum flexible temperature	.52° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with selected configuration, wind and actual takeoff weight to read the flexible temperature associated with this weight.

2. Apply the first correction :

If the flexible temperature is less than or equal to TVMC (line 3), apply ΔT_{flex} correction from line 1 and apply speed corrections ($\Delta V1/\Delta VR/\Delta V2$) from line 2.

Else, (flexible temperature greater than TVMC), apply ΔT_{flex} from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.

Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU, flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart for the actual weight if they are all lower.

No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).

3. To combine a second and/or a third correction, proceed as per point 2.

4. Check that the final flexible temperature is :

- higher than OAT and TREF
- limited to TMAXFLEX

If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.

If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.

Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.20 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
– Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet influence first.

DETERMINATION OF FLEXIBLE TAKEOFF TEMPERATURE AND SPEEDS

- Before determining the flexible temperature, calculate the maximum permissible takeoff weight (see previous section) and ensure that the actual takeoff weight is lower than the determined maximum takeoff weight.
- For a given configuration and wind value, enter the RTOW chart with the actual takeoff weight to read the flexible temperature and associated speeds. It is reminded that the takeoff weight is the sum of the weight entry and the delta weight displayed in each box. It is allowed to interpolate between two consecutive rows and/or columns for weight and for wind values not displayed on the chart.
 - Repeat this process for the other configuration available. Select that configuration giving the highest flexible temperature.

CORRECTIONS DUE TO DIFFERENT TAKEOFF CONDITIONS

When the takeoff conditions are different from those provided on the chart, apply the associated corrections.

- R

R

R
- Note : If the RTOW chart is based on the CG being at 25 %, the crew can determine the flexible temperature at a more forward CG by decreasing the flexible temperature by 2°C. V1, VR and V2 must be increased by 1 knot.*

CONSERVATIVE CORRECTIONS FOR QNH AND BLEEDS FROM FCOM 2.02.24 P 1

- Corrections are given for QNH $\neq$ 1013 hPa, air conditioning ON, anti ice ON.
- For a given takeoff weight, wind condition and selected configuration, read the flexible temperature. Retain the takeoff speeds associated with the actual weight.
 - Apply the published temperature correction. To combine two or more corrections, add the different corrections and apply to temperature value.
(No speed corrections required).

Example D

DATA : Actual takeoff weight = 68 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 1013 hPa

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example A). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 67° C

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 66° C

Retain CONF 1+F for takeoff configuration.
 Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt
 Flexible temperature with air conditioning OFF 67° C
 Air conditioning correction (FCOM 2.02.24 p 1)- 7° C
 Maximum flexible temperature 60° C

CORRECTIONS FOR WET RUNWAY FROM FCOM 2.04.10

(Refer to FCOM 2.04.10)

CORRECTIONS PRODUCED ON THE RTOW CHART (SEE EXAMPLE ON 2.02.16 P 6)

A description of this correction is given on 2.02.16 p 3. The list of corrections is not exhaustive, however the most commonly used corrections are wet runway, QNH, air conditioning and/or anti-icing. A maximum of three corrections can be produced on one chart.

To apply the correction, proceed as follows :

1. Enter the chart with selected configuration, wind and actual takeoff weight to read the flexible temperature associated with this weight.
2. Apply the first correction :

If the flexible temperature is less than or equal to TVMC (line 3), apply ΔT_{flex} correction from line 1 and apply speed corrections ($\Delta V1/\Delta VR/\Delta V2$) from line 2.

Else, (flexible temperature greater than TVMC), apply ΔT_{flex} from line 3 and $\Delta V1/\Delta VR/\Delta V2$ corrections from line 4.

Check V2 against VMU limitation (FCOM 2.02.25). If V2 is lower than V2 limited by VMU, flexible takeoff is not possible. Set TOGA thrust and retain the speeds associated with maximum permissible takeoff weight or the speeds read in the chart for the actual weight if they are all lower.

No speed correction is required for QNH and bleeds influence (Not applicable to maximum takeoff weight determination).

3. To combine a second and/or a third correction, proceed as per point 2.
4. Check that the final flexible temperature is :

- higher than OAT and TREF
- limited to TMAXFLEX

If the check is fulfilled, retain final flexible temperature as the one to be inserted in the MCDU.

If the check is not fulfilled, (final flexible temperature lower than OAT or TREF), no flexible takeoff is possible.

Use TOGA thrust and retain speeds that have been calculated for the maximum permissible takeoff weight. (See 2.02.20 p 7)

Note : – QNH correction is given for ± 10 hPa. It is allowed to extrapolate linearly for greater QNH deviation.
 – Corrections from the chart must be applied from top to bottom, i.e. in the RTOW on 2.02.16 p 6, apply the wet influence first.

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example E

DATA : Actual takeoff weight = 68 000 kg
Head wind = 10 kt
QNH = 998 hPa
WET runway
Air conditioning OFF

- R Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example B). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 53° C
Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 51° C
Retain CONF 1+F as the flexible temperature is higher.

Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 155 kt

Apply WET correction

For flexible temperature < TVMC (58° C), $\Delta T_{flex} =$ – 1° C

Intermediate flex temperature 52° C

Associated speeds,

V1 = 153 kt – 6 = 147 kt

VR = 153 kt – 0 = 153 kt

V2 = 155 kt – 0 = 153 kt

- R Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.

Apply QNH correction

For flex temperature < TVMC (54° C), $\Delta T_{flex} =$ – 2° C

Maximum flexible temperature 50° C

Check that OAT/TREF < flex temperature ≤ TMAXFLEX

No speed correction.

Takeoff speeds are V1 = 147 kt, VR = 153 kt, V2 = 153 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	53	153	153	155
FCOM correction(s)				
Intermediate value	53	153	153	155
WET Correction	– 1	– 6	0	0
Intermediate value	52	147	153	153
QNH Correction	– 2	0	0	0
Final value	50	147	153	153

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COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
Apply speed corrections except for QNH and bleed influences.

Example F

DATA : Actual takeoff weight = 68 000 kg
Head wind = 10 kt
Air conditioning ON
QNH = 998 hPa
WET runway

- R Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example C). The actual weight being lower than the maximum one, flexible takeoff is possible.
- Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 53° C
 - Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 51° C
 - Retain CONF 1+F for takeoff configuration.
Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 155 kt
 - First, apply the correction from FCOM page 2.02.24 p 1.
Flexible temperature with air conditioning OFF 53° C
Air conditioning correction – 4° C
Intermediate flexible temperature 49° C
No speed correction.
 - Apply WET correction
For flexible temperature < TVMC (58° C), $\Delta T_{flex} =$ – 1° C
Intermediate flex temperature 48° C
Associated speeds,
V1 = 153 kt – 6 = 147 kt
VR = 153 kt – 0 = 153 kt
V2 = 155 kt – 0 = 155 kt
 - R Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.
 - Apply QNH correction
For flexible temperature ≤ TVMC (54° C), $\Delta T_{flex} =$ – 2° C
Maximum flexible temperature 46° C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
No speed correction.
Takeoff speeds are V1 = 147 kt, VR = 153 kt, V2 = 155 kt

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example E

DATA : Actual takeoff weight = 72 000 kg
Head wind = 10 kt
QNH = 998 hPa
WET runway
Air conditioning OFF

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example B). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 1+F,

Flexible temperature 57° C

Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 2,

Flexible temperature 57° C

Equivalent performance is obtained from the two different configurations.

Retain CONF 1+F as the speeds are lower.

Takeoff speeds are V1 = 138 kt, VR = 150 kt, V2 = 151 kt

Apply WET correction

For flexible temperature < TVMC (57° C), $\Delta T_{flex} =$ – 1° C

Intermediate flex temperature 56° C

Associated speeds,

V1 = 138 kt – 7 = 131 kt

VR = 150 kt – 0 = 150 kt

V2 = 151 kt – 0 = 151 kt

Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.

Apply QNH correction

R For flex temperature $\geq$ TVMC (50° C), $\Delta T_{flex} =$ – 3° C

R Maximum flexible temperature 53° C

Check that OAT/TREF < flex temperature $\leq$ TMAXFLEX

No speed correction.

Takeoff speeds are V1 = 131 kt, VR = 150 kt, V2 = 151 kt

R

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	57	138	150	151
FCOM correction(s)				
Intermediate value	57	138	150	151
WET Correction	– 1	– 7	0	0
Intermediate value	56	131	150	151
QNH Correction	– 3	0	0	0
Final value	53	131	150	151

COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
 Apply speed corrections except for QNH and bleed influences.

Example F

DATA : Actual takeoff weight = 72 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 998 hPa
 WET runway

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example C). The actual weight being lower than the maximum one, flexible takeoff is possible.

- Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 1+F,
 Flexible temperature 57° C
- Enter the 10 kt head wind column and interpolate for 72 000 kg, CONF 2,
 Flexible temperature 57° C
- Equivalent performance is obtained from the two different configurations.
- Retain CONF 1+F as the speeds are lower.
- Takeoff speeds are V1 = 138 kt, VR = 150 kt, V2 = 151 kt
- First, apply the correction from FCOM page 2.02.24 p 1.
 Flexible temperature with air conditioning OFF 57° C
- R Air conditioning correction – 5° C
- R Intermediate flexible temperature 52° C
- No speed correction.
- Apply WET correction
 For flexible temperature < TVMC (57° C), ΔTflex = ... – 1° C
- R Intermediate flex temperature 51° C
- Associated speeds,
 V1 = 138 kt – 7 = 131 kt
 VR = 150 kt – 0 = 150 kt
 V2 = 151 kt – 0 = 151 kt
 Since speed correction on V2 is 0, no V2 check against VMU limitation is necessary.
- Apply QNH correction
 For flexible temperature ≤ TVMC (50° C), ΔTflex = ... – 3° C
- R Maximum flexible temperature 48° C
- Check that OAT/TREF < flex temperature ≤ TMAXFLEX
- No speed correction.
- Takeoff speeds are V1 = 131 kt, VR = 150 kt, V2 = 151 kt

Note : – When the flexible temperature is higher than TVMC, it is allowed to limit the flexible temperature to TVMC and apply only corrections from lines 1 and 2.
– If asterisk or dotted lines appear in the correction boxes, refer to more conservative corrections provided in the FCOM.

Example E

DATA : Actual takeoff weight = 68 000 kg
Head wind = 10 kt
QNH = 998 hPa
WET runway
Air conditioning OFF

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example B). The actual weight being lower than the maximum one, flexible takeoff is possible.

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 67° C

Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 66° C

Retain CONF 1+F as the flexible temperature is higher.

Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt

Apply WET correction

For flexible temperature < TVMC (69° C), $\Delta T_{flex} =$ – 2° C

Intermediate flex temperature 65 ° C

Associated speeds,

V1 = 153 kt – 8 = 145 kt

VR = 153 kt – 2 = 151 kt

V2 = 154 kt – 2 = 152 kt

Check V2 against VMU limitation in FCOM 2.02.25.

Apply QNH correction

R For flex temperature $\geq$ TVMC (61° C), $\Delta T_{flex} =$ – 3° C

Maximum flexible temperature 62° C

Check that OAT/TREF < flex temperature $\leq$ TMAXFLEX

No speed correction.

Takeoff speeds are V1 = 145 kt, VR = 151 kt, V2 = 152 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	67	153	153	154
FCOM correction(s)				
Intermediate value	67	153	153	154
WET Correction	– 2	– 8	– 2	– 2
Intermediate value	65	145	151	152
QNH Correction	– 3	0	0	0
Final value	62	145	151	152

COMBINING CORRECTIONS FROM FCOM AND CHART

1. Apply corrections from FCOM (see 2.02.24 p 1).
2. Apply corrections from the RTOW chart.
Apply speed corrections except for QNH and bleed influences.

Example F

DATA : Actual takeoff weight = 68 000 kg
 Head wind = 10 kt
 Air conditioning ON
 QNH = 998 hPa
 WET runway

Use the chart from 2.02.16 p 6. Determine the maximum permissible takeoff weight (see example C). The actual weight being lower than the maximum one, flexible takeoff is possible.

- Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 1+F,
Flexible temperature 67° C
- Enter the 10 kt head wind column and interpolate for 68 000 kg, CONF 2,
Flexible temperature 66° C
- Retain CONF 1+F for takeoff configuration.
Takeoff speeds are V1 = 153 kt, VR = 153 kt, V2 = 154 kt
- First, apply the correction from FCOM page 2.02.24 p 1.
Flexible temperature with air conditioning OFF 67° C
Air conditioning correction – 7° C
Intermediate flexible temperature 60° C
No speed correction.
- Apply WET correction
For flexible temperature < TVMC (69° C), $\Delta T_{flex} =$ – 2° C
Intermediate flex temperature 58° C
Associated speeds,
V1 = 153 kt – 8 = 145 kt
VR = 153 kt – 2 = 151 kt
V2 = 154 kt – 2 = 152 kt
- R Check V2 against VMU limitation in FCOM 2.02.25.
- Apply QNH correction
- R For flexible temperature < TVMC (61° C), $\Delta T_{flex} =$ – 3° C
Maximum flexible temperature 55° C
Check that OAT/TREF < flex temperature ≤ TMAXFLEX
No speed correction.
Takeoff speeds are V1 = 145 kt, VR = 151 kt, V2 = 152 kt

	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	57	138	150	151
FCOM correction(s)	– 5	0	0	0
Intermediate value	52	138	150	151
WET Correction	– 1	– 7	0	0
Intermediate value	51	131	150	151
QNH Correction	– 3	0	0	0
Final value	48	131	150	151

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

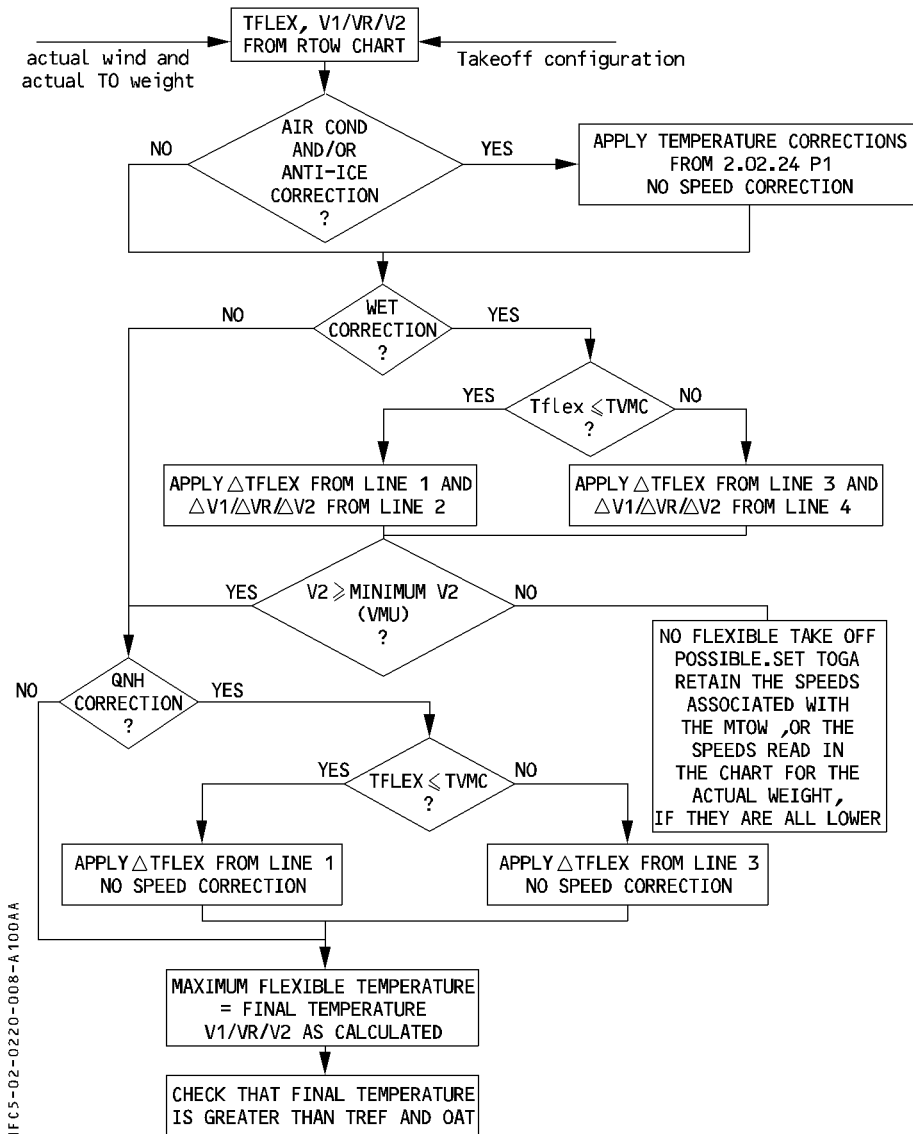
- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight;

R OR

- R – You can retain the speeds associated with the actual takeoff weight provided they are
- R all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

R The flow diagram gives the different steps to follow



	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	53	153	153	155
FCOM correction(s)	– 4	0	0	0
Intermediate value	49	153	153	155
WET Correction	– 1	– 6	0	0
Intermediate value	48	147	153	155
QNH Correction	– 2	0	0	0
Final value	46	147	153	155

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

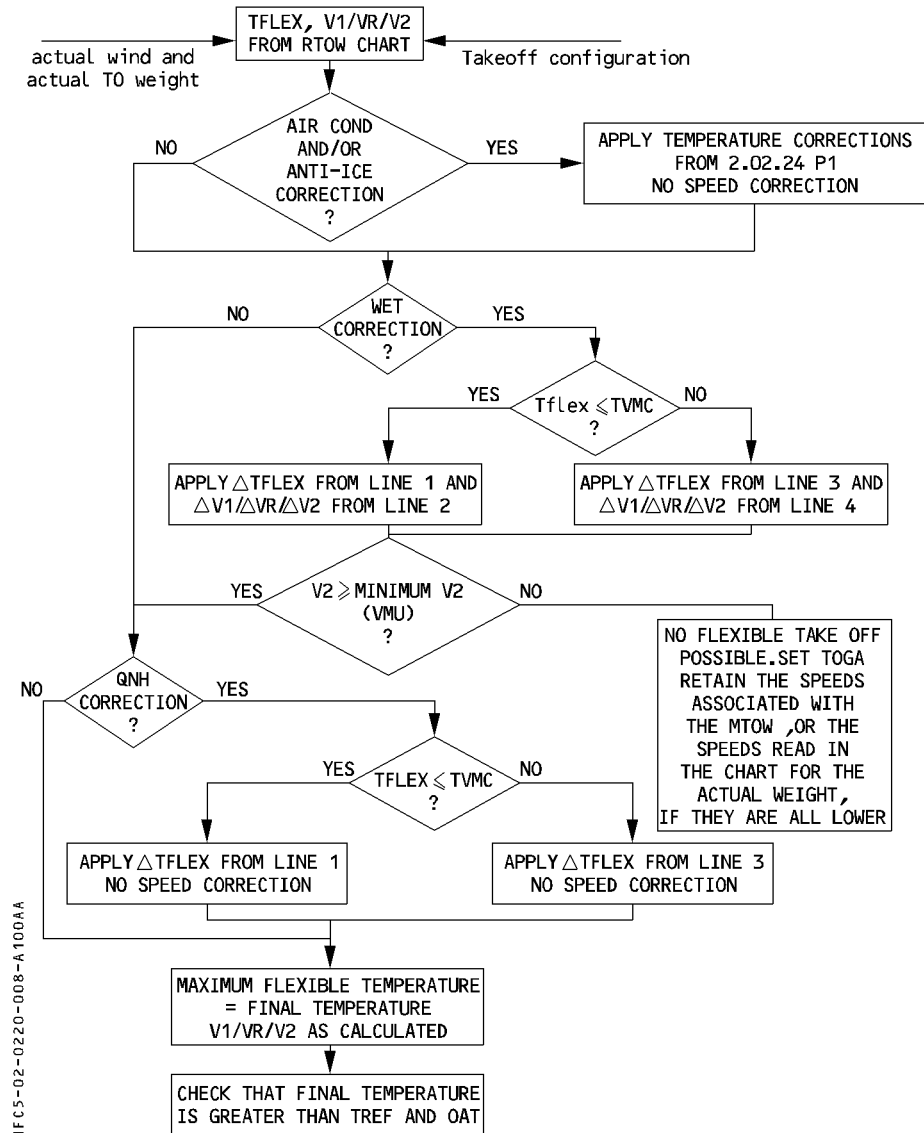
- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight;

R OR

- R – You can retain the speeds associated with the actual takeoff weight provided they are
- R all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

R The flow diagram gives the different steps to follow



	Takeoff Configuration : 1 + F			
	Tflex	V1	VR	V2
Chart temperature	67	153	153	154
FCOM correction(s)	– 7	0	0	0
Intermediate value	60	153	153	154
WET Correction	– 2	– 8	– 2	– 2
Intermediate value	58	145	151	152
QNH Correction	– 3	0	0	0
Final value	55	145	151	152

FLEXIBLE TAKEOFF NOT POSSIBLE

In some cases when the actual takeoff weight is lower than the maximum permissible one but no flexible takeoff possible (that is flexible temperature lower than TREF or OAT) :

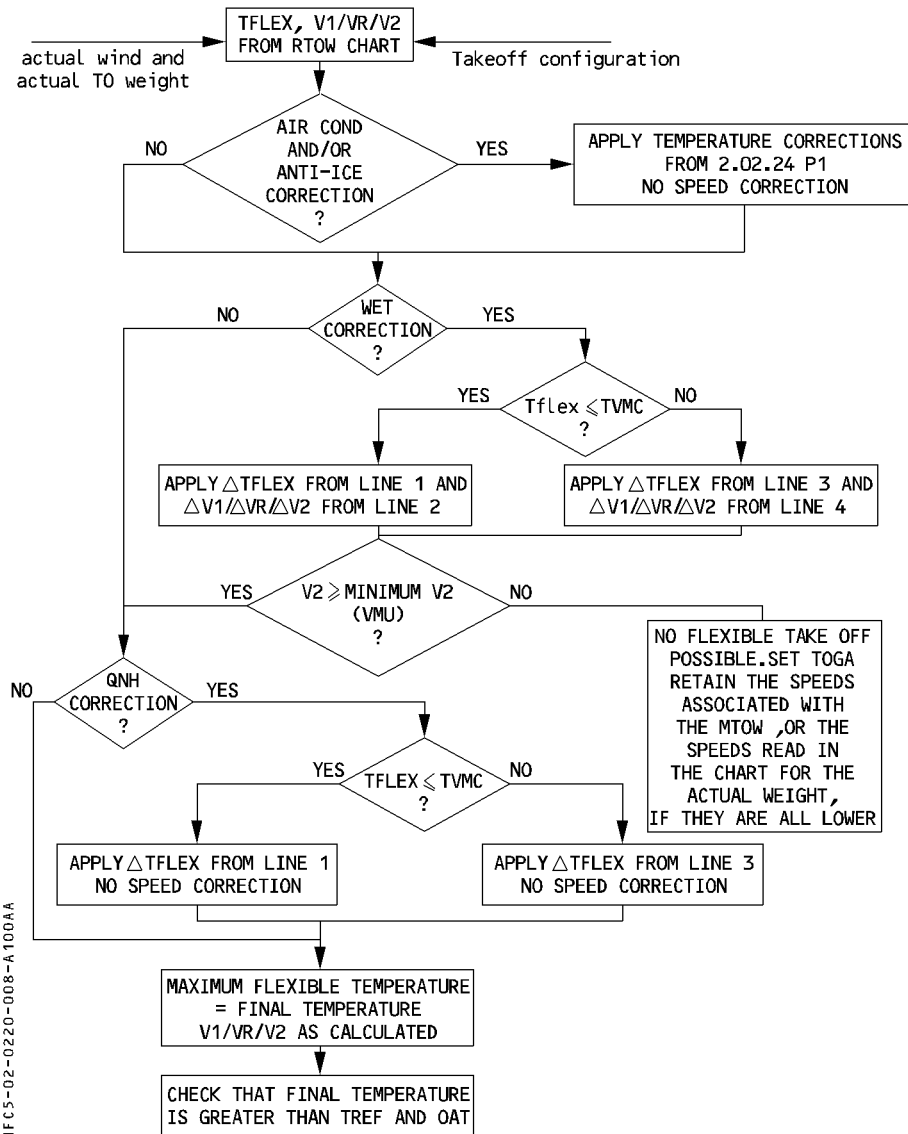
- It is mandatory to use TOGA thrust
- You can retain the speeds that have been calculated for the maximum permissible takeoff weight ;

OR

- You can retain the speeds associated with the actual takeoff weight provided they are all lower than the speeds calculated for the maximum permissible takeoff weight.

SUMMARY

R The flow diagram gives the different steps to follow



EFFECT OF QNH AND BLEEDS (up to 9200 feet)

R

To take into account QNH deviation and/or bleeds ON apply

CORRECTIONS ON TEMPERATURE IF FLEX TAKEOFF PERFORMED		CORRECTIONS ON WEIGHT IF TAKEOFF WITH FULL THRUST IS PERFORMED
Add 1°C/30hPa until pressure altitude equals zero. Add 1°C/40hPa for pressure altitude below 0 ft.	QNH above 1013 hPa	Add 50 kg/hPa until pressure altitude equals zero. Add 30 kg/hPa for pressure altitude below 0 ft.
Subtract 1°C/3hPa	QNH below 1013 hPa	Subtract 120 kg/hPa
Subtract 1°C	* Engine A/ICE ON	Subtract 450 kg
Subtract 2°C	* Total A/ICE ON	OAT ≤ ISA + 5 Subtract 1450 kg OAT > ISA + 5 Subtract 3350 kg
Subtract 5°C	Air Conditioning ON	Subtract 3200 kg
Compare corrected temp (CT), flat rating temp (T REF) and OAT	CT higher than OAT and CT higher than TREF } Take CT as flex temp limited to ISA + 43 Either conditions above not fulfilled } No flexible takeoff possible determine MAX TOW	

NEC5-02-0224-001-A035AA

Note : — * Corrections valid only for OAT < 10°C
 — For high altitude operation, refer to 2.02.24 p3 (if applicable)

EXAMPLES

Airport geometric elevation = 450 feet

Takeoff chart data

QNH = 1013 hPa

Anti ice OFF

Air conditioning OFF

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.24	P 2
	QNH/BLEEDS CORRECTION		SEQ 035	REV 29

Example 1 - Full thrust takeoff

- R Actual data : OAT = 5°C
QNH = 1040 hPa
Engine anti ice ON
Air conditioning OFF
- R Weight read on the takeoff chart : 85000 kg.
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 feet according to the ISA model).
Pressure altitude = $450 - (1040 - 1013) \times 28 = -306$ feet
Read in the above table the corrections for high QNH and engine anti ice ON.
QNH correction = $50 \text{ kg} \times (450/28) + 30 \text{ kg} \times (306/28) = +1130$ kg
Engine anti ice correction : - 450 kg
The maximum permissible takeoff weight is $85000 + 1130 - 450 = 85680$ kg

Example 2 - Flexible thrust takeoff

- R Actual data : OAT = 5°C
QNH = 1040 hPa
Anti ice OFF
Air conditioning ON
TOW = 75000 kg
- R Flexible temperature read on the takeoff chart : TFLEX = 55°C.
Read TREF on the takeoff chart or on the quick reference table.
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 feet according to the ISA model).
Pressure altitude = $450 - (1040 - 1013) \times 28 = -306$ feet
Read in the above table the correction for QNH and air conditioning ON :
QNH correction = $1^\circ\text{C}/30 \text{ hPa} \times (450/28) + 1^\circ\text{C}/40 \text{ hPa} \times (306/28) = 0^\circ\text{C}$
- R Air conditioning ON correction : - 5°C
- R New flexible temperature = $55 + 0 - 5 = 50^\circ\text{C}$
Check that the flexible temperature is above TREF and actual OAT.
Check that the flexible temperature is less than the maximum flexible temperature and retain the lower of the two.

EFFECT OF QNH AND BLEEDS (up to 9200 feet)

R

To take into account QNH deviation and/or bleeds ON apply

CORRECTIONS ON TEMPERATURE IF FLEX TAKEOFF PERFORMED		CORRECTIONS ON WEIGHT IF TAKEOFF WITH FULL THRUST IS PERFORMED
Add 1°C/40hPa until pressure altitude equals zero. No correction for pressure altitude below 0 ft.	QNH above 1013 hPa	Add 20 kg/hPa until pressure altitude equals zero. No correction for pressure altitude below 0 ft.
Subtract 1°C/6hPa	QNH below 1013 hPa	Subtract 90 kg/hPa
Subtract 1°C	Engine A/ICE ON *	Subtract 250 kg
Subtract 2°C	Total A/ICE ON *	Subtract 750 kg
Subtract 4°C	Air Conditioning ON	Subtract 2100 kg

Compare corrected temp (CT), flat rating temp (T REF) and OAT	CT higher than OAT and CT higher than TREF	} Take CT as flex temp limited to ISA + 60
	Either conditions above not fulfilled		} No flexible takeoff possible determine MAX TOW

NFC5-02-0224-001-A115AA

Note : — * Corrections valid only for OAT < 10°C
 — For high altitude operation, refer to 2.02.24 p3 (if applicable)

EXAMPLES

Takeoff chart data

Airport geometric elevation = 450 feet
 QNH = 1013 hPa
 Anti ice OFF
 Air conditioning OFF

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.24	P 2
	QNH/BLEEDS CORRECTION		SEQ 045	REV 31

Example 1 - Full thrust takeoff

- R Actual data : OAT = 5°C
QNH = 1040 hPa
Engine anti ice ON
Air conditioning OFF
- R Weight read on the takeoff chart : 70000 kg
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 feet according to the ISA model).
Pressure altitude = $450 - (1040 - 1013) \times 28 = -306$ feet
Read in the above table the corrections for high QNH and engine anti ice ON.
QNH correction = $20 \text{ kg} \times (450/28) + 0 \text{ kg} \times (306/28) = +320$ kg
Engine anti ice correction : -250 kg
The maximum permissible takeoff weight is $70000 + 320 - 250 = 70070$ kg

Example 2 - Flexible thrust takeoff

- R : Actual data OAT = 5°C
QNH = 1040 hPa
Anti ice OFF
Air conditioning ON
TOW = 65000 kg
- R Flexible temperature read on the takeoff chart : TFLEX = 55°C
Read TREF on the takeoff chart or on the quick reference table.
Determine the actual airport pressure altitude (1 hPa is equivalent to 28 feet according to the ISA model).
Pressure altitude = $450 - (1040 - 1013) \times 28 = -306$ feet
Read in the above table the correction for QNH and air conditioning ON :
QNH correction = $1^\circ\text{C}/40 \text{ hPa} \times (450/28) + 0 = 0^\circ\text{C}$
Air conditioning ON correction : -4°C
New flexible temperature = $55 + 0 - 4 = 51^\circ\text{C}$
Check that the flexible temperature is above TREF and actual OAT.
Check that the flexible temperature is less than the maximum flexible temperature and retain the lower of the two.

EFFECT OF QNH AND BLEEDS (up to 9200 feet)

To take into account QNH deviation and/or bleeds ON apply

CORRECTIONS ON TEMPERATURE IF FLEX TAKEOFF PERFORMED		CORRECTIONS ON WEIGHT IF TAKEOFF WITH FULL THRUST IS PERFORMED
No correction except if actual pressure altitude is between 2000 ft and 4000 ft: subtract 1°C/3hPa	QNH above 1013 hPa	No correction except if actual pressure altitude is between 2000 ft and 4000 ft: subtract 40 kg/hPa
Subtract 1°C/2hPa	QNH below 1013 hPa	Subtract 140 kg/hPa
Subtract 1°C	* Engine A/ICE ON	Subtract 300 kg
Subtract 2°C	* Total A/ICE ON	OAT ≤ ISA + 5 Subtract 950 kg OAT > ISA + 5 Subtract 1650 kg
Subtract 7°C	Air Conditioning ON	Subtract 2200 kg
Compare corrected temp (CT), flat rating temp (T REF) and OAT	CT higher than OAT and CT higher than TREF } Take CT as flex temp limited to ISA + 53 Either conditions above not fulfilled } No flexible takeoff possible determine MAX TOW	

NFC5-02-0224-001-A245AA

Note : – * Corrections valid only for OAT < 10°C
 – For high altitude operation, refer to 2.02.24 p 3 (if applicable)

EXAMPLES

Airport geometric elevation = 450 feet

Takeoff chart data

QNH = 1013 hPa

Anti ice OFF

Air conditioning OFF

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.24	P 2
	QNH/BLEEDS CORRECTION		SEQ 245	REV 34

Example 1 - Full thrust takeoff

Actual data : OAT = 5°C

QNH = 1040 hPa

Engine anti ice ON

Air conditioning OFF

Weight read on the takeoff chart : 73 000 kg

Read in the above table the corrections for high QNH and engine anti ice ON.

QNH correction : none

Engine anti ice correction : - 300 kg

The maximum permissible takeoff weight is $73000 + 0 - 300 = 72700$ kg

Example 2 - Flexible thrust takeoff

Actual data : OAT = 5°C

QNH = 1040 hPa

Anti ice OFF

Air conditioning ON

TOW = 65000 kg

Flexible temperature read on the takeoff chart : TFLEX = 55°C

Read TREF on the takeoff chart or on the quick reference table.

Read in the above table the correction for QNH and air conditioning ON :

QNH correction = none

Air conditioning ON correction : - 7°C

New flexible temperature = $55 - 7 = 48$ °C

Check that the flexible temperature is above TREF and actual OAT.

Check that the flexible temperature is less than the maximum flexible temperature and retain the lower of the two.

SPEEDS LIMITED BY VMC

Takeoff speeds all have a minimum value limited by control. These minimum values are given in the tables down below.

R

MINIMUM V1											
CONF	PRESSURE ALTITUDE (FT)										
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000	14100
1 + F	116	115	114	112	111	109	106	103	100	100	100
2	116	115	114	112	111	109	106	103	100	100	100
3	114	113	112	110	109	108	105	101	100	100	100

R

MINIMUM VR											
CONF	PRESSURE ALTITUDE (FT)										
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000	14100
1 + F	121	121	119	118	116	114	110	107	104	100	100
2	121	121	119	118	116	114	110	107	104	100	100
3	119	119	117	116	114	112	109	105	103	100	100

R

MINIMUM V2											
CONF	PRESSURE ALTITUDE (FT)										
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000	14100
1 + F	126	126	124	122	120	118	114	110	108	102	100
2	125	125	123	121	119	117	113	109	107	101	100
3	125	125	123	121	119	118	114	110	107	102	100

V2 LIMITED BY VMU/VMCA

The following tables, one per configuration, provide the V2 limited by minimum unstick speed and minimum control speed in the air.

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 1 + F										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	126	127	133	138	143	148	152	156	161	164
0	125	127	133	138	143	148	152	156	161	164
1000	123	127	133	138	143	147	152	156	161	164
2000	122	127	133	138	143	147	152	156	161	164
3000	121	127	132	138	143	147	152	156	161	164
4000	121	127	132	138	143	147	152	156	161	164
5000	121	127	132	138	143	147	152	156	161	164
6000	121	127	132	137	143	147	152	156	162	164
7000	121	126	132	137	143	147	152	157	162	165
8000	120	126	132	137	143	147	152	157	162	165
9000	120	126	132	137	143	147	152	157	163	166
10000	120	126	132	137	143	148	153	158	163	166
11000	120	126	132	137	143	148	153	158	163	166
12000	120	126	132	137	143	148	153	159	164	167
13000	120	126	132	137	143	149	154	159	164	167
14000	120	126	132	138	144	149	154	159	165	168
14600	120	126	132	138	144	149	154	160	165	168

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SPEEDS LIMITED BY VMC

Takeoff speeds all have a minimum value limited by control. These minimum values are given in the tables down below.

R

MINIMUM V1										
CONF	PRESSURE ALTITUDE (FT)									
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000
1+F	110	110	109	108	107	106	104	103	101	100
2	110	110	109	108	107	106	104	103	101	100
3	110	110	109	108	107	106	104	103	101	100

R

MINIMUM VR										
CONF	PRESSURE ALTITUDE (FT)									
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000
1+F	113	113	112	111	110	109	107	104	103	100
2	113	113	112	111	110	109	107	104	103	100
3	113	113	112	111	110	109	107	104	103	100

R

MINIMUM V2										
CONF	PRESSURE ALTITUDE (FT)									
	-1000	0	1000	2000	3000	4000	6000	8000	9200	12000
1+F	120	120	118	117	116	115	113	110	109	106
2	120	119	118	117	116	115	113	110	109	106
3	120	120	118	117	116	115	113	110	109	106

V2 LIMITED BY VMU/VMCA

The following tables, one per configuration, provide the V2 limited by minimum unstick speed and minimum control speed in the air.

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 1 + F										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	35	40	45	50	55	60	65	70	75	80
-1000	119	119	119	119	122	128	133	137	142	147
0	119	119	119	119	122	128	133	138	142	147
1000	118	118	118	118	122	128	133	138	143	148
2000	117	117	117	117	122	128	133	138	143	148
3000	116	116	116	117	123	128	133	138	143	148
4000	115	115	115	117	123	128	133	138	143	148
5000	114	114	114	117	123	128	133	138	143	148
6000	113	113	113	117	123	128	133	138	143	148
7000	111	111	111	117	123	128	133	139	143	149
8000	110	110	111	117	123	128	134	139	144	149
9000	109	109	111	117	123	128	134	139	144	149
10000	108	108	111	117	123	129	134	139	144	149
11000	107	107	111	117	123	129	134	139	144	149
12000	106	106	111	117	123	129	134	139	144	150
13000	104	104	111	118	124	129	134	140	145	150
14000	103	104	111	118	124	129	134	140	145	150

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SPEEDS LIMITED BY VMC

Takeoff speeds all have a minimum value limited by control. These minimum values are given in the tables down below.

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	8000	9200	V1 min
CONF 1 + F	116	115	114	112	111	109	108	106	103	100	
CONF 2	116	115	114	112	111	109	108	106	103	100	
CONF 3	114	113	112	110	109	108	106	105	101	100	

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	8000	9200	VR min
CONF 1 + F	122	121	119	118	116	114	112	110	107	104	
CONF 2	122	121	119	118	116	114	112	110	107	104	
CONF 3	120	119	117	116	114	112	111	109	105	103	

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	8000	9200	V2 min
CONF 1 + F	127	126	124	122	120	118	116	114	110	108	
CONF 2	126	125	123	121	119	117	115	113	109	107	
CONF 3	126	125	123	121	119	118	116	114	110	107	

V2 LIMITED BY VMU/VMCA

The following tables, one per configuration, provide the V2 limited by minimum unstick speed and minimum control speed in the air.

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 1 + F										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	127	128	133	138	143	148	152	157	161	163
0	126	128	133	138	143	148	152	157	161	163
1000	124	128	133	138	143	148	152	157	161	164
2000	122	128	133	138	143	148	152	157	161	164
3000	122	127	133	138	143	148	152	157	161	164
4000	122	127	133	138	143	148	152	157	161	164
5000	121	127	133	138	143	148	152	157	162	164
6000	121	127	133	138	143	148	152	157	162	164
7000	121	127	133	138	143	148	152	157	162	165
8000	121	127	132	138	143	148	153	158	163	165
9000	121	127	132	138	143	148	153	158	163	165
10000	121	127	132	138	143	148	153	158	163	166
11000	121	127	132	138	143	148	154	159	164	166
12000	121	127	132	138	143	149	154	159	164	167
13000	121	127	132	138	144	149	154	159	165	167
14000	120	126	132	138	144	150	155	160	165	168
14600	120	126	132	138	144	150	155	160	165	168

SPEEDS LIMITED BY VMC

Takeoff speeds all have a minimum value limited by control. These minimum values are given in the tables down below.

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9200	14100	V1 min
CONF 1 + F	117	115	114	113	112	112	111	110	109	108	106	100	
CONF 2	115	113	112	111	111	110	109	108	107	106	104	100	
CONF 3	114	112	111	110	110	110	109	108	107	105	104	100	

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9200	14100	VR min
CONF 1 + F	121	119	118	116	116	116	115	114	113	111	110	102	
CONF 2	119	117	116	115	114	114	113	112	111	109	108	100	
CONF 3	118	116	115	114	114	114	113	112	110	109	107	100	

R

Pressure altitude (ft)	-2000	0	1000	2000	3000	4000	5000	6000	7000	8000	9200	14100	V2 min
CONF 1 + F	124	121	120	119	119	119	118	117	115	114	112	104	
CONF 2	123	121	120	119	119	119	117	116	115	114	112	103	
CONF 3	123	121	120	119	119	118	117	116	115	114	112	103	

V2 LIMITED BY VMU/VMCA

The following tables, one per configuration, provide the V2 limited by minimum unstick speed and minimum control speed in the air.

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)								
CONFIGURATION 1 + F								
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)							
	45	50	55	60	65	70	75	80
-2000	124	124	130	135	140	145	150	155
0	121	124	130	135	140	145	150	155
1000	120	124	130	135	140	145	151	155
2000	119	124	129	135	140	146	151	155
3000	119	124	130	135	140	146	151	156
4000	119	124	130	135	141	146	151	156
5000	119	124	130	135	141	146	151	156
6000	119	124	130	135	141	146	152	156
7000	119	124	130	136	141	146	152	156
8000	118	124	130	136	141	147	152	157
9000	118	124	130	136	141	147	152	157
10000	118	124	130	136	141	147	152	157
11000	118	124	130	136	142	147	153	157
12000	118	124	130	136	142	147	153	158
13000	118	124	130	136	142	148	153	158
14100	118	124	130	136	142	148	153	158

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 2										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	125	125	126	131	135	140	144	148	152	154
0	124	124	126	131	135	140	144	148	152	154
1000	122	122	126	131	135	139	144	148	152	154
2000	121	121	126	130	135	139	144	148	152	154
3000	119	121	126	130	135	139	144	148	152	155
4000	117	120	125	130	135	139	144	148	152	155
5000	115	120	125	130	135	139	144	148	152	155
6000	115	120	125	130	135	139	144	148	153	155
7000	115	120	125	130	135	139	144	148	153	155
8000	114	120	125	130	135	139	144	148	153	156
9000	114	120	125	130	135	140	144	149	153	156
10000	114	120	125	130	135	140	144	149	153	156
11000	114	119	125	130	135	140	145	149	154	156
12000	114	119	125	130	135	140	145	149	154	157
13000	114	119	125	130	136	140	145	150	154	157
14000	114	119	125	130	136	141	145	150	155	157
14600	114	119	125	131	136	141	146	150	155	158

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R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 3										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	126	126	126	126	129	134	137	141	145	148
0	124	124	124	125	129	134	137	141	145	148
1000	123	123	123	125	129	134	137	141	145	148
2000	121	121	121	125	129	134	137	141	146	148
3000	119	119	120	125	129	134	137	141	146	148
4000	117	117	120	125	129	134	137	141	146	148
5000	115	115	120	124	129	134	138	141	146	148
6000	113	114	120	124	129	134	138	142	146	148
7000	111	114	119	124	129	134	138	142	146	149
8000	109	114	119	124	129	134	138	142	146	149
9000	109	114	119	124	129	134	138	142	146	149
10000	109	114	119	124	129	134	138	142	147	149
11000	109	114	119	124	129	134	138	142	147	150
12000	109	114	119	124	130	134	138	143	147	150
13000	109	114	119	125	130	134	139	143	147	150
14000	109	114	119	125	130	135	139	143	148	150
14600	109	114	119	125	130	135	139	143	148	151

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MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 2										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	35	40	45	50	55	60	65	70	75	80
-1000	119	119	119	119	119	122	126	131	136	140
0	119	119	119	119	119	122	126	131	136	141
1000	118	118	118	118	118	122	126	131	136	141
2000	117	117	117	117	117	122	127	131	136	141
3000	115	115	115	115	117	122	127	131	136	141
4000	114	114	114	114	117	122	127	132	136	141
5000	113	113	113	113	117	122	127	132	136	141
6000	112	112	112	112	117	122	127	132	137	141
7000	111	111	111	111	117	122	127	132	137	142
8000	110	110	110	111	117	122	127	132	137	142
9000	109	109	109	112	117	122	127	132	137	142
10000	108	108	108	112	117	123	127	132	137	142
11000	106	106	106	112	118	123	128	132	137	142
12000	105	105	106	112	118	123	128	133	137	142
13000	104	104	106	112	118	123	128	133	138	143
14000	103	103	106	112	118	123	128	133	138	143

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MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 3										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	35	40	45	50	55	60	65	70	75	80
-1000	119	119	119	119	119	119	123	128	132	137
0	119	119	119	119	119	119	123	128	133	137
1000	118	118	118	118	118	119	124	128	133	137
2000	117	117	117	117	117	119	124	128	133	137
3000	116	116	116	116	116	119	124	128	133	137
4000	115	115	115	115	115	119	124	128	133	138
5000	114	114	114	114	115	119	124	129	133	138
6000	113	113	113	113	115	119	124	129	133	138
7000	111	111	111	111	115	120	124	129	133	138
8000	110	110	110	110	115	120	124	129	133	138
9000	109	109	109	109	115	120	124	129	134	138
10000	108	108	108	110	115	120	124	129	134	138
11000	107	107	107	110	115	120	125	129	134	139
12000	106	106	106	110	115	120	125	129	134	139
13000	104	104	104	110	115	120	125	130	134	139
14000	103	103	104	110	115	120	125	130	134	139

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R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 2										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	126	126	127	131	136	140	144	148	152	154
0	125	125	127	131	136	140	144	148	152	154
1000	123	123	126	131	136	140	144	148	152	154
2000	121	121	126	131	136	140	144	148	152	154
3000	119	121	126	131	136	140	144	148	152	155
4000	117	121	126	131	135	140	144	148	153	155
5000	115	121	126	131	135	140	144	148	153	155
6000	115	121	126	131	135	140	144	149	153	155
7000	115	120	126	131	135	140	144	149	153	155
8000	115	120	125	131	135	140	144	149	153	156
9000	115	120	125	130	135	140	145	149	154	156
10000	115	120	125	130	135	140	145	149	154	156
11000	114	120	125	130	136	140	145	150	154	156
12000	114	120	125	131	136	141	145	150	154	157
13000	114	120	125	131	136	141	146	150	155	157
14000	114	120	125	131	136	141	146	150	155	157
14600	114	120	125	131	136	141	146	151	155	157

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)										
CONFIGURATION 3										
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)									
	50	55	60	65	70	75	80	85	90	93
-2000	126	126	126	126	130	134	138	142	146	148
0	125	125	125	125	130	134	138	142	146	148
1000	123	123	123	125	130	134	138	142	146	148
2000	121	121	121	125	130	134	138	142	146	148
3000	119	119	120	125	130	134	138	142	146	148
4000	118	118	120	125	130	134	138	142	146	148
5000	116	116	120	125	130	134	138	142	146	148
6000	114	115	120	125	130	134	138	142	146	148
7000	112	115	120	125	130	134	138	142	146	149
8000	110	115	120	125	130	134	138	142	147	149
9000	109	115	120	125	130	134	138	143	147	149
10000	109	115	120	125	130	134	139	143	147	149
11000	109	115	120	125	130	134	139	143	147	149
12000	109	115	120	125	130	135	139	143	148	150
13000	109	115	120	125	130	135	139	143	148	150
14000	109	115	120	125	130	135	139	144	148	150
14600	109	115	120	125	131	135	139	144	148	150

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)								
CONFIGURATION 2								
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)							
	45	50	55	60	65	70	75	80
-2000	123	123	124	129	134	139	144	149
0	121	121	124	129	134	140	145	149
1000	120	120	124	129	135	140	145	149
2000	119	119	124	129	135	140	145	149
3000	119	119	124	129	135	140	145	150
4000	119	119	124	130	135	140	145	150
5000	117	119	124	130	135	140	146	150
6000	116	119	124	130	135	141	146	150
7000	115	119	124	130	135	141	146	150
8000	114	119	124	130	136	141	146	151
9000	113	119	124	130	136	141	146	151
10000	113	119	125	130	136	141	147	151
11000	113	119	125	130	136	141	147	151
12000	113	119	125	131	136	142	147	152
13000	113	119	125	131	136	142	147	152
14100	113	119	125	131	137	142	147	152

R

MINIMUM V2 LIMITED BY VMU/VMCA (KT IAS)								
CONFIGURATION 3								
PRESSURE ALTITUDE (FT)	TAKEOFF WEIGHT (1000 KG)							
	45	50	55	60	65	70	75	80
−2000	123	123	123	124	129	134	139	143
0	121	121	121	124	129	135	140	144
1000	120	120	120	124	129	135	140	144
2000	119	119	119	124	130	135	140	144
3000	119	119	119	124	130	135	140	144
4000	118	118	119	124	130	135	140	144
5000	117	117	119	125	130	135	140	144
6000	116	116	120	125	130	135	140	145
7000	115	115	120	125	130	136	141	145
8000	114	114	119	125	130	136	141	145
9000	112	114	120	125	131	136	141	145
10000	110	114	120	125	131	136	141	145
11000	109	114	120	125	131	136	141	145
12000	109	114	120	126	131	137	142	146
13000	108	114	120	126	131	137	142	146
14100	109	115	120	126	132	137	142	146

INTRODUCTION

These tables enable the crew to quickly determine the takeoff performance at an airport for which no takeoff chart has been established. They are conservative.

USE OF TABLES

A first table gives the corrections to be applied to the runway length for wind and runway slope. Nine other tables give, for three different pressure altitudes (0, 1000 and 2000 feet) and three configurations, the maximum takeoff weight, limitation codes and associated speeds as a function of temperature and corrected runway length. TREF and TMAX are given on the top of each table. For pressure altitudes above 2000 feet, use a specific RTOW chart.

- R *Note* : 1. Quick reference tables are established at V1 min with air conditioning OFF and anti ice OFF
 2. Do not use quick reference tables in case of tailwind.

HOW TO PROCEED

1. Enter the first table with runway length, slope and wind data. Determine the corrected runway length by applying the corrections due to slope and wind.
2. Select the configuration as a function of this corrected runway length.
3. Enter the table(s) corresponding to the configuration and airport pressure altitude.
 As far as airport pressure altitude is concerned, two methods may be applied :
 - interpolate the takeoff performance by using the two tables enclosing the airport pressure altitude,
 - for a more conservative figure, use the table corresponding to the pressure altitude immediately above the airport pressure altitude.
4. Enter the appropriate column of the table(s) with the corrected runway length.
 Once again, two methods may be applied :
 - interpolate the takeoff performance between the two columns enclosing the corrected runway length,
 - for a more conservative figure, use the column corresponding to the shorter corrected runway length.
5. Determination of maximum takeoff weight.
 Enter the table(s) and column(s) as explained above with the actual OAT and read maximum takeoff weight, limitation codes, V1, VR and V2. If necessary interpolate weight and speeds.
6. Determination of flexible temperature.
 The determination of flexible temperature is possible only when there is no obstacle on the flight path. Enter the table(s) and column(s) with the actual takeoff weight and read the corresponding temperature as flexible temperature.
7. In case of obstacles, use the graphs from 2.02.50 to determine the corresponding weight penalty.

LIMITATION CODES

- 1 : first segment

– 2 : second segment

– 3 : runway

– 5 : tire speed

– 6 : brake energy

– 7 : maximum computation weight

– 8 : final takeoff

– 9 : VMU

Note :

1. Limitation code 4 (obstacles) does not appear in quick reference tables.
2. VMC limitation appears with an asterisk (*) in the chart.

CORRECTIONS FOR WIND AND RUNWAY SLOPE

Runway length (m)		1500	1750	2000	2250	2500	2750	3000	3250	3500
Effect of wind	per knot of head wind add (meters)	6	7.5	8	8.5	9.5	10	11	11.5	12.5
Effect of runway slope	per percent uphill slope subtract (meters)	100	150	200	280	375	475	600	725	820
	per percent downhill slope add (meters)	15	15	18	23	23	28	28	30	30

INTRODUCTION

These tables enable the crew to quickly determine the takeoff performance at an airport for which no takeoff chart has been established. They are conservative.

USE OF TABLES

A first table gives the corrections to be applied to the runway length for wind and runway slope. Nine other tables give, for three different pressure altitudes (0, 1000 and 2000 feet) and three configurations, the maximum takeoff weight, limitation codes and associated speeds as a function of temperature and corrected runway length. TREF and TMAX are given on the top of each table. For pressure altitudes above 2000 feet, use a specific RTOW chart.

- R *Note* : 1. Quick reference tables are established at V1 min with air conditioning OFF and anti ice OFF
 2. Do not use quick reference tables in case of tailwind.

HOW TO PROCEED

1. Enter the first table with runway length, slope and wind data. Determine the corrected runway length by applying the corrections due to slope and wind.
2. Select the configuration as a function of this corrected runway length.
3. Enter the table(s) corresponding to the configuration and airport pressure altitude.
 As far as airport pressure altitude is concerned, two methods may be applied :
 - interpolate the takeoff performance by using the two tables enclosing the airport pressure altitude,
 - for a more conservative figure, use the table corresponding to the pressure altitude immediately above the airport pressure altitude.
4. Enter the appropriate column of the table(s) with the corrected runway length.
 Once again, two methods may be applied :
 - interpolate the takeoff performance between the two columns enclosing the corrected runway length,
 - for a more conservative figure, use the column corresponding to the shorter corrected runway length.
5. Determination of maximum takeoff weight.
 Enter the table(s) and column(s) as explained above with the actual OAT and read maximum takeoff weight, limitation codes, V1, VR and V2. If necessary interpolate weight and speeds.
6. Determination of flexible temperature.
 The determination of flexible temperature is possible only when there is no obstacle on the flight path. Enter the table(s) and column(s) with the actual takeoff weight and read the corresponding temperature as flexible temperature.
7. In case of obstacles, use the graphs from 2.02.50 to determine the corresponding weight penalty.

LIMITATION CODES

- 1 : first segment

– 2 : second segment

– 3 : runway

– 5 : tire speed

– 6 : brake energy

– 7 : maximum computation weight

– 8 : final takeoff

– 9 : VMU

Note :

1. Limitation code 4 (obstacles) does not appear in quick reference tables.
2. VMC limitation appears with an asterisk (*) in the chart.

CORRECTIONS FOR WIND AND RUNWAY SLOPE

Runway length (m)		1500	1750	2000	2250	2500	2750	3000	3250	3500
Effect of wind	per knot of head wind add (meters)	6.5	7	8	8.5	9.5	10	11	11.5	12.5
	per percent uphill slope subtract (meters)	160	215	270	325	380	435	490	545	600
Effect of runway slope	per percent downhill slope add (meters)	17	23	29	36	42	48	55	61	67

INTRODUCTION

These tables enable the crew to quickly determine the takeoff performance at an airport for which no takeoff chart has been established. They are conservative.

USE OF TABLES

A first table gives the corrections to be applied to the runway length for wind and runway slope. Nine other tables give, for three different pressure altitudes (0, 1000 and 2000 feet) and three configurations, the maximum takeoff weight, limitation codes and associated speeds as a function of temperature and corrected runway length. TREF and TMAX are given on the top of each table. For pressure altitudes above 2000 feet, use a specific RTOW chart.

Note : 1. Quick reference tables are established for the forward CG envelope (less than 25%) at V1 min with air conditioning OFF and anti ice OFF
 2. Do not use quick reference tables in case of tailwind.

HOW TO PROCEED

1. Enter the first table with runway length, slope and wind data. Determine the corrected runway length by applying the corrections due to slope and wind.
2. Select the configuration as a function of this corrected runway length.
3. Enter the table(s) corresponding to the configuration and airport pressure altitude.
 As far as airport pressure altitude is concerned, two methods may be applied :
 - interpolate the takeoff performance by using the two tables enclosing the airport pressure altitude,
 - for a more conservative figure, use the table corresponding to the pressure altitude immediately above the airport pressure altitude.
4. Enter the appropriate column of the table(s) with the corrected runway length.
 Once again, two methods may be applied :
 - interpolate the takeoff performance between the two columns enclosing the corrected runway length,
 - for a more conservative figure, use the column corresponding to the shorter corrected runway length.
5. Determination of maximum takeoff weight.
 Enter the table(s) and column(s) as explained above with the actual OAT and read maximum takeoff weight, limitation codes, V1, VR and V2. If necessary interpolate weight and speeds.
6. Determination of flexible temperature.
 The determination of flexible temperature is possible only when there is no obstacle on the flight path. Enter the table(s) and column(s) with the actual takeoff weight and read the corresponding temperature as flexible temperature.
7. In case of obstacles, use the graphs from 2.02.50 to determine the corresponding weight penalty.

LIMITATION CODES

- 1 : first segment

– 2 : second segment

– 3 : runway

– 5 : tire speed

– 6 : brake energy

– 7 : maximum computation weight

– 8 : final takeoff

– 9 : VMU

Note :

1. Limitation code 4 (obstacles) does not appear in quick reference tables.
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CORRECTIONS FOR WIND AND RUNWAY SLOPE

Runway length (m)		1500	1750	2000	2250	2500	2750	3000	3250	3500
Effect of wind	per knot of head wind add (meters)	6.5	7	8	8.5	9.5	10	11	11.5	12.5
	per percent uphill slope subtract (meters)	160	215	270	325	380	435	490	545	600
Effect of runway slope	per percent downhill slope add (meters)	17	23	29	36	42	48	55	61	67

EXAMPLE

Pressure altitude : 1400 ft
 Temperature : 30°C
 Runway length : 2750 m
 Wind : 10 kt head
 Slope : 1 % up
 Takeoff configuration : 1 + F

– **Determination of corrected runway length**

(Refer to 2.02.40 p2)
 runway length 2750
 correction for wind 10 × 10 = + 100
 correction for slope- 435
 corrected runway length 2415

– **Determination of a conservative maximum takeoff weight :**

(Refer to 2.02.40 p6)
 – Pressure altitude : 1400 ft – Use the table for 2000 ft.
 – Enter the column for to 2250 m
 – Read the maximum takeoff weight on the line corresponding to the temperature of 30°C : 67100 kg
 V1 = 133 kt, VR = 134 kt, V2 = 139 kt

– **Determination of a precise flexible temperature for the actual takeoff weight of 64000 kg :**

(Refer to 2.02.40 p5 and p6)
 – Interpolate the temperature corresponding to 64000 kg for the runway length of 2415 m at 1000 ft and 2000 ft pressure altitude.
 Results :
 1000 ft : 53°C, V1 = 135 kt, VR = 136 kt, V2 = 140 kt
 2000 ft : 48°C, V1 = 133 kt, VR = 135 kt, V2 = 140 kt
 – Interpolate between these two values to get the flexible temperature
 1400 ft : 51°C, V1 = 134 kt, VR = 136 kt, V2 = 140 kt

CONFIGURATION 1 + F				PRESSURE ALTITUDE = 0 FT	
TREF = 45 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	73.1 2/3 146/46/52	74.9 2/3 152/53/58	76.3 2/3 158/59/64	77.1 3/6 161/62/67	77.4 3/6 160/64/69
-10	72.5 2/3 144/45/50	74.3 2/3 150/51/56	75.8 2/3 156/57/62	76.5 3/6 158/60/65	76.9 3/6 157/62/67
0	71.9 2/3 142/43/48	73.7 2/3 148/49/54	75.2 2/3 153/55/60	76.0 3/6 155/58/63	76.4 3/6 155/60/65
10	71.2 2/3 140/41/46	73.1 2/3 146/47/52	74.7 2/3 151/53/58	75.4 3/6 153/56/61	75.8 3/6 152/58/63
20	70.4 2/3 139/39/44	72.4 2/3 144/45/50	73.9 2/3 149/51/56	74.7 3/6 150/54/59	75.2 3/6 150/56/61
30	69.6 2/3 137/38/43	71.7 2/3 142/44/49	73.3 2/3 147/49/54	74.0 3/6 148/52/57	74.5 3/6 148/54/59
40	69.0 2/3 135/36/41	71.1 2/3 140/42/47	72.7 3/6 146/48/52	73.4 3/6 146/50/55	73.9 3/6 145/52/57
45	68.6 2/3 134/35/40	70.7 2/3 140/41/46	72.4 3/6 145/47/52	73.1 3/6 145/49/54	73.6 3/6 144/51/56
47	67.6 2/3 134/35/40	69.6 2/3 139/41/45	71.2 2/3 144/46/51	72.0 3/6 146/49/54	72.5 3/6 145/51/56
49	66.7 2/3 134/34/39	68.6 2/3 139/40/45	70.2 2/3 144/46/50	71.1 3/6 146/49/54	71.6 3/6 146/51/56
51	65.7 2/3 134/34/39	67.7 2/3 139/40/44	69.2 2/3 144/45/50	70.2 3/6 147/49/54	70.6 3/6 147/51/56
53	64.8 2/3 133/33/38	66.6 2/3 138/39/44	68.1 2/3 144/45/49	69.3 3/6 148/50/54	69.7 3/6 148/51/56
55	63.9 2/3 133/33/38	65.7 2/3 138/39/43	67.1 2/3 143/44/49	68.2 2/3 148/49/53	68.7 3/6 149/51/56
57	62.9 3/3 133/33/38	64.7 2/3 138/38/43	66.0 2/3 143/44/48	67.1 2/3 148/48/53	67.7 3/6 150/51/56
59	61.9 3/3 133/33/37	63.7 2/3 138/38/42	65.0 2/3 143/43/47	66.1 2/3 148/48/52	66.8 3/6 151/51/56
60	61.4 3/3 132/32/37	63.2 2/3 137/37/42	64.5 2/3 143/43/47	65.5 2/3 147/48/52	66.3 3/6 151/52/56

EXAMPLE

Pressure altitude : 1400 ft
Temperature : 30°C
Runway length : 2750 m
Wind : 10 kt head
Slope : 1 % up
Takeoff configuration : 1 + F

– **Determination of corrected runway length**

(Refer to 2.02.40 p2)
runway length 2750
correction for wind 10 × 10 = + 100
correction for slope- 475
corrected runway length 2375

– **Determination of a conservative maximum takeoff weight :**

(Refer to 2.02.40 p6)
– Pressure altitude : 1400 ft – Use the table for 2000 ft.
– Enter the column corresponding to 2250 M
– Read the maximum takeoff weight on the line corresponding to the temperature of
R 30°C : 79600 kg
R V1 = 139 kt, VR = 147 kt, V2 = 152 kt

– **Determination of a precise flexible temperature for the actual takeoff weight of 73000 kg :**

(Refer to 2.02.40 p5 and p6)
– Interpolate the temperature corresponding to 73000 kg for the runway length of
R 2375 m at 1000 ft and 2000 ft pressure altitude.
Results :
R 1000 ft : 51°C, V1 = 138 kt, VR = 142 kt, V2 = 146 kt
R 2000 ft : 46°C, V1 = 137 kt, VR = 142 kt, V2 = 146 kt
– Interpolate between these two values to get the flexible temperature
R 1400 ft : 49°C, V1 = 137 kt, VR = 142 kt, V2 = 146 kt

CONFIGURATION 1+F				PRESSURE ALTITUDE = 0 FT	
TREF = 30 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	91.1 3/9	95.4 3/9	98.2 2/3	99.4 3/6	100.0 3/7
	146/57/62	150/61/66	156/66/70	157/70/74	155/72/76
-10	89.7 3/9	94.0 3/9	97.5 3/9	98.7 3/6	99.5 3/6
	144/56/61	149/60/64	154/64/68	155/68/72	154/71/74
0	88.3 3/9	92.6 3/9	96.5 3/9	97.9 3/6	98.7 3/6
	142/54/59	147/58/63	151/62/67	152/65/70	151/68/72
10	86.9 3/9	91.2 3/9	95.1 3/9	97.1 3/6	97.9 3/6
	141/53/58	145/57/62	150/61/65	150/63/67	149/66/70
20	85.5 3/9	89.7 3/9	93.6 3/9	95.8 3/6	97.0 3/6
	139/52/57	144/56/61	148/60/64	148/62/66	147/64/68
30	84.4 3/9	88.3 3/9	92.2 3/9	94.3 3/6	96.1 3/6
	139/51/56	142/55/59	146/58/63	146/60/65	144/62/66
32	83.8 3/9	87.4 3/9	91.2 3/9	93.5 3/6	95.0 3/6
	139/50/55	142/54/59	146/58/62	146/60/64	145/62/66
34	83.2 3/9	86.4 3/9	90.1 3/9	92.5 3/6	93.7 3/6
	140/50/55	142/53/58	146/57/61	146/59/63	146/61/65
36	82.5 3/9	85.3 3/9	89.1 3/9	91.5 3/6	92.4 3/6
	141/49/54	141/52/57	145/56/60	147/59/63	147/61/65
38	81.7 3/9	84.6 3/9	88.0 3/9	90.3 3/6	91.1 3/6
	141/49/53	142/52/56	145/55/59	148/58/62	147/61/65
40	80.7 3/9	83.9 3/9	86.9 3/9	89.0 3/6	89.8 3/6
	140/48/52	142/51/55	145/54/58	149/58/62	148/61/64
42	79.6 3/9	83.1 3/9	85.7 3/9	87.6 3/6	88.3 3/6
	140/47/51	143/51/55	145/53/57	150/58/62	149/61/64
44	78.5 3/9	82.2 3/9	84.5 3/9	86.0 2/3	86.8 3/6
	140/46/50	144/50/54	145/52/56	150/58/61	150/61/64
46	77.3 3/9	81.0 3/9	83.2 2/3	84.4 2/3	85.2 3/6
	139/45/49	144/49/53	147/53/56	151/57/61	152/61/64
48	76.0 3/9	79.7 3/9	81.6 2/3	82.9 3/6	83.5 3/6
	139/44/48	143/48/51	148/53/56	153/58/61	152/60/63
50	74.7 3/9	78.4 3/9	80.0 2/3	81.3 3/6	81.8 3/6
	138/43/47	143/47/50	148/52/55	153/58/61	153/60/63
52	73.4 3/9	76.9 3/9	78.4 2/3	79.6 2/3	80.3 3/6
	137/42/46	143/46/49	148/52/55	153/57/60	154/60/63
54	72.2 3/9	75.3 2/3	76.8 2/3	78.0 2/3	78.8 3/6
	137/41/45	142/45/48	148/51/54	153/56/59	156/61/63
56	70.9 3/9	73.7 2/3	75.2 2/3	76.3 2/3	77.3 3/6
	136/40/43	141/44/48	147/50/53	152/56/58	157/61/63
58	69.7 3/9	72.1 2/3	73.5 2/3	74.6 2/3	75.5 2/3
	135/39/42	141/44/47	146/49/52	152/55/57	157/60/62

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EXAMPLE

Pressure altitude : 1400 ft
Temperature : 30°C
Runway length : 2750 m
Wind : 10 kt head
Slope : 1 % up
Takeoff configuration : 1 + F

– **Determination of corrected runway length**

(Refer to 2.02.40 p2)

runway length	.2750
correction for wind	.10 × 10 = + 100
correction for slope	– 435
corrected runway length	.2415

– **Determination of a conservative maximum takeoff weight :**

(Refer to 2.02.40 p6)

- Pressure altitude : 1400 ft – Use the table for 2000 ft.
- Enter the column corresponding to 2250 m
- Read the maximum takeoff weight on the line corresponding to the temperature of 30°C : 71300 kg
- V1 = 139 kt, VR = 146 kt, V2 = 148 kt

– **Determination of a precise flexible temperature for the actual takeoff weight of 64000 kg :**

(Refer to 2.02.40 p5 and p6)

- Interpolate the temperature corresponding to 64000 kg for the runway length of 2415 m at 1000 ft and 2000 ft pressure altitude.
Results :
1000 ft : 61°C, V1 = 138 kt, VR = 139 kt, V2 = 140 kt
2000 ft : 57°C, V1 = 137 kt, VR = 139 kt, V2 = 140 kt
- Interpolate between these two values to get the flexible temperature
1400 ft : 59°C, V1 = 137 kt, VR = 139 kt, V2 = 140 kt

CONFIGURATION 1+F			PRESSURE ALTITUDE = 0 FT		FWD CG
TREF = 44 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	80.4 3/9 150/53/55	82.9 3/6 155/57/59	83.8 3/6 154/59/61	84.5 3/6 154/62/64	85.1 3/6 153/64/66
-10	79.4 3/9 148/52/54	82.2 3/6 153/55/57	83.0 3/6 152/57/59	83.8 3/6 151/60/62	84.5 3/6 151/62/64
0	78.4 3/9 147/51/53	81.3 3/6 151/54/56	82.4 3/6 150/55/57	83.1 3/6 149/58/60	83.9 3/6 148/60/62
10	77.3 3/9 145/50/52	80.2 3/6 149/53/55	81.5 3/6 148/54/56	82.5 3/6 147/56/58	83.2 3/6 146/58/60
20	76.0 3/9 143/49/51	79.2 3/6 147/52/54	80.5 3/6 146/53/55	81.6 3/6 145/54/56	82.4 3/6 144/57/58
30	74.8 3/9 142/48/50	78.1 3/6 145/51/53	79.5 3/6 144/52/54	80.6 3/6 143/53/55	81.7 3/6 142/55/57
40	73.6 3/9 141/47/49	77.1 3/6 144/50/51	78.5 3/6 142/51/53	79.7 3/6 141/52/54	80.9 3/6 140/54/55
44	73.1 3/9 140/47/49	76.6 3/6 143/49/51	78.1 3/6 142/51/52	79.3 3/6 140/52/54	80.5 3/6 139/53/55
46	72.1 3/9 140/46/48	75.7 3/6 144/49/51	77.2 3/6 142/50/52	78.3 3/6 141/51/53	79.4 3/6 140/52/54
48	71.1 3/9 140/45/47	74.6 3/6 144/48/50	76.2 3/6 143/49/51	77.4 3/6 142/50/52	78.1 3/6 141/52/54
50	70.2 3/9 139/44/46	73.4 3/9 144/48/49	75.2 3/6 144/49/50	76.2 3/6 143/50/51	76.9 3/6 142/52/54
52	69.2 3/9 139/43/45	72.3 3/9 143/47/48	74.2 3/6 145/48/50	75.0 3/6 144/50/51	75.6 3/6 143/52/53
54	68.2 3/9 139/42/44	71.2 3/9 143/46/47	73.2 3/6 146/48/49	73.8 3/6 145/50/51	74.4 3/6 145/52/53
55	67.8 3/9 138/42/43	70.6 3/9 143/45/47	72.6 3/6 146/48/49	73.2 3/6 146/50/51	73.7 3/6 145/52/53
57	66.8 3/9 138/41/42	69.5 3/9 143/44/45	71.3 3/6 147/48/49	71.9 3/6 147/50/51	72.4 3/6 146/52/53
59	65.8 3/9 138/40/41	68.3 3/9 142/43/44	70.0 2/3 147/47/48	70.7 3/6 148/50/51	71.1 3/6 148/52/53
61	64.8 3/9 137/39/40	67.2 3/9 142/42/43	68.7 2/3 147/47/48	69.5 3/6 149/51/51	69.9 3/6 149/52/53
63	63.8 3/9 137/38/39	65.9 3/3 142/42/43	67.3 3/3 147/47/48	68.3 3/6 151/51/51	68.7 3/6 150/52/53
65	62.9 3/9 137/37/38	64.6 3/3 142/42/43	65.9 3/3 146/46/47	66.9 3/3 150/50/51	67.5 3/6 151/52/53
67	61.6 3/9 136/36/37	63.3 3/3 141/41/42	64.5 3/3 145/45/45	65.5 3/3 149/49/50	66.1 3/6 153/53/53
68	61.0 3/9 135/35/36	62.6 3/3 140/40/41	63.8 3/3 145/45/45	64.7 2/3 148/48/48	65.4 2/3 151/51/52

CONFIGURATION 1+F			PRESSURE ALTITUDE = 1000 FT		
TREF = 43 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 53 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	71.9 2/3 144/45/50	73.7 2/3 150/51/56	75.2 2/3 156/57/62	76.0 3/6 159/60/65	76.3 3/6 158/62/67
-10	71.3 2/3 142/43/48	73.1 2/3 148/49/54	74.6 2/3 153/55/60	75.5 3/6 156/58/63	75.8 3/6 155/60/65
0	70.6 2/3 140/41/46	72.5 2/3 146/47/52	74.1 2/3 151/53/58	74.9 3/6 153/56/61	75.3 3/6 153/58/63
10	69.9 2/3 138/39/44	71.9 2/3 144/45/50	73.5 2/3 149/51/56	74.3 3/6 151/54/59	74.8 3/6 150/56/61
20	69.1 2/3 137/37/42	71.2 2/3 142/43/48	72.8 2/3 147/49/54	73.6 3/6 149/52/57	74.1 3/6 148/54/59
30	68.4 2/3 135/36/41	70.5 2/3 140/42/47	72.1 2/3 145/47/52	72.9 3/6 146/50/55	73.4 3/6 146/52/57
40	67.8 2/3 133/34/39	69.9 2/3 139/40/45	71.6 2/3 144/46/50	72.4 3/6 144/48/53	72.9 3/6 144/50/55
43	67.5 2/3 133/34/39	69.6 2/3 138/40/44	71.4 2/3 143/45/50	72.1 3/6 144/48/53	72.7 3/6 143/50/55
45	66.5 2/3 133/33/38	68.6 2/3 138/39/44	70.2 2/3 143/45/49	71.1 3/6 144/48/53	71.6 3/6 144/50/55
47	65.6 2/3 132/33/38	67.6 2/3 137/39/43	69.2 2/3 142/44/49	70.2 3/6 145/48/53	70.6 3/6 145/50/54
49	64.6 2/3 132/32/37	66.6 2/3 137/38/43	68.1 2/3 142/44/48	69.3 3/6 146/48/53	69.7 3/6 146/50/54
51	63.8 2/3 132/32/37	65.7 2/3 137/38/42	67.1 2/3 142/43/47	68.4 3/6 147/48/52	68.8 3/6 146/50/54
53	62.8 3/3 132/32/36	64.7 2/3 137/37/42	66.1 2/3 142/43/47	67.3 2/3 146/47/52	67.9 3/6 147/50/54
55	61.9 3/3 131/31/36	63.8 2/3 136/37/41	65.2 2/3 141/42/46	66.3 2/3 146/47/51	67.0 3/6 148/50/54
57	60.9 3/3 131/31/36	62.8 2/3 136/36/41	64.2 2/3 141/41/46	65.3 2/3 146/46/50	66.0 3/6 149/50/54
58	60.5 3/3 131/31/36	62.3 2/3 136/36/40	63.7 2/3 141/41/45	64.7 2/3 145/46/50	65.6 3/6 150/50/54

CONFIGURATION 1+F			PRESSURE ALTITUDE = 2000 FT		
TREF = 41 °C		DRY RUNWAY		MAX TO WEIGHT(1000KG) CODES	
TMAX = 51 °C		SLOPE = 0 %		IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	70.7 2/3 142/43/48	72.5 2/3 148/49/54	73.9 2/3 154/55/60	74.8 3/6 157/59/64	75.1 3/6 157/60/65
-10	70.0 2/3 140/41/46	71.9 2/3 146/47/52	73.4 2/3 151/53/58	74.3 3/6 154/57/62	74.6 3/6 154/58/63
0	69.3 2/3 138/39/44	71.3 2/3 144/45/50	72.8 2/3 149/51/56	73.7 3/6 152/54/59	74.1 3/6 151/56/61
10	68.6 2/3 137/37/42	70.6 2/3 142/43/48	72.2 2/3 147/49/54	73.1 3/6 149/52/57	73.6 3/6 149/54/59
20	67.9 2/3 135/36/41	69.9 2/3 140/42/46	71.6 2/3 145/47/52	72.4 3/6 147/50/55	72.9 3/6 147/52/57
30	67.1 2/3 133/34/39	69.2 2/3 138/40/45	70.9 2/3 143/45/50	71.8 3/6 145/49/53	72.3 3/6 144/50/55
40	66.5 2/3 132/32/38	68.6 2/3 137/38/43	70.3 2/3 142/44/48	71.2 3/6 143/47/52	71.7 3/6 142/49/53
41	66.4 2/3 132/32/37	68.5 2/3 137/38/43	70.3 2/3 141/44/48	71.1 3/6 143/47/51	71.6 3/6 142/49/53
43	65.5 2/3 131/32/37	67.6 2/3 136/38/42	69.2 2/3 141/43/48	70.2 3/6 143/47/51	70.7 3/6 143/48/53
45	64.5 2/3 131/31/36	66.6 2/3 136/37/42	68.2 2/3 141/43/47	69.3 3/6 144/47/51	69.7 3/6 143/48/53
47	63.6 2/3 131/31/36	65.6 2/3 136/37/41	67.1 2/3 140/42/46	68.4 3/6 145/47/51	68.8 3/6 144/48/53
49	62.7 2/3 130/30/35	64.6 2/3 135/36/41	66.1 2/3 140/41/46	67.3 3/6 145/46/51	67.8 3/6 145/48/53
51	61.8 3/3 130/30/35	63.7 2/3 135/36/40	65.1 2/3 140/41/45	66.3 2/3 145/46/50	66.9 3/6 146/48/53
53	60.9 3/3 130/30/35	62.8 2/3 135/35/40	64.2 2/3 140/40/45	65.4 2/3 144/45/49	66.1 3/6 147/49/53
55	59.9 3/3 130/30/34	61.9 2/3 134/35/39	63.2 2/3 139/40/44	64.4 2/3 144/45/49	65.2 3/6 148/49/53
56	59.5 3/3 129/29/34	61.4 2/3 134/34/39	62.8 2/3 139/40/44	63.9 2/3 144/44/48	64.8 3/6 148/49/53

CONFIGURATION 1 + F			PRESSURE ALTITUDE = 1000 FT		
TREF = 28 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	88.7 3/9 144/55/60	92.9 3/9 149/59/64	95.9 2/3 154/64/68	97.2 3/6 156/68/72	97.9 3/6 156/71/75
-10	87.3 3/9 142/53/59	91.5 3/9 147/58/62	95.2 3/9 152/62/66	96.4 3/6 154/66/70	97.2 3/6 153/69/72
0	86.0 3/9 141/52/57	90.2 3/9 145/56/61	93.9 3/9 150/60/64	95.6 3/6 151/64/68	96.5 3/6 150/66/70
10	84.7 3/9 139/51/56	88.7 3/9 144/55/60	92.6 3/9 148/59/63	94.8 3/6 149/61/65	95.7 3/6 148/64/68
20	83.8 3/9 139/50/55	87.3 3/9 142/54/59	91.2 3/9 146/58/62	93.6 3/6 147/60/64	94.8 3/6 146/62/66
28	83.1 3/9 139/49/55	86.2 3/9 141/53/58	90.1 3/9 145/57/61	92.4 3/6 145/59/63	94.1 3/6 144/60/65
30	82.4 3/9 140/49/54	85.3 3/9 141/52/57	89.1 3/9 145/56/60	91.6 3/6 146/58/62	92.9 3/6 144/60/64
32	81.6 3/9 140/48/53	84.6 3/9 141/51/56	88.1 3/9 144/55/59	90.7 3/6 146/58/62	91.8 3/6 145/60/64
34	80.7 3/9 140/48/53	83.9 3/9 142/51/55	87.2 3/9 144/54/58	89.8 3/6 147/57/61	90.6 3/6 146/60/63
36	79.8 3/9 139/47/52	83.4 3/9 142/50/55	86.1 3/9 144/53/57	88.6 3/6 147/57/61	89.4 3/6 147/60/63
38	78.8 3/9 139/46/51	82.6 3/9 143/50/54	85.1 3/9 144/52/56	87.4 3/6 148/57/60	88.2 3/6 147/59/63
40	77.8 3/9 139/45/50	81.7 3/9 143/49/53	84.3 3/9 144/52/56	86.0 2/3 148/56/60	86.8 3/6 148/59/63
42	76.8 3/9 138/45/49	80.6 3/9 143/48/52	83.3 3/9 145/51/55	84.5 2/3 149/56/59	85.4 3/6 150/59/62
44	75.6 3/9 138/44/48	79.4 3/9 142/47/51	81.9 2/3 147/52/55	83.2 3/6 150/56/59	83.8 3/6 150/59/62
46	74.3 3/9 137/43/47	78.1 3/9 142/46/50	80.3 2/3 147/51/54	81.5 3/6 151/56/59	82.1 3/6 150/58/61
48	73.0 3/9 136/41/45	76.7 3/9 141/45/49	78.6 2/3 146/50/54	79.9 3/6 152/56/59	80.4 3/6 152/58/61
50	71.8 3/9 136/40/44	75.4 3/9 141/44/47	76.9 2/3 146/50/53	78.2 2/3 151/55/58	79.0 3/6 154/59/61
52	70.6 3/9 135/39/43	73.8 3/9 140/43/47	75.3 2/3 146/49/52	76.6 2/3 151/55/57	77.5 3/6 155/59/62
54	69.4 3/9 134/38/42	72.3 2/3 140/43/46	73.7 2/3 145/48/51	74.9 2/3 150/54/56	75.8 2/3 156/59/61
56	68.2 3/9 134/37/41	70.8 2/3 139/42/45	72.1 2/3 144/47/50	73.2 2/3 150/53/55	74.1 2/3 155/58/60

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CONFIGURATION 1+F			PRESSURE ALTITUDE = 2000 FT		
TREF = 26 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 51 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	86.3 3/9 142/53/58	90.5 3/9 147/57/61	93.5 2/3 152/61/65	94.9 3/6 156/66/70	95.6 3/6 155/69/73
	-10	84.9 3/9 141/51/56	89.1 3/9 145/56/60	92.8 3/9 150/59/63	94.1 3/6 153/64/68
0	84.1 3/9 140/51/56	87.7 3/9 143/54/59	91.5 3/9 148/58/62	93.4 3/6 150/62/66	94.2 3/6 149/64/68
10	83.2 3/9 140/50/55	86.3 3/9 142/53/58	90.1 3/9 146/57/61	92.6 3/6 148/59/63	93.4 3/6 147/62/66
20	82.2 3/9 140/49/54	85.0 3/9 140/52/56	88.7 3/9 144/56/60	91.3 3/6 146/58/62	92.6 3/6 145/60/64
26	81.4 3/9 139/48/53	84.4 3/9 140/51/56	88.0 3/9 144/55/59	90.5 3/6 145/57/61	92.1 3/6 143/59/63
28	80.5 3/9 139/47/52	83.8 3/9 141/51/55	86.9 3/9 143/54/58	89.7 3/6 145/57/61	90.9 3/6 144/59/63
30	79.6 3/9 139/47/52	83.2 3/9 142/50/55	86.0 3/9 143/53/57	88.8 3/6 146/56/60	89.7 3/6 145/58/62
32	78.8 3/9 138/46/51	82.6 3/9 142/50/54	85.1 3/9 143/52/56	87.9 3/6 146/56/59	88.7 3/6 145/58/62
34	77.9 3/9 138/45/50	81.8 3/9 142/49/54	84.5 3/9 143/52/56	86.9 3/6 147/55/59	87.7 3/6 146/58/62
36	76.9 3/9 138/45/49	80.9 3/9 142/49/53	83.7 3/9 144/51/55	85.6 3/6 146/55/58	86.5 3/6 147/58/61
38	76.0 3/9 137/44/48	79.9 3/9 141/48/52	83.0 3/9 144/51/54	84.4 3/6 147/55/58	85.2 3/6 148/58/61
40	74.9 3/9 136/43/47	78.8 3/9 141/47/51	81.9 3/9 145/50/54	83.1 3/6 148/55/58	83.8 3/6 148/57/60
42	73.7 3/9 136/42/46	77.7 3/9 141/46/50	80.4 2/3 145/50/53	81.6 3/6 149/54/58	82.2 3/6 148/57/60
44	72.6 3/9 135/41/45	76.4 3/9 140/45/49	78.8 2/3 145/49/53	80.2 3/6 150/54/57	80.7 3/6 149/57/60
46	71.3 3/9 135/40/44	75.1 3/9 140/44/47	77.2 2/3 145/49/52	78.5 2/3 150/54/57	79.2 3/6 151/57/60
48	70.1 3/9 134/39/43	73.7 3/9 139/43/46	75.5 2/3 144/48/51	76.8 2/3 150/53/56	77.6 3/6 153/57/60
50	69.0 3/9 133/38/41	72.4 3/9 138/41/45	73.9 2/3 144/47/50	75.1 2/3 149/53/55	76.1 3/6 154/58/60
52	67.8 3/9 133/37/40	70.9 3/9 138/41/44	72.3 2/3 143/46/49	73.5 2/3 148/52/54	74.4 2/3 153/57/59
54	66.7 3/9 132/36/39	69.4 2/3 137/40/43	70.7 2/3 143/46/48	71.8 2/3 148/51/53	72.7 2/3 153/56/58

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CONFIGURATION 1 + F		PRESSURE ALTITUDE = 1000 FT		FWD CG	
TREF = 42 °C		DRY RUNWAY		MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C		SLOPE = 0 %		IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	78.9 3/9 148/51/54	81.6 3/6 154/55/57	82.5 3/6 153/58/60	83.2 3/6 152/60/62	83.8 3/6 152/63/64
-10	77.9 3/9 147/50/52	80.8 3/6 151/54/56	81.8 3/6 150/56/57	82.6 3/6 150/58/60	83.2 3/6 149/61/62
0	76.7 3/9 145/49/51	79.9 3/6 149/53/55	81.0 3/6 148/54/56	81.9 3/6 147/56/58	82.6 3/6 147/59/60
10	75.5 3/9 143/49/51	78.9 3/6 148/52/53	80.0 3/6 146/53/55	81.2 3/6 145/54/56	81.9 3/6 145/57/59
20	74.2 3/9 142/48/50	77.8 3/6 146/50/52	79.1 3/6 145/52/54	80.2 3/6 143/53/55	81.2 3/6 143/55/57
30	73.0 3/9 141/47/49	76.6 3/6 144/49/51	78.0 3/6 143/51/53	79.1 3/6 141/52/54	80.3 3/6 141/53/55
40	71.9 3/9 139/46/48	75.4 3/6 143/49/51	77.0 3/6 141/50/52	78.3 3/6 140/51/53	79.5 3/6 139/52/54
42	71.6 3/9 139/46/48	75.2 3/6 142/49/51	76.7 3/6 141/50/51	78.1 3/6 140/51/53	79.3 3/6 138/52/54
44	70.7 3/9 139/45/47	74.2 3/6 143/48/50	75.8 3/6 142/49/51	77.1 3/6 140/50/52	78.2 3/6 139/51/53
46	69.8 3/9 138/44/46	73.1 3/9 143/48/49	74.8 3/6 142/49/50	76.1 3/6 141/49/51	77.0 3/6 140/51/52
48	68.9 3/9 138/43/45	72.0 3/9 142/47/48	73.9 3/6 143/48/50	75.0 3/6 142/49/50	75.8 3/6 141/51/52
50	67.9 3/9 138/42/44	71.0 3/9 142/46/47	73.0 3/6 144/48/49	74.0 3/6 143/49/50	74.6 3/6 142/51/52
52	67.0 3/9 137/41/43	69.9 3/9 142/45/46	72.0 3/6 145/47/48	72.8 3/6 144/49/50	73.3 3/6 143/51/52
53	66.5 3/9 137/41/42	69.4 3/9 142/44/45	71.6 3/6 145/47/48	72.2 3/6 145/49/50	72.7 3/6 144/51/52
55	65.6 3/9 137/40/41	68.3 3/9 141/43/44	70.3 3/6 146/46/47	70.9 3/6 146/49/50	71.4 3/6 145/51/52
57	64.6 3/9 137/39/40	67.2 3/9 141/42/43	68.9 2/3 146/46/47	69.7 3/6 147/49/50	70.1 3/6 147/51/52
59	63.6 3/9 136/38/39	66.0 3/9 141/41/42	67.5 2/3 145/45/46	68.4 3/6 148/49/50	68.8 3/6 148/51/52
61	62.7 3/9 136/37/38	64.8 3/3 140/40/41	66.2 3/3 145/45/46	67.2 3/6 149/49/50	67.6 3/6 149/51/52
63	61.7 3/9 135/36/37	63.5 3/3 140/40/41	64.8 3/3 145/45/45	65.8 3/3 149/49/49	66.4 3/6 150/51/52
65	60.6 3/9 135/35/36	62.2 3/3 140/40/40	63.5 3/3 143/43/44	64.4 3/3 148/48/48	65.1 2/3 151/51/51
66	60.0 3/9 134/34/35	61.6 3/3 139/39/40	62.8 3/3 142/43/43	63.7 2/3 147/47/47	64.4 2/3 150/50/50

CONFIGURATION 1+F			PRESSURE ALTITUDE = 2000 FT		FWD CG
TREF = 40 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 51 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	2250	2500	2750	3000	3250
-20	77.3 3/9 147/50/52	80.2 3/6 152/53/55	81.2 3/6 151/56/58	81.9 3/6 151/58/60	82.5 3/6 150/61/62
-10	76.1 3/9 145/49/51	79.3 3/6 150/52/54	80.5 3/6 149/54/55	81.3 3/6 148/56/58	81.9 3/6 148/59/60
0	74.9 3/9 143/48/51	78.3 3/6 148/51/53	79.6 3/6 147/53/54	80.6 3/6 146/54/56	81.3 3/6 145/57/58
10	73.6 3/9 142/48/50	77.3 3/6 146/50/52	78.6 3/6 145/52/53	79.7 3/6 144/53/55	80.6 3/6 143/55/56
20	72.4 3/9 141/47/49	76.2 3/6 145/49/51	77.6 3/6 143/51/52	78.7 3/6 142/52/54	79.8 3/6 141/53/55
30	71.3 3/9 139/46/48	74.9 3/6 143/49/51	76.5 3/6 142/50/51	77.8 3/6 140/51/53	78.9 3/6 139/52/54
40	70.3 3/9 138/45/47	73.7 3/6 142/48/50	75.3 3/6 140/49/51	76.8 3/6 139/50/52	78.0 3/6 138/51/53
42	69.4 3/9 138/44/46	72.7 3/6 142/47/49	74.4 3/6 141/49/50	75.8 3/6 140/49/51	76.8 3/6 138/50/52
44	68.4 3/9 137/43/45	71.6 3/9 141/46/48	73.4 3/6 142/48/50	74.7 3/6 140/49/50	75.8 3/6 139/50/51
46	67.5 3/9 137/42/44	70.6 3/9 141/45/47	72.6 3/6 142/48/49	73.7 3/6 141/48/50	74.6 3/6 140/50/51
48	66.6 3/9 136/41/43	69.6 3/9 141/44/46	71.7 3/6 143/47/48	72.7 3/6 142/48/49	73.4 3/6 141/50/51
50	65.7 3/9 136/40/42	68.6 3/9 140/43/45	70.9 3/6 144/46/47	71.7 3/6 143/48/49	72.2 3/6 143/50/51
51	65.3 3/9 136/40/41	68.1 3/9 140/43/44	70.4 3/6 144/46/47	71.1 3/6 144/48/49	71.6 3/6 143/50/51
52	64.8 3/9 136/39/41	67.6 3/9 140/42/44	69.8 3/6 144/45/46	70.5 3/6 144/48/49	71.0 3/6 144/50/51
54	63.9 3/9 135/38/39	66.5 3/9 140/41/42	68.5 2/3 144/45/46	69.3 3/6 145/48/49	69.7 3/6 145/50/51
56	62.9 3/9 135/37/38	65.4 3/9 139/40/41	67.1 2/3 144/44/45	68.0 3/6 147/48/49	68.4 3/6 146/50/51
58	61.9 3/9 135/36/37	64.3 3/9 139/39/40	65.7 2/3 144/44/45	66.8 3/6 148/48/49	67.2 3/6 148/50/51
60	61.0 3/9 134/35/36	63.0 3/3 139/39/40	64.4 3/3 143/43/44	65.4 2/3 147/47/48	66.0 3/6 149/50/50
62	60.0 3/9 134/34/35	61.8 3/3 138/38/39	63.1 3/3 142/42/43	64.0 2/3 146/46/47	64.8 3/6 150/50/50
64	58.9 3/9 133/33/34	60.5 3/3 137/37/38	61.8 2/3 141/41/42	62.7 2/3 145/45/46	63.4 2/3 149/49/49

CONFIGURATION 2			PRESSURE ALTITUDE = 0 FT		
TREF = 45 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 55 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	68.1 3/3	71.1 2/3	72.9 2/3	74.2 2/3	75.2 2/3
	134/34/39	140/40/45	147/47/52	153/54/58	159/59/64
-10	67.5 3/3	70.4 2/3	72.4 2/3	73.8 2/3	74.8 2/3
	132/32/37	138/38/43	144/45/50	151/52/56	156/58/62
0	66.9 3/3	69.8 2/3	71.9 2/3	73.3 2/3	74.4 2/3
	130/30/35	136/37/41	142/43/48	148/50/54	154/56/60
10	66.3 3/3	69.1 2/3	71.2 2/3	72.8 2/3	74.0 2/3
	129/29/33	135/35/39	140/42/46	146/48/52	152/54/58
20	65.7 3/3	68.4 2/3	70.5 2/3	72.2 2/3	73.4 2/3
	126/26/30	133/33/38	139/40/44	144/46/50	150/52/56
30	65.0 3/3	67.7 2/3	69.8 2/3	71.6 2/3	72.8 2/3
	124/24/28	131/32/36	137/38/43	142/44/49	148/50/54
40	64.4 3/9	67.0 2/3	69.2 2/3	71.1 2/3	72.4 2/3
	122/22/27	129/30/34	135/37/41	140/43/47	146/48/53
45	64.1 3/9	66.7 2/3	68.9 2/3	70.7 2/3	72.1 2/3
	122/22/27	129/29/34	134/36/40	140/42/46	145/47/52
47	63.1 3/3	65.7 2/3	67.8 2/3	69.6 2/3	70.9 2/3
	121/21/26	128/29/33	134/36/40	139/41/46	145/47/51
49	62.1 3/3	64.8 2/3	66.9 2/3	68.6 2/3	69.8 2/3
	121/21/26	128/29/33	134/35/39	139/41/45	144/46/51
51	61.2 3/3	63.9 2/3	65.9 2/3	67.5 2/3	68.7 2/3
	120/20/25	128/28/32	134/35/39	139/40/44	144/46/50
53	60.2 3/3	63.0 2/3	64.9 2/3	66.5 2/3	67.6 2/3
	119/19/24	128/28/32	133/34/38	139/40/44	144/45/49
55	59.3 3/3	62.0 3/3	64.0 2/3	65.5 2/3	66.6 2/3
	119/19/24	128/28/32	133/34/37	138/39/43	144/45/49
57	58.4 3/3	61.0 3/3	63.0 2/3	64.4 2/3	65.5 2/3
	119/19/24	127/27/31	133/33/37	138/39/43	143/44/48
59	57.4 3/3	60.0 3/3	62.1 2/3	63.4 2/3	64.4 2/3
	119/19/23	127/27/31	132/33/36	138/38/42	143/44/48
60	56.9 3/3	59.5 3/3	61.6 2/3	62.9 2/3	63.9 2/3
	118/18/23	126/26/30	132/32/36	138/38/42	143/44/47

CONFIGURATION 2			PRESSURE ALTITUDE = 1000 FT		
TREF = 43 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG)		CODES
TMAX = 53 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	67.0 3/3 132/32/37	69.9 2/3 138/38/43	71.8 2/3 145/45/50	73.2 2/3 151/52/56	74.2 2/3 157/58/62
-10	66.3 3/3 131/31/35	69.2 2/3 136/37/41	71.3 2/3 142/43/48	72.7 2/3 148/50/54	73.8 2/3 154/56/60
0	65.7 3/3 128/28/33	68.5 2/3 134/35/39	70.6 2/3 140/42/46	72.2 2/3 146/48/52	73.4 2/3 152/54/58
10	65.1 3/3 125/25/30	67.9 2/3 133/33/38	70.0 2/3 138/40/44	71.6 2/3 144/46/50	72.9 2/3 150/52/56
20	64.5 3/3 124/24/29	67.2 2/3 131/31/36	69.3 2/3 137/38/42	71.0 2/3 142/44/48	72.3 2/3 148/50/54
30	63.8 3/3 122/22/27	66.5 2/3 129/30/34	68.7 2/3 135/36/41	70.4 2/3 140/42/47	71.7 2/3 146/48/52
40	63.3 3/9 121/21/26	65.9 2/3 128/28/33	68.1 2/3 133/35/39	69.9 2/3 139/41/45	71.3 2/3 144/46/50
43	63.1 3/9 121/21/26	65.7 2/3 127/28/32	67.9 2/3 133/34/39	69.6 2/3 138/40/44	71.1 2/3 143/46/50
45	62.1 3/3 120/20/25	64.7 2/3 127/27/32	66.8 2/3 133/34/38	68.6 2/3 138/40/44	69.9 2/3 143/45/49
47	61.1 3/3 120/20/25	63.7 2/3 127/27/31	65.8 2/3 132/33/37	67.5 2/3 138/39/43	68.8 2/3 143/45/49
49	60.1 3/3 119/19/24	62.8 2/3 127/27/31	64.9 2/3 132/33/37	66.5 2/3 137/39/43	67.7 2/3 143/44/48
51	59.2 3/3 118/18/23	61.9 2/3 126/26/31	63.9 2/3 132/33/36	65.5 2/3 137/38/42	66.7 2/3 142/44/48
53	58.3 3/3 118/18/23	61.0 3/3 126/26/30	63.0 2/3 131/32/36	64.6 2/3 137/38/42	65.7 2/3 142/43/47
55	57.4 3/3 118/18/23	60.0 3/3 126/26/30	62.1 2/3 131/32/35	63.6 2/3 136/37/41	64.7 2/3 142/43/46
57	56.5 3/3 118/18/22	59.1 3/3 125/25/29	61.2 2/3 131/31/35	62.6 2/3 136/37/40	63.6 2/3 141/42/46
58	56.0 3/3 117/17/22	58.6 3/3 125/25/29	60.7 2/3 131/31/34	62.1 2/3 136/37/40	63.1 2/3 141/42/45

CONFIGURATION 2			PRESSURE ALTITUDE = 0 FT		
TREF = 30 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 55 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	84.2 3/9 135/43/47	89.1 3/9 139/48/51	93.7 3/9 144/53/55	96.2 2/3 150/60/61	98.2 2/3 156/66/67
-10	83.2 3/9 134/43/46	87.8 3/9 137/47/50	92.4 3/9 142/51/54	95.4 2/3 148/57/59	97.5 2/3 154/64/65
0	82.3 3/9 134/42/46	86.4 3/9 135/46/49	91.0 3/9 140/50/53	94.5 2/3 146/55/57	96.7 2/3 152/62/63
10	81.1 3/9 133/41/44	85.0 3/9 134/45/48	89.7 3/9 139/49/52	93.6 3/9 144/53/55	95.9 2/3 149/60/61
20	79.6 3/9 131/39/43	84.1 3/9 134/44/47	88.3 3/9 137/48/51	92.4 3/9 142/52/54	94.9 2/3 147/58/59
30	78.3 3/9 130/38/42	83.2 3/9 134/43/46	86.9 3/9 136/47/49	91.1 3/9 140/51/53	94.0 2/3 145/56/57
32	77.5 3/9 130/38/42	82.5 3/9 134/43/46	86.0 3/9 136/46/49	90.1 3/9 140/50/52	92.8 2/3 145/55/57
34	76.6 3/9 129/37/41	81.8 3/9 135/42/45	85.0 3/9 135/45/48	89.1 3/9 140/49/51	91.5 2/3 145/55/56
36	75.6 3/9 129/36/40	80.8 3/9 134/41/44	84.4 3/9 136/45/47	88.0 3/9 140/48/50	90.1 2/3 145/54/56
38	74.7 3/9 128/35/39	79.9 3/9 134/41/44	83.7 3/9 137/44/47	86.8 3/9 139/48/50	88.8 2/3 145/54/55
40	73.8 3/9 128/35/38	79.0 3/9 134/40/43	83.0 3/9 137/44/46	85.5 3/9 139/47/49	87.5 2/3 145/53/54
42	72.8 3/9 127/34/37	78.0 3/9 133/39/42	82.2 3/9 138/43/45	84.3 2/3 140/47/49	86.0 2/3 145/53/54
44	71.7 3/9 127/33/36	76.9 3/9 133/38/41	81.0 3/9 138/42/44	83.1 2/3 142/48/49	84.5 2/3 145/52/53
46	70.6 3/9 126/32/35	75.6 3/9 132/37/40	79.6 3/9 137/41/43	81.7 2/3 143/48/49	83.1 2/3 147/53/54
48	69.5 3/9 126/31/34	74.3 3/9 132/36/39	78.1 3/9 137/41/43	80.0 2/3 143/47/48	81.6 2/3 148/53/54
50	68.3 3/9 125/30/33	73.0 3/9 131/35/37	76.5 2/3 137/40/42	78.4 2/3 143/46/48	79.9 2/3 148/52/53
52	67.3 3/9 124/29/32	71.8 3/9 130/34/36	75.0 2/3 137/40/41	76.8 2/3 142/46/47	78.3 2/3 148/51/52
54	66.2 3/9 124/28/31	70.5 3/9 130/33/35	73.5 2/3 136/39/40	75.2 2/3 142/45/46	76.7 2/3 147/51/51
56	65.1 3/9 123/27/30	69.3 3/9 129/32/34	72.0 2/3 135/38/40	73.6 2/3 141/44/45	75.0 2/3 147/50/51
58	64.0 3/9 122/26/29	68.1 3/9 128/31/33	70.4 2/3 135/37/39	72.0 2/3 141/43/44	73.3 2/3 146/49/50

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CONFIGURATION 2			PRESSURE ALTITUDE = 1000 FT		
TREF = 28 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	82.7 3/9	86.8 3/9	91.3 3/9	93.9 2/3	95.8 2/3
	135/42/46	137/46/49	142/51/53	148/57/59	154/64/65
-10	81.6 3/9	85.4 3/9	90.0 3/9	93.1 2/3	95.1 2/3
	134/41/45	135/45/48	140/49/52	146/55/57	152/61/63
0	80.1 3/9	84.4 3/9	88.7 3/9	92.2 2/3	94.4 2/3
	133/40/44	135/44/47	139/48/51	144/53/55	150/59/61
10	78.8 3/9	83.4 3/9	87.3 3/9	91.3 3/9	93.6 2/3
	131/39/43	135/43/47	137/47/50	142/51/53	147/57/59
20	77.4 3/9	82.5 3/9	85.9 3/9	90.1 3/9	92.6 2/3
	130/38/41	134/42/46	135/46/49	140/50/52	145/55/57
28	76.3 3/9	81.6 3/9	84.9 3/9	89.0 3/9	91.9 2/3
	129/37/41	134/42/45	135/45/48	139/49/51	144/54/55
30	75.4 3/9	80.7 3/9	84.3 3/9	88.0 3/9	90.7 2/3
	128/36/40	134/41/44	135/45/47	139/48/50	144/53/55
32	74.5 3/9	79.8 3/9	83.6 3/9	87.0 3/9	89.5 2/3
	128/35/39	133/40/43	136/44/46	138/47/49	144/53/54
34	73.7 3/9	79.0 3/9	83.1 3/9	86.1 3/9	88.3 2/3
	127/34/38	133/40/43	136/44/46	138/47/49	143/52/54
36	72.8 3/9	78.1 3/9	82.3 3/9	85.0 3/9	87.1 2/3
	127/34/37	133/39/42	137/43/46	138/46/48	143/52/53
38	71.8 3/9	77.1 3/9	81.5 3/9	84.0 2/3	85.7 2/3
	126/33/37	132/38/41	137/42/45	139/46/48	143/51/53
40	70.9 3/9	76.1 3/9	80.4 3/9	83.0 2/3	84.5 2/3
	126/32/36	132/37/40	137/42/44	141/46/48	144/51/52
42	69.9 3/9	75.0 3/9	79.3 3/9	81.7 2/3	83.2 2/3
	125/31/35	131/37/39	136/41/43	142/46/48	145/51/52
44	68.9 3/9	73.9 3/9	78.1 3/9	80.2 2/3	81.8 2/3
	124/31/34	131/36/38	136/40/42	141/46/47	146/51/52
46	67.9 3/9	72.7 3/9	76.6 3/9	78.6 2/3	80.2 2/3
	124/30/33	130/35/37	136/39/41	141/45/47	147/51/52
48	66.8 3/9	71.4 3/9	75.0 2/3	76.9 2/3	78.5 2/3
	123/29/32	129/34/36	135/38/40	141/45/46	146/50/51
50	65.7 3/9	70.1 3/9	73.5 2/3	75.3 2/3	76.8 2/3
	123/28/31	129/33/35	135/38/39	140/44/45	146/50/50
52	64.7 3/9	69.0 3/9	72.0 2/3	73.8 2/3	75.2 2/3
	122/27/29	128/32/34	134/37/39	140/43/44	145/49/50
54	63.6 3/9	67.8 3/9	70.5 2/3	72.2 2/3	73.6 2/3
	121/26/28	127/31/33	133/36/38	139/42/43	145/48/49
56	62.6 3/9	66.7 3/9	69.1 2/3	70.7 2/3	71.9 2/3
	121/25/27	127/29/31	133/36/37	139/42/43	144/47/48

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CONFIGURATION 2			PRESSURE ALTITUDE = 0 FT		FWD CG
TREF = 44 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	74.3 3/9 136/40/44	78.5 3/9 141/43/47	81.3 2/3 147/48/52	83.2 3/6 152/54/59	84.0 3/6 152/57/62
-10	73.1 3/9 135/39/43	77.5 3/9 140/42/46	80.6 2/3 145/46/50	82.6 3/6 150/52/57	83.4 3/6 150/55/60
0	71.9 3/9 133/38/43	76.5 3/9 138/41/45	79.9 3/9 143/44/49	82.0 3/6 148/50/55	82.7 3/6 148/53/58
10	70.9 3/9 132/37/41	75.3 3/9 136/40/45	79.0 3/9 141/43/48	81.3 3/6 146/48/53	82.0 3/6 145/51/56
20	69.8 3/9 130/36/40	74.1 3/9 135/40/44	78.0 3/9 140/43/47	80.4 3/6 144/47/51	81.3 3/6 144/49/54
30	68.7 3/9 129/35/39	72.9 3/9 134/39/43	77.0 3/9 138/42/46	79.7 3/6 142/45/49	80.5 3/6 142/47/52
40	67.7 3/9 128/34/38	71.8 3/9 133/38/42	75.9 3/9 137/41/45	78.9 3/6 140/44/48	79.8 3/6 140/46/50
44	67.3 3/9 127/33/38	71.4 3/9 132/38/42	75.5 3/9 136/41/45	78.5 3/6 140/43/47	79.5 3/6 139/45/49
46	66.5 3/9 127/32/37	70.5 3/9 132/37/41	74.3 3/9 136/40/44	77.5 3/6 141/43/47	78.3 3/6 140/45/49
48	65.6 3/9 127/32/36	69.6 3/9 131/36/40	73.2 3/9 136/40/44	76.1 3/9 140/42/46	77.1 3/6 141/45/49
50	64.8 3/9 126/31/35	68.6 3/9 131/35/39	72.1 3/9 136/39/43	74.8 3/9 140/42/46	75.9 3/6 142/45/49
52	63.9 3/9 126/30/34	67.7 3/9 131/34/38	71.0 3/9 136/38/42	73.5 2/3 140/41/45	74.7 3/6 143/46/49
54	63.1 3/9 126/29/33	66.7 3/9 131/34/37	69.9 3/9 135/37/40	72.2 2/3 140/41/44	73.5 3/6 144/46/49
55	62.6 3/9 126/29/33	66.2 3/9 130/33/37	69.4 3/9 135/37/40	71.5 2/3 140/41/44	72.9 3/6 144/46/49
57	61.7 3/9 125/28/32	65.3 3/9 130/32/36	68.2 3/9 135/35/39	70.1 2/3 140/40/44	71.5 2/3 144/45/49
59	60.8 3/9 125/27/31	64.2 3/9 130/31/34	67.0 3/9 135/35/38	68.7 2/3 140/40/43	70.0 2/3 144/45/48
61	60.0 3/9 125/26/30	63.3 3/9 130/30/33	65.7 3/3 135/35/38	67.4 2/3 140/40/42	68.7 2/3 144/44/48
63	59.1 3/9 124/26/29	62.4 3/9 129/29/32	64.5 3/3 134/34/37	66.1 3/3 140/40/42	67.3 2/3 144/44/47
65	58.2 3/9 124/25/28	61.2 3/9 129/29/32	63.3 3/3 134/34/37	64.7 3/3 139/39/42	65.9 2/3 143/43/45
67	57.3 3/9 123/24/27	60.0 3/9 128/28/30	62.0 3/3 133/33/36	63.4 3/3 138/38/41	64.5 2/3 142/42/44
68	56.9 3/9 123/24/27	59.5 3/3 128/28/30	61.3 3/3 132/32/35	62.7 3/3 137/37/40	63.8 2/3 141/41/44

CONFIGURATION 2			PRESSURE ALTITUDE = 1000 FT		FWD CG
TREF = 42 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	72.6 3/9 135/39/43	77.0 3/9 140/42/46	79.9 2/3 145/46/50	81.9 3/6 150/52/57	82.8 3/6 151/55/60
-10	71.5 3/9 133/38/42	75.9 3/9 138/41/45	79.2 3/9 143/44/48	81.3 3/6 148/50/55	82.1 3/6 148/53/58
0	70.4 3/9 132/37/41	74.8 3/9 137/40/45	78.4 3/9 141/43/47	80.6 3/6 147/49/53	81.4 3/6 146/51/56
10	69.3 3/9 130/35/40	73.6 3/9 135/40/44	77.5 3/9 140/42/46	79.9 3/6 145/47/51	80.8 3/6 144/49/54
20	68.2 3/9 129/34/39	72.4 3/9 134/39/43	76.4 3/9 138/42/46	79.2 3/6 143/45/49	80.0 3/6 142/48/52
30	67.2 3/9 128/33/38	71.3 3/9 132/38/42	75.3 3/9 137/41/45	78.4 3/6 141/43/47	79.2 3/6 140/46/50
40	66.2 3/9 126/32/37	70.3 3/9 131/37/41	74.2 3/9 136/40/44	77.5 3/6 139/42/46	78.6 3/6 138/44/48
42	66.0 3/9 126/32/36	70.1 3/9 131/37/41	73.9 3/9 135/40/44	77.3 3/6 139/42/46	78.4 3/6 138/44/48
44	65.2 3/9 126/31/36	69.2 3/9 131/36/40	72.8 3/9 135/40/43	76.2 3/6 139/42/45	77.1 3/6 139/44/48
46	64.4 3/9 125/30/35	68.3 3/9 130/35/39	71.8 3/9 135/39/43	74.9 3/9 139/41/45	75.9 3/6 140/44/48
48	63.5 3/9 125/30/34	67.4 3/9 130/34/38	70.8 3/9 135/38/41	73.6 3/9 139/41/44	74.8 3/6 141/44/48
50	62.7 3/9 125/29/33	66.4 3/9 130/33/37	69.7 3/9 134/37/40	72.4 3/9 139/40/43	73.6 3/6 142/44/48
52	61.9 3/9 125/28/32	65.5 3/9 129/32/36	68.7 3/9 134/36/39	71.0 2/3 139/40/43	72.5 3/6 143/44/48
53	61.4 3/9 124/28/31	65.0 3/9 129/32/35	68.2 3/9 134/35/39	70.4 2/3 139/39/43	71.8 3/6 143/45/48
55	60.6 3/9 124/27/31	64.1 3/9 129/31/34	67.1 3/9 134/34/38	69.0 2/3 138/39/42	70.4 2/3 143/44/47
57	59.7 3/9 124/26/30	63.1 3/9 129/30/33	65.9 3/9 133/33/36	67.7 2/3 138/39/41	69.0 2/3 143/44/47
59	58.8 3/9 123/25/29	62.2 3/9 128/29/32	64.6 3/3 133/33/36	66.3 2/3 138/38/41	67.6 2/3 143/43/46
61	57.9 3/9 123/25/28	61.2 3/9 128/28/31	63.4 3/3 133/33/36	65.0 3/3 138/38/41	66.3 2/3 142/42/45
63	57.1 3/9 123/24/27	60.2 3/9 127/27/30	62.2 3/3 133/33/36	63.7 3/3 138/38/40	64.9 2/3 142/42/44
65	56.2 3/9 122/23/26	59.0 3/9 126/26/29	61.0 3/3 132/32/35	62.4 3/3 137/37/39	63.5 2/3 140/40/43
66	55.8 3/9 122/22/25	58.4 3/9 126/26/29	60.3 3/3 131/31/33	61.7 3/3 136/36/39	62.8 2/3 140/40/42

CONFIGURATION 2			PRESSURE ALTITUDE = 2000 FT		
TREF = 41 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 51 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	65.7 3/3 131/31/35	68.6 2/3 137/37/41	70.6 2/3 143/43/48	72.0 2/3 149/50/54	73.0 2/3 154/56/60
-10	65.1 3/3 128/28/33	67.9 2/3 135/35/39	70.0 2/3 140/41/46	71.5 2/3 146/48/52	72.6 2/3 152/53/58
0	64.5 3/3 127/27/31	67.3 2/3 133/33/37	69.4 2/3 138/40/44	70.9 2/3 144/46/50	72.2 2/3 150/52/56
10	63.9 3/3 123/23/28	66.6 2/3 131/31/36	68.8 2/3 137/38/42	70.5 2/3 142/44/48	71.7 2/3 148/50/54
20	63.2 3/3 122/22/27	65.9 2/3 129/30/34	68.1 2/3 135/36/40	69.8 2/3 140/42/46	71.1 2/3 146/48/52
30	62.6 3/3 121/21/26	65.2 2/3 128/28/33	67.4 2/3 133/35/39	69.2 2/3 138/41/45	70.6 2/3 144/46/50
40	62.0 3/9 120/20/24	64.6 2/3 126/27/31	66.8 2/3 131/33/37	68.7 2/3 137/39/43	70.1 2/3 142/44/48
41	62.0 3/9 119/19/24	64.6 2/3 126/26/31	66.7 2/3 131/33/37	68.6 2/3 137/39/43	70.0 2/3 142/44/48
43	61.0 3/9 119/19/24	63.7 2/3 126/26/30	65.8 2/3 131/32/37	67.6 2/3 136/38/42	69.0 2/3 141/44/48
45	60.0 3/3 119/19/23	62.7 2/3 125/26/30	64.8 2/3 131/32/36	66.6 2/3 136/38/42	67.9 2/3 141/43/47
47	59.1 3/3 118/18/23	61.7 2/3 125/25/29	63.8 2/3 131/31/35	65.5 2/3 136/37/41	66.8 2/3 141/43/46
49	58.1 3/3 117/17/22	60.8 2/3 125/25/29	62.9 2/3 130/31/35	64.5 2/3 135/37/40	65.7 2/3 141/42/46
51	57.3 3/3 117/17/21	59.9 3/3 124/24/29	62.0 2/3 130/31/34	63.6 2/3 135/36/40	64.7 2/3 140/42/45
53	56.4 3/3 117/17/21	59.0 3/3 124/24/28	61.1 2/3 130/30/34	62.6 2/3 135/36/39	63.7 2/3 140/41/45
55	55.5 3/3 116/16/21	58.1 3/3 123/23/27	60.2 2/3 129/30/33	61.7 2/3 135/35/39	62.8 2/3 140/41/44
56	55.1 3/3 116/16/20	57.6 3/3 123/23/27	59.7 2/3 129/29/33	61.2 2/3 134/35/39	62.3 2/3 140/40/44

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CONFIGURATION 2			PRESSURE ALTITUDE = 2000 FT		
TREF = 26 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 51 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	80.6 3/9 134/41/44	84.6 3/9 136/44/48	88.9 3/9 141/49/51	91.6 2/3 146/55/57	93.4 2/3 152/61/62
-10	79.2 3/9 133/39/43	83.7 3/9 136/44/47	87.6 3/9 139/47/50	90.7 2/3 144/53/55	92.7 2/3 150/59/60
0	77.9 3/9 131/38/42	82.8 3/9 135/43/46	86.3 3/9 137/46/49	89.9 3/9 142/51/53	92.0 2/3 148/57/58
10	76.5 3/9 130/37/41	81.7 3/9 135/42/45	84.9 3/9 136/45/48	89.0 3/9 140/49/51	91.2 2/3 145/55/56
20	75.0 3/9 128/36/39	80.4 3/9 133/41/44	84.1 3/9 136/44/47	87.7 3/9 139/48/50	90.3 2/3 144/53/55
26	74.1 3/9 127/35/39	79.6 3/9 133/40/43	83.5 3/9 135/44/47	86.9 3/9 138/47/49	89.8 2/3 142/52/54
28	73.3 3/9 126/34/38	78.7 3/9 132/39/43	82.8 3/9 136/43/46	85.9 3/9 137/46/49	88.6 2/3 142/51/53
30	72.4 3/9 126/33/37	77.8 3/9 132/39/42	82.2 3/9 136/43/45	84.9 3/9 137/46/48	87.4 2/3 142/51/52
32	71.6 3/9 125/33/36	77.0 3/9 132/38/41	81.4 3/9 136/42/45	84.3 3/9 138/45/47	86.2 2/3 142/50/52
34	70.9 3/9 125/32/36	76.1 3/9 131/37/40	80.6 3/9 136/42/44	83.6 3/9 139/45/47	85.2 2/3 142/50/51
36	69.9 3/9 124/31/35	75.2 3/9 131/37/39	79.6 3/9 136/41/43	82.6 2/3 140/45/47	84.1 2/3 143/50/51
38	69.1 3/9 124/31/34	74.2 3/9 130/36/39	78.6 3/9 135/40/42	81.4 2/3 140/45/47	83.1 2/3 144/50/51
40	68.2 3/9 123/30/33	73.2 3/9 129/35/38	77.5 3/9 135/39/41	80.1 2/3 140/45/46	81.8 2/3 145/50/51
42	67.3 3/9 123/29/32	72.1 3/9 129/34/37	76.4 3/9 135/38/40	78.7 2/3 140/44/46	80.3 2/3 145/50/51
44	66.3 3/9 122/28/31	71.0 3/9 128/33/36	75.1 3/9 134/37/39	77.2 2/3 140/43/45	78.7 2/3 145/49/50
46	65.2 3/9 122/27/30	69.8 3/9 128/32/35	73.5 3/9 133/37/38	75.5 2/3 139/43/44	77.1 2/3 145/49/49
48	64.2 3/9 121/26/29	68.6 3/9 127/31/33	72.0 2/3 133/36/38	73.8 2/3 139/42/43	75.3 2/3 144/48/49
50	63.2 3/9 120/25/28	67.4 3/9 126/30/32	70.5 2/3 132/35/37	72.3 2/3 138/41/42	73.7 2/3 144/47/48
52	62.2 3/9 120/24/27	66.3 3/9 126/29/31	69.1 2/3 132/35/36	70.8 2/3 137/41/42	72.1 2/3 143/46/47
54	61.2 3/9 119/23/26	65.2 3/9 125/28/30	67.7 2/3 131/34/35	69.3 2/3 137/40/41	70.5 2/3 142/46/46

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CONFIGURATION 2		PRESSURE ALTITUDE = 2000 FT			FWD CG
TREF = 40 °C		DRY RUNWAY		MAX TO WEIGHT(1000KG) CODES	
TMAX = 51 °C		SLOPE = 0 %		IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1750	2000	2250	2500	2750
-20	71.0 3/9 133/37/42	75.3 3/9 138/41/45	78.5 3/9 143/44/48	80.6 2/3 149/50/55	81.5 3/6 149/53/58
-10	69.9 3/9 132/36/41	74.2 3/9 137/40/44	77.7 3/9 141/43/47	79.9 2/3 147/48/53	80.9 3/6 147/51/56
0	68.8 3/9 130/35/40	73.0 3/9 135/40/44	76.8 3/9 140/42/46	79.2 3/6 145/47/51	80.2 3/6 145/49/54
10	67.8 3/9 129/34/38	71.9 3/9 134/39/43	75.8 3/9 138/41/45	78.5 3/6 143/45/49	79.5 3/6 143/48/52
20	66.7 3/9 127/33/37	70.8 3/9 132/38/42	74.7 3/9 137/41/45	77.8 3/6 141/43/47	78.7 3/6 141/46/50
30	65.7 3/9 126/32/36	69.7 3/9 131/36/41	73.5 3/9 136/40/44	76.9 3/6 140/42/46	77.9 3/6 139/44/48
40	64.7 3/9 125/31/35	68.7 3/9 130/35/39	72.4 3/9 134/39/43	76.0 3/6 138/42/46	77.2 3/6 137/43/47
42	63.9 3/9 125/30/34	67.9 3/9 129/35/39	71.4 3/9 134/39/42	74.7 3/9 138/41/45	76.0 3/6 138/43/47
44	63.1 3/9 124/29/33	67.0 3/9 129/34/38	70.4 3/9 134/38/41	73.5 3/9 138/41/44	74.8 3/6 139/43/47
46	62.3 3/9 124/29/33	66.0 3/9 129/33/37	69.4 3/9 133/37/40	72.3 3/9 138/40/43	73.7 3/6 140/43/47
48	61.4 3/9 124/28/32	65.2 3/9 129/32/36	68.4 3/9 133/36/39	71.1 3/9 137/39/42	72.5 3/6 141/43/47
50	60.6 3/9 123/27/31	64.2 3/9 128/31/35	67.4 3/9 133/35/38	69.9 3/9 137/38/41	71.4 3/6 142/43/47
51	60.2 3/9 123/27/30	63.8 3/9 128/31/34	66.9 3/9 133/34/38	69.2 2/3 137/38/41	70.7 3/6 142/43/46
52	59.8 3/9 123/26/30	63.3 3/9 128/30/34	66.4 3/9 132/34/37	68.6 2/3 137/38/41	70.0 2/3 142/43/46
54	58.9 3/9 123/25/29	62.4 3/9 128/30/33	65.3 3/9 132/33/36	67.3 2/3 137/37/40	68.6 2/3 142/42/46
56	58.1 3/9 122/25/28	61.5 3/9 127/29/32	64.2 3/9 132/32/35	65.9 2/3 137/37/40	67.2 2/3 142/42/45
58	57.2 3/9 122/24/27	60.5 3/9 127/28/31	62.9 3/3 132/32/35	64.6 2/3 137/37/39	65.8 2/3 141/41/44
60	56.3 3/9 121/23/26	59.5 3/9 127/27/30	61.6 3/3 132/32/34	63.2 3/3 136/36/39	64.4 2/3 141/41/43
62	55.5 3/9 121/22/25	58.5 3/9 126/26/28	60.5 3/3 131/31/33	62.0 3/3 136/36/38	63.1 2/3 140/40/42
64	54.6 3/9 121/21/24	57.4 3/9 125/25/27	59.3 3/3 130/30/33	60.7 3/3 135/35/37	61.8 2/3 139/39/41

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CONFIGURATION 3			PRESSURE ALTITUDE = 0 FT		
TREF = 45 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 55 °C			IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	65.4 3/3 126/26/30	68.7 3/3 134/34/38	71.4 2/3 140/41/45	73.0 2/3 146/48/52	73.9 2/3 153/54/58
	64.8 3/3 124/24/29	68.1 3/3 132/32/36	70.8 2/3 138/39/43	72.6 2/3 144/46/50	73.6 2/3 151/52/56
0	64.2 3/3 122/22/27	67.5 3/3 130/30/34	70.1 2/3 136/37/41	72.1 2/3 142/44/48	73.2 2/3 148/50/54
	63.5 3/3 120/20/25	66.9 2/3 128/28/32	69.4 2/3 134/35/39	71.5 2/3 140/42/46	72.9 2/3 146/48/52
10	62.8 3/3 119/19/24	66.2 2/3 126/26/31	68.7 2/3 133/34/38	70.8 2/3 138/40/44	72.3 2/3 144/46/50
	62.1 3/9 118/18/23	65.5 2/3 124/24/29	67.9 2/3 131/32/36	70.1 2/3 137/39/42	71.7 2/3 142/45/48
30	61.4 3/9 116/16/21	64.9 2/3 123/23/28	67.3 2/3 129/31/34	69.5 2/3 135/37/41	71.3 2/3 140/43/47
	61.0 3/9 115/16/21	64.6 2/3 122/22/27	67.0 2/3 128/30/34	69.2 2/3 134/36/40	70.9 2/3 139/42/46
45	60.0 3/9 115/15/20	63.6 3/3 122/22/27	66.0 2/3 128/29/33	68.1 2/3 134/36/39	69.8 2/3 139/42/45
	* 59.2 3/9 * 114/14/19	62.6 3/3 122/22/26	65.0 2/3 128/29/33	67.1 2/3 134/35/39	68.7 2/3 139/41/45
49	* 58.3 3/9 * 114/14/19	61.7 2/3 121/21/25	64.2 2/3 128/28/32	66.2 2/3 133/35/38	67.6 2/3 139/41/44
	* 57.2 3/3 * 113/14/19	60.7 3/3 121/21/25	63.3 2/3 127/28/32	65.2 2/3 133/34/38	66.6 2/3 138/40/44
51	* 56.2 3/3 * 113/14/19	59.7 3/3 120/20/25	62.3 2/3 127/28/31	64.2 2/3 133/34/37	65.6 2/3 138/40/43
	* 55.1 3/3 * 113/14/19	58.8 3/3 120/20/24	61.4 2/3 127/27/31	63.3 2/3 132/33/37	64.5 2/3 138/39/42
53	* 53.9 3/3 * 112/14/19	57.9 3/3 120/20/24	60.5 2/3 126/27/30	62.3 2/3 132/33/36	63.4 2/3 138/39/42
	* 53.3 3/3 * 112/14/19	57.4 3/3 119/19/23	60.0 2/3 126/26/30	61.8 2/3 132/33/36	62.9 2/3 138/38/42
55					
57					
59					
60					

CONFIGURATION 3				PRESSURE ALTITUDE = 1000 FT	
TREF = 43 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	64.2 3/3 124/24/29	67.5 3/3 132/32/36	70.2 2/3 138/39/43	71.9 2/3 144/46/50	72.9 2/3 151/52/56
-10	63.6 3/3 123/23/27	66.9 3/3 130/30/34	69.5 2/3 136/37/41	71.4 2/3 142/44/48	72.6 2/3 148/50/54
0	62.9 3/3 121/21/25	66.3 3/3 128/28/32	68.8 2/3 134/35/39	70.9 2/3 140/42/46	72.2 2/3 146/48/52
10	62.3 3/3 118/18/24	65.7 3/3 126/26/31	68.2 2/3 132/34/37	70.3 2/3 138/40/44	71.8 2/3 144/46/50
20	61.5 3/3 118/18/23	65.0 2/3 124/24/29	67.5 2/3 131/32/36	69.6 2/3 136/38/42	71.2 2/3 142/44/48
30	60.8 3/9 116/16/21	64.3 3/3 123/23/28	66.8 2/3 129/30/34	68.9 2/3 135/37/40	70.6 2/3 140/43/46
40	60.0 3/9 114/15/20	63.8 3/3 122/22/26	66.2 2/3 128/29/33	68.4 2/3 133/35/39	70.1 2/3 138/41/45
43	59.7 3/9 114/15/20	63.5 3/3 121/21/26	65.9 2/3 127/28/32	68.1 2/3 133/35/38	69.9 2/3 138/40/44
45	* 58.9 3/9 * 113/14/19	62.6 3/3 121/21/25	65.0 2/3 127/28/32	67.1 2/3 132/34/38	68.8 2/3 138/40/44
47	* 58.0 3/9 * 113/13/18	61.5 3/3 120/20/25	64.0 2/3 127/27/31	66.1 2/3 132/34/37	67.7 2/3 137/39/43
49	* 57.0 3/9 * 112/13/18	60.6 2/3 119/19/24	63.1 2/3 126/27/31	65.1 2/3 132/33/37	66.7 2/3 137/39/42
51	* 56.0 3/3 * 112/13/18	59.7 3/3 119/19/23	62.2 2/3 126/27/30	64.2 2/3 131/33/36	65.7 2/3 137/39/42
53	* 55.0 3/3 * 112/13/18	58.8 3/3 119/19/23	61.3 2/3 126/26/30	63.3 2/3 131/32/36	64.7 2/3 137/38/41
55	* 53.9 3/3 * 111/13/18	57.8 3/3 118/18/22	60.4 2/3 125/26/29	62.3 2/3 131/32/35	63.6 2/3 136/38/41
57	* 52.8 3/3 * 111/13/18	56.9 3/3 118/18/22	59.5 2/3 125/25/29	61.4 2/3 131/31/34	62.7 2/3 136/37/40
58	* 52.2 3/3 * 111/13/18	56.5 3/3 118/18/22	59.0 2/3 125/25/28	60.9 2/3 130/31/34	62.1 2/3 136/37/40

CONFIGURATION 3			PRESSURE ALTITUDE = 0 FT		
TREF = 30 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	81.4 3/9 127/33/39	86.0 3/9 130/37/42	89.8 2/3 136/44/49	92.2 2/3 143/51/55	94.0 2/3 149/58/62
-10	80.1 3/9 126/31/38	84.8 3/9 128/36/41	88.9 2/3 134/42/47	91.5 2/3 141/49/53	93.4 2/3 147/56/60
0	78.7 3/9 124/30/37	84.0 3/9 128/35/41	88.1 3/9 132/40/45	90.8 2/3 139/47/51	92.8 2/3 145/54/58
10	77.4 3/9 123/29/36	83.1 3/9 128/34/40	87.2 3/9 131/38/43	90.0 2/3 137/45/50	92.1 2/3 143/52/56
20	76.0 3/9 122/28/34	82.2 3/9 127/34/39	85.9 3/9 129/37/42	89.0 2/3 135/43/48	91.2 2/3 141/50/54
30	74.6 3/9 120/27/33	80.9 3/9 126/33/38	84.8 3/9 128/36/41	88.1 2/3 133/42/46	90.4 2/3 139/48/52
32	73.7 3/9 119/26/33	80.0 3/9 126/32/37	84.1 3/9 129/36/41	87.0 2/3 133/41/46	89.2 2/3 139/47/51
34	72.7 3/9 119/26/32	79.1 3/9 126/31/37	83.5 3/9 129/35/40	85.8 2/3 133/41/45	88.0 2/3 138/47/51
36	71.9 3/9 118/25/31	78.2 3/9 125/31/36	82.7 3/9 130/35/40	84.7 2/3 133/40/45	86.6 2/3 138/47/50
38	71.0 3/9 118/24/30	77.3 3/9 125/30/35	81.7 3/9 130/35/39	83.7 2/3 134/41/45	85.3 2/3 138/46/50
40	70.2 3/9 118/23/29	76.3 3/9 125/29/34	80.5 2/3 130/34/39	82.7 2/3 135/41/45	84.2 2/3 139/46/50
42	69.2 3/9 117/23/28	75.2 3/9 124/28/34	79.2 2/3 130/34/38	81.4 2/3 136/41/45	82.9 2/3 141/47/50
44	68.2 3/9 116/22/27	74.0 3/9 124/28/33	77.8 2/3 130/34/38	79.9 2/3 136/40/44	81.4 2/3 142/47/50
46	67.2 3/9 116/21/26	72.8 3/9 123/27/32	76.3 2/3 130/33/37	78.3 2/3 136/40/44	79.6 2/3 142/46/49
48	* 66.1 3/9 * 115/20/25	71.5 3/9 122/26/31	74.8 2/3 129/32/36	76.6 2/3 136/39/43	77.9 2/3 141/46/49
50	* 64.9 3/9 * 115/19/24	70.2 3/9 122/25/29	73.2 2/3 129/32/36	75.0 2/3 135/39/42	76.1 2/3 141/45/48
52	* 63.1 3/3 * 114/19/24	69.1 3/9 121/24/28	71.7 2/3 128/31/35	73.4 2/3 134/38/41	74.5 2/3 141/44/47
54	* 61.2 3/3 * 114/20/24	67.8 3/9 121/23/27	70.2 2/3 128/30/34	71.8 2/3 134/37/41	72.8 2/3 140/44/46
56	* 59.4 3/3 * 114/20/24	66.5 3/9 120/22/26	68.7 2/3 127/30/33	70.2 2/3 133/37/40	71.2 2/3 139/43/46
58	* 57.4 3/3 * 114/20/24	65.1 2/3 120/22/26	67.2 2/3 126/29/33	68.6 2/3 133/36/39	69.6 2/3 139/42/45

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CONFIGURATION 3			PRESSURE ALTITUDE = 1000 FT		
TREF = 28 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	79.1 3/9	84.2 3/9	87.6 2/3	90.0 2/3	91.8 2/3
	126/31/37	129/35/41	135/42/46	141/49/53	147/56/60
-10	77.8 3/9	83.3 3/9	86.8 2/3	89.4 2/3	91.3 2/3
	124/30/36	129/35/40	133/40/45	139/47/51	145/54/57
0	76.4 3/9	82.4 3/9	85.9 3/9	88.6 2/3	90.6 2/3
	123/29/35	129/34/39	131/38/43	137/45/49	143/52/55
10	75.0 3/9	81.2 3/9	84.9 3/9	87.8 2/3	89.9 2/3
	121/27/34	127/33/38	129/36/41	135/43/47	141/50/53
20	73.6 3/9	79.9 3/9	84.1 3/9	86.8 2/3	89.1 2/3
	120/26/33	126/32/37	129/36/41	133/41/46	139/48/52
28	72.5 3/9	78.8 3/9	83.4 3/9	86.1 2/3	88.4 2/3
	118/25/32	125/31/37	129/35/40	132/40/44	137/46/50
30	71.7 3/9	78.0 3/9	82.7 3/9	85.0 2/3	87.2 2/3
	118/25/31	125/30/36	129/35/40	132/39/44	137/46/50
32	70.8 3/9	77.1 3/9	82.0 3/9	84.1 2/3	86.0 2/3
	117/24/30	124/30/35	129/34/39	133/40/44	137/45/49
34	70.0 3/9	76.2 3/9	81.0 3/9	83.3 2/3	84.9 2/3
	117/23/29	124/29/34	129/34/38	134/40/44	137/45/49
36	69.2 3/9	75.3 3/9	80.0 3/9	82.3 2/3	83.9 2/3
	116/23/29	124/28/34	129/33/38	135/40/44	138/45/49
38	68.3 3/9	74.3 3/9	78.8 3/9	81.1 2/3	82.7 2/3
	116/22/28	123/28/33	129/33/37	135/40/43	139/45/49
40	67.5 3/9	73.3 3/9	77.6 2/3	79.8 2/3	81.5 2/3
	115/21/27	123/27/32	129/32/37	135/39/43	140/45/49
42	66.5 3/9	72.2 3/9	76.3 2/3	78.4 2/3	79.9 2/3
	115/20/26	122/26/31	128/32/36	134/39/42	140/45/48
44	65.5 3/9	71.1 3/9	74.8 2/3	76.9 2/3	78.3 2/3
	114/20/25	121/25/30	128/31/35	134/38/42	140/44/48
46	64.6 3/9	69.9 3/9	73.3 2/3	75.2 2/3	76.6 2/3
	114/19/24	121/24/29	127/31/35	134/38/41	140/44/47
48	* 63.5 3/9	68.7 3/9	71.8 2/3	73.6 2/3	74.8 2/3
	* 113/18/23	120/23/28	127/30/34	133/37/40	139/43/46
50	* 61.8 3/3	67.5 3/9	70.3 2/3	72.0 2/3	73.1 2/3
	* 113/18/23	120/22/27	126/29/33	133/36/40	139/43/45
52	* 60.0 3/3	66.4 3/9	68.9 2/3	70.5 2/3	71.5 2/3
	* 113/18/23	119/21/26	126/29/33	132/36/39	138/42/45
54	* 58.2 3/3	65.1 3/9	67.4 2/3	68.9 2/3	69.9 2/3
	* 112/18/23	118/21/25	125/28/32	132/35/38	138/41/44
56	* 56.4 3/3	63.8 3/9	66.0 2/3	67.4 2/3	68.3 2/3
	* 112/18/23	118/20/24	125/28/31	131/34/37	137/40/43

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CONFIGURATION 3			PRESSURE ALTITUDE = 0 FT		FWD CG
TREF = 44 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 55 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	71.2 3/3 129/31/37	76.1 3/3 134/35/40	79.3 2/3 141/41/45	81.6 2/3 147/49/52	83.4 2/3 154/55/58
-10	70.2 3/3 127/30/36	75.1 3/3 133/35/39	78.6 2/3 139/39/43	81.0 2/3 145/47/50	82.8 3/6 151/53/56
0	69.1 3/3 126/29/34	73.9 3/3 131/34/39	77.9 2/3 137/37/41	80.4 2/3 143/45/48	82.2 3/6 149/51/55
10	68.1 3/3 124/28/33	72.8 3/3 130/33/38	77.1 3/3 135/36/41	79.7 2/3 141/43/46	81.6 3/6 147/50/53
20	67.0 3/3 123/27/32	71.7 3/3 128/32/37	76.1 3/3 133/35/40	78.9 2/3 139/41/45	80.9 3/6 145/48/51
30	66.0 3/3 122/26/31	70.7 3/3 127/31/36	75.0 3/3 132/35/39	78.1 2/3 137/39/43	80.2 3/6 143/46/49
40	65.0 3/3 120/25/30	69.7 3/3 126/30/35	73.9 3/3 131/34/39	77.5 2/3 135/37/42	79.5 3/6 140/44/47
44	64.6 3/3 120/25/30	69.3 3/3 125/30/35	73.4 3/3 130/34/39	77.2 2/3 135/37/41	79.2 3/6 140/43/47
46	63.8 3/3 120/24/29	68.4 3/3 125/29/34	72.4 3/3 130/33/38	75.9 2/3 135/36/40	77.9 3/6 140/43/46
48	63.0 3/3 119/23/28	67.5 3/3 125/28/33	71.3 3/3 130/32/37	74.5 2/3 135/36/40	76.5 2/3 140/42/46
50	62.2 3/3 119/22/27	66.6 3/3 124/28/32	70.3 3/3 130/32/36	73.1 2/3 135/36/40	75.1 2/3 140/42/45
52	61.3 3/3 119/22/26	65.7 3/3 124/27/31	69.2 3/3 129/31/35	71.7 2/3 135/35/39	73.6 2/3 140/42/45
54	60.5 3/3 118/21/25	64.7 3/3 124/26/30	68.1 3/3 129/30/33	70.4 2/3 134/35/39	72.1 2/3 140/41/45
55	60.0 3/3 118/21/25	64.2 3/3 124/25/29	67.5 3/3 129/29/33	69.8 2/3 134/35/38	71.4 2/3 140/41/44
57	59.2 3/3 118/20/24	63.3 3/3 124/24/28	66.2 3/3 129/29/33	68.5 2/3 134/34/38	70.0 2/3 140/40/44
59	58.3 3/3 117/19/23	62.3 3/3 123/24/27	64.9 3/3 129/29/32	67.1 3/3 134/34/38	68.6 2/3 140/40/43
61	57.4 3/3 117/18/22	61.2 3/3 123/23/26	63.7 3/3 129/29/32	65.8 3/3 134/34/38	67.3 2/3 139/39/43
63	* 56.5 3/3 * 116/17/21	60.1 3/3 122/22/25	62.5 3/3 129/29/32	64.5 3/3 134/34/37	65.9 2/3 139/39/42
65	* 55.4 3/3 * 116/17/21	58.9 3/3 120/20/24	61.3 3/3 128/28/31	63.2 3/3 133/33/36	64.6 2/3 138/38/41
67	* 54.1 3/3 * 116/17/21	57.8 3/3 120/20/23	60.1 3/3 127/27/30	61.9 3/3 132/32/35	63.2 3/3 137/37/40
68	* 53.5 3/3 * 116/17/21	57.2 3/3 120/20/23	59.5 3/3 126/26/29	61.3 3/3 131/31/34	62.5 2/3 136/36/39

CONFIGURATION 3			PRESSURE ALTITUDE = 1000 FT		FWD CG
TREF = 42 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES	
TMAX = 53 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2	
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	69.7 3/3	74.5 3/3	78.0 2/3	80.3 2/3	82.1 2/3
	127/30/35	133/34/39	139/39/43	145/47/50	151/53/56
-10	68.7 3/3	73.4 3/3	77.3 2/3	79.7 2/3	81.5 2/3
	126/29/34	131/34/39	137/37/41	143/45/48	149/51/54
0	67.6 3/3	72.3 3/3	76.4 3/3	79.0 2/3	80.9 2/3
	124/28/33	130/33/38	135/36/40	141/43/46	147/49/53
10	66.6 3/3	71.2 3/3	75.5 3/3	78.3 2/3	80.3 3/6
	123/27/32	128/32/37	133/35/40	139/41/45	145/48/51
20	65.5 3/3	70.2 3/3	74.3 3/3	77.5 2/3	79.6 3/6
	122/26/31	127/31/36	132/35/39	137/39/43	143/46/49
30	64.5 3/3	69.2 3/3	73.3 3/3	76.8 2/3	78.9 3/6
	120/25/30	126/30/35	131/34/39	135/37/41	141/44/47
40	63.6 3/3	68.2 3/3	72.3 3/3	76.1 3/3	78.2 3/6
	119/24/29	124/29/34	129/33/38	134/36/40	139/42/46
42	63.4 3/3	68.0 3/3	72.1 3/3	75.9 3/3	78.1 3/6
	119/24/29	124/29/34	129/33/38	133/36/40	139/42/45
44	62.6 3/3	67.1 3/3	71.0 3/3	74.5 3/3	76.7 2/3
	118/23/28	124/28/33	129/32/37	133/35/39	139/41/45
46	61.7 3/3	66.2 3/3	70.0 3/3	73.2 2/3	75.3 2/3
	118/22/27	124/27/32	129/31/36	133/34/39	138/41/44
48	60.9 3/3	65.3 3/3	69.0 3/3	71.9 2/3	73.8 2/3
	118/21/26	123/26/31	128/30/35	133/34/38	138/41/44
50	60.1 3/3	64.4 3/3	68.0 3/3	70.6 2/3	72.4 2/3
	117/21/25	123/26/30	128/30/33	133/34/38	138/40/44
52	59.2 3/3	63.5 3/3	66.9 3/3	69.3 2/3	71.0 2/3
	117/20/24	123/25/29	128/29/32	133/33/37	138/40/43
53	58.9 3/3	63.1 3/3	66.4 3/3	68.7 2/3	70.3 2/3
	117/20/24	123/24/28	128/28/32	133/33/37	138/39/43
55	58.0 3/3	62.1 3/3	65.2 3/3	67.4 2/3	68.9 2/3
	117/19/23	122/23/27	128/28/31	133/33/36	138/39/42
57	57.1 3/3	61.1 3/3	63.9 3/3	66.1 3/3	67.6 2/3
	116/18/22	122/23/26	128/28/31	133/33/36	138/38/42
59	56.2 3/3	60.1 3/3	62.6 3/3	64.7 3/3	66.2 2/3
	116/17/21	122/22/25	127/27/31	133/33/36	138/38/41
61	* 55.3 3/3	59.0 3/3	61.4 3/3	63.4 3/3	64.9 2/3
	* 115/16/20	121/21/24	127/27/30	132/32/36	137/37/40
63	* 54.2 3/3	57.9 3/3	60.2 3/3	62.2 3/3	63.5 3/3
	* 115/16/20	119/19/23	126/26/29	132/32/35	137/37/40
65	* 52.9 3/3	56.8 3/3	59.1 3/3	60.9 3/3	62.2 3/3
	* 114/16/20	118/18/21	125/25/28	131/31/33	136/36/39
66	* 52.3 3/3	56.2 3/3	58.5 3/3	60.3 3/3	61.5 3/3
	* 114/16/20	118/18/21	125/25/28	130/30/33	135/35/38

CONFIGURATION 3			PRESSURE ALTITUDE = 2000 FT		
TREF = 41 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 51 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	62.9 3/3	66.2 3/3	68.9 2/3	70.7 2/3	71.8 2/3
	122/22/27	130/30/34	136/37/41	142/44/48	149/50/54
-10	62.3 3/3	65.6 3/3	68.3 2/3	70.2 2/3	71.4 2/3
	121/21/26	128/28/32	134/35/39	140/42/46	146/48/52
0	61.6 3/3	65.0 3/3	67.5 2/3	69.6 2/3	71.1 2/3
	118/18/23	126/26/30	132/33/37	138/40/44	144/46/50
10	61.0 3/3	64.4 3/3	66.9 2/3	69.0 2/3	70.6 2/3
	117/17/22	125/25/29	131/32/35	136/38/42	142/44/48
20	60.2 3/9	63.7 3/3	66.2 2/3	68.4 2/3	70.0 2/3
	116/16/21	123/23/27	129/30/34	135/37/40	140/42/46
30	59.4 3/9	63.1 3/3	65.5 2/3	67.6 2/3	69.4 2/3
	114/15/20	121/21/26	127/29/32	133/35/38	138/41/44
40	58.6 3/9	62.5 3/3	65.0 2/3	67.1 2/3	68.9 2/3
	112/14/19	120/20/24	126/27/31	131/33/37	137/39/43
41	58.5 3/9	62.4 3/3	64.9 2/3	67.0 2/3	68.8 2/3
	112/14/19	120/20/24	126/27/31	131/33/37	136/39/42
43	57.6 3/9	61.5 3/3	63.9 2/3	66.1 2/3	67.8 2/3
	112/13/18	119/19/24	125/26/30	131/33/36	136/38/42
45	* 56.8 3/9	60.5 3/3	62.9 2/3	65.1 2/3	66.8 2/3
	* 111/12/17	119/19/23	125/26/30	131/32/36	136/38/41
47	* 55.8 3/9	59.5 3/3	62.0 2/3	64.1 2/3	65.7 2/3
	* 111/12/17	118/18/23	125/25/29	130/32/35	135/37/41
49	* 54.7 3/3	58.5 3/3	61.1 2/3	63.1 2/3	64.7 2/3
	* 110/12/17	117/17/22	125/25/29	130/31/35	135/37/40
51	* 53.7 3/3	57.7 3/3	60.2 2/3	62.2 2/3	63.7 2/3
	* 110/12/17	117/17/22	124/25/28	130/31/34	135/36/40
53	* 52.6 3/3	56.8 3/3	59.3 2/3	61.3 2/3	62.7 2/3
	* 110/12/17	117/17/21	124/24/28	129/30/34	135/36/39
55	* 51.6 3/3	55.9 3/3	58.4 2/3	60.4 2/3	61.7 2/3
	* 109/12/17	116/16/21	123/23/27	129/30/33	134/35/39
56	* 51.1 3/3	55.5 3/3	58.0 2/3	59.9 2/3	61.3 2/3
	* 109/12/17	116/16/20	123/23/27	129/29/33	134/35/38

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CONFIGURATION 3			PRESSURE ALTITUDE = 2000 FT		
TREF = 26 °C		DRY RUNWAY	MAX TO WEIGHT(1000KG)		CODES
TMAX = 51 °C		SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)				
	1500	1750	2000	2250	2500
-20	76.8 3/9 124/29/35	82.6 3/9 130/34/39	85.4 2/3 133/40/44	87.8 2/3 139/47/51	89.6 2/3 145/54/57
-10	75.4 3/9 123/28/34	81.5 3/9 129/33/39	84.7 2/3 131/38/43	87.1 2/3 137/45/49	89.0 2/3 143/51/55
0	74.0 3/9 121/27/33	80.1 3/9 127/32/38	84.0 3/9 131/37/41	86.4 2/3 135/43/47	88.3 2/3 141/49/53
10	72.6 3/9 119/25/32	78.9 3/9 126/31/37	83.3 3/9 130/35/40	85.5 2/3 133/41/45	87.6 2/3 139/47/51
20	71.2 3/9 118/24/30	77.6 3/9 125/30/36	82.4 3/9 129/35/39	84.7 2/3 132/39/44	86.9 2/3 137/45/49
26	70.5 3/9 117/24/30	76.8 3/9 124/30/35	81.8 3/9 129/34/39	84.3 2/3 131/39/43	86.4 2/3 136/44/48
28	69.7 3/9 116/23/29	75.9 3/9 123/29/34	80.9 3/9 128/33/38	83.4 2/3 132/39/43	85.2 2/3 136/44/48
30	68.8 3/9 116/22/28	75.0 3/9 123/28/33	79.9 3/9 128/33/37	82.5 2/3 133/39/43	84.2 2/3 137/44/48
32	68.1 3/9 115/22/27	74.1 3/9 122/27/33	79.0 3/9 128/32/37	81.6 2/3 134/39/43	83.3 2/3 138/44/48
34	67.4 3/9 115/21/27	73.3 3/9 122/27/32	78.1 3/9 128/32/36	80.6 2/3 133/38/42	82.4 2/3 139/44/48
36	66.5 3/9 114/20/26	72.3 3/9 121/26/31	77.0 3/9 127/31/36	79.4 2/3 133/38/42	81.1 2/3 139/44/47
38	65.7 3/9 114/20/25	71.4 3/9 121/25/30	75.8 3/9 127/31/35	78.1 2/3 133/37/41	79.8 2/3 139/44/47
40	64.9 3/9 113/19/24	70.4 3/9 120/25/30	74.5 2/3 127/30/34	76.8 2/3 133/37/41	78.4 2/3 138/43/46
42	63.9 3/9 113/18/23	69.4 3/9 120/24/29	73.2 2/3 126/30/34	75.3 2/3 132/36/40	76.8 2/3 138/43/46
44	63.0 3/9 112/17/22	68.3 3/9 119/23/28	71.8 2/3 126/29/33	73.8 2/3 132/36/39	75.2 2/3 138/42/45
46	* 62.0 3/9 * 112/16/21	67.2 3/9 119/22/26	70.3 2/3 125/28/32	72.2 2/3 131/35/39	73.5 2/3 137/41/44
48	* 60.5 3/3 * 111/16/21	66.0 3/9 118/21/25	68.9 2/3 125/28/32	70.6 2/3 131/35/38	71.7 2/3 137/41/44
50	* 58.7 3/3 * 111/16/21	64.9 3/9 117/20/24	67.5 2/3 124/27/31	69.1 2/3 130/34/37	70.1 2/3 136/40/43
52	* 57.0 3/3 * 111/17/21	63.8 3/9 117/19/23	66.0 2/3 124/26/30	67.6 2/3 130/33/36	68.6 2/3 136/39/42
54	* 55.3 3/3 * 111/17/21	62.5 3/9 116/18/22	64.7 2/3 123/26/29	66.1 2/3 129/32/36	67.0 2/3 135/39/41

OCTO 15.0.1 AC211B04 FCOM-NO-02-02-40-013-260

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CONFIGURATION 3			PRESSURE ALTITUDE = 2000 FT			FWD CG
TREF = 40 °C			DRY RUNWAY	MAX TO WEIGHT(1000KG) CODES		
TMAX = 51 °C			SLOPE = 0 %	IAS(KT) : V1 / VR / V2		
TEMP. (°C)	CORRECTED RUNWAY LENGTH (M)					
	1500	1750	2000	2250	2500	
-20	68.2 3/3 126/29/34	72.7 3/3 132/34/38	76.5 3/3 137/37/41	79.0 2/3 143/44/48	80.8 2/3 149/51/54	
	67.1 3/3 124/28/33	71.7 3/3 130/33/37	75.8 3/3 135/36/40	78.3 2/3 141/42/46	80.2 2/3 147/49/52	
0	66.1 3/3 123/27/32	70.7 3/3 128/32/36	74.8 3/3 134/35/40	77.6 2/3 139/40/44	79.6 2/3 145/47/50	
	65.1 3/3 122/25/31	69.7 3/3 127/31/35	73.8 3/3 132/35/39	76.9 2/3 137/38/43	78.9 2/3 143/45/49	
20	64.1 3/3 120/24/29	68.6 3/3 126/30/34	72.7 3/3 131/34/38	76.1 2/3 135/37/41	78.2 3/6 141/44/47	
	63.1 3/3 119/23/28	67.6 3/3 124/29/33	71.6 3/3 129/33/37	75.3 3/3 134/36/40	77.5 3/6 139/42/45	
40	62.1 3/3 118/22/27	66.7 3/3 123/28/32	70.7 3/3 128/32/36	74.4 3/3 132/35/39	76.8 3/6 137/40/44	
	61.3 3/3 117/22/26	65.8 3/3 123/27/31	69.7 3/3 128/31/35	73.1 3/3 132/34/39	75.4 2/3 137/40/43	
44	60.5 3/3 117/21/26	64.9 3/3 122/26/30	68.7 3/3 127/30/34	71.8 3/3 132/34/38	73.9 2/3 137/39/43	
	59.7 3/3 117/20/25	64.1 3/3 122/25/29	67.7 3/3 127/29/33	70.7 2/3 132/33/37	72.5 2/3 137/39/43	
48	58.9 3/3 116/20/24	63.2 3/3 122/24/28	66.7 3/3 127/28/32	69.4 2/3 132/32/36	71.2 2/3 137/39/42	
	58.0 3/3 116/19/23	62.3 3/3 122/24/28	65.7 3/3 127/28/31	68.2 2/3 132/32/36	69.8 2/3 137/38/42	
51	57.6 3/3 116/18/22	61.8 3/3 121/23/27	65.2 3/3 126/27/31	67.5 2/3 132/32/35	69.2 2/3 137/38/41	
	57.2 3/3 115/18/22	61.4 3/3 121/23/27	64.7 3/3 126/27/30	66.9 2/3 132/32/35	68.5 2/3 137/38/41	
54	56.4 3/3 115/17/21	60.5 3/3 121/22/26	63.5 3/3 126/26/30	65.6 2/3 132/32/35	67.2 2/3 137/37/41	
	* 55.5 3/3 * 114/16/20	59.5 3/3 121/21/25	62.2 3/3 126/26/29	64.3 3/3 131/31/35	65.8 2/3 137/37/40	
58	* 54.6 3/3 * 114/15/19	58.5 3/3 120/20/23	60.9 3/3 126/26/29	63.0 3/3 131/31/34	64.4 2/3 136/36/39	
	* 53.6 3/3 * 113/15/18	57.3 3/3 119/19/22	59.7 3/3 125/25/28	61.6 3/3 130/30/33	63.1 2/3 135/35/38	
62	* 52.3 3/3 * 113/15/18	56.3 3/3 118/18/21	58.6 3/3 124/24/27	60.4 3/3 129/29/32	61.8 2/3 134/34/37	
	* 51.1 3/3 * 113/15/18	55.2 3/3 117/17/20	57.4 3/3 123/23/26	59.2 3/3 128/28/31	60.5 2/3 134/34/36	

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A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.50	P 1
	NET TAKEOFF FLIGHT PATH		SEQ. 001	REV 32

INTRODUCTION

The following graphs enable the crew to quickly determine the takeoff performance out of an airport by positioning obstacles.
 They must be used with the corresponding quick reference table so as to determine weight decrement and required gradient.
 The net takeoff flight path and the associated weight decrement are conservative.

HOW TO PROCEED

1. Position the obstacle by entering its distance from end of runway and its height above the end of runway (No 35 feet margin is required as this is already included).
 In case of an ascending runway, increase the obstacle height by an additional value as indicated below each graph.
2. Read the associated weight correction. Interpolate if necessary. The second segment gradient is given for information only.
- R 3. Decrease the takeoff speeds by 1 knot per 1000 kg (0.5 kt per 1000 lb) weight decrement. Limit the final speeds to the minimum values as given on 2.02.25 p1.

Note : *In case of tailwind, do not use the obstacle clearance graphs.*

A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.50	P 1
	NET TAKEOFF FLIGHT PATH		SEQ. 001	REV 32

INTRODUCTION

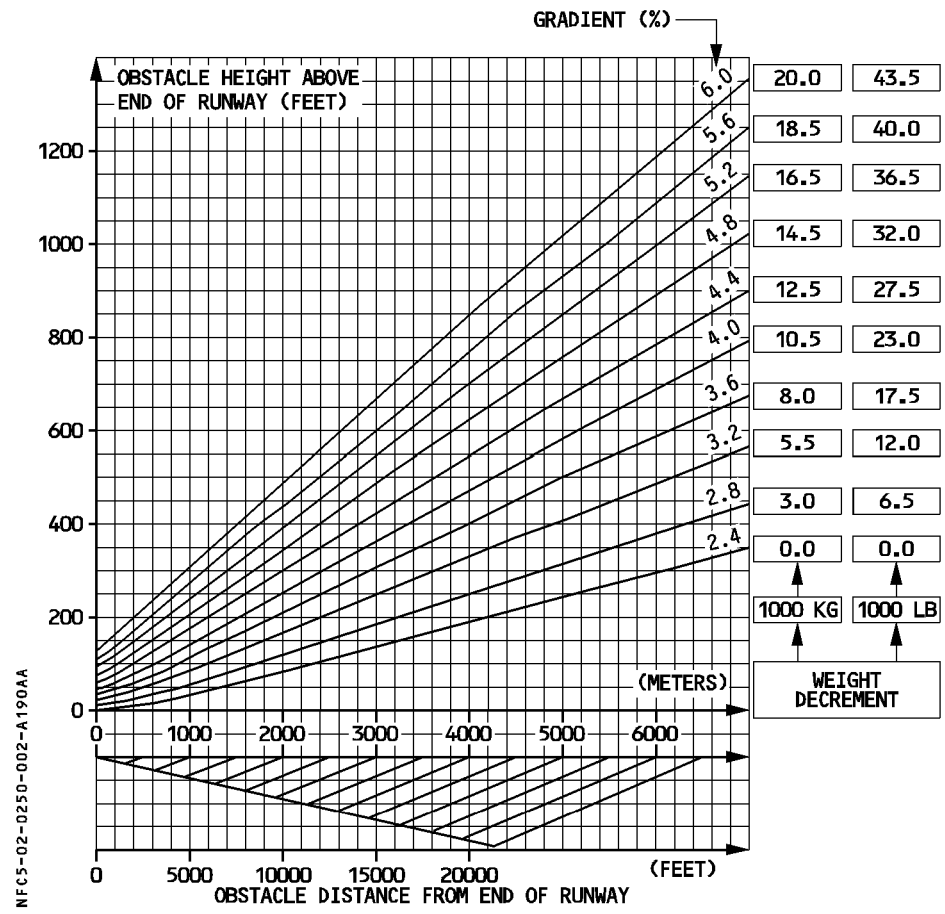
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CLOSE OBSTACLE CLEARANCE CONF 1 + F



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A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	TAKEOFF		2.02.50	P 1
	NET TAKEOFF FLIGHT PATH		SEQ. 001	REV 32

INTRODUCTION

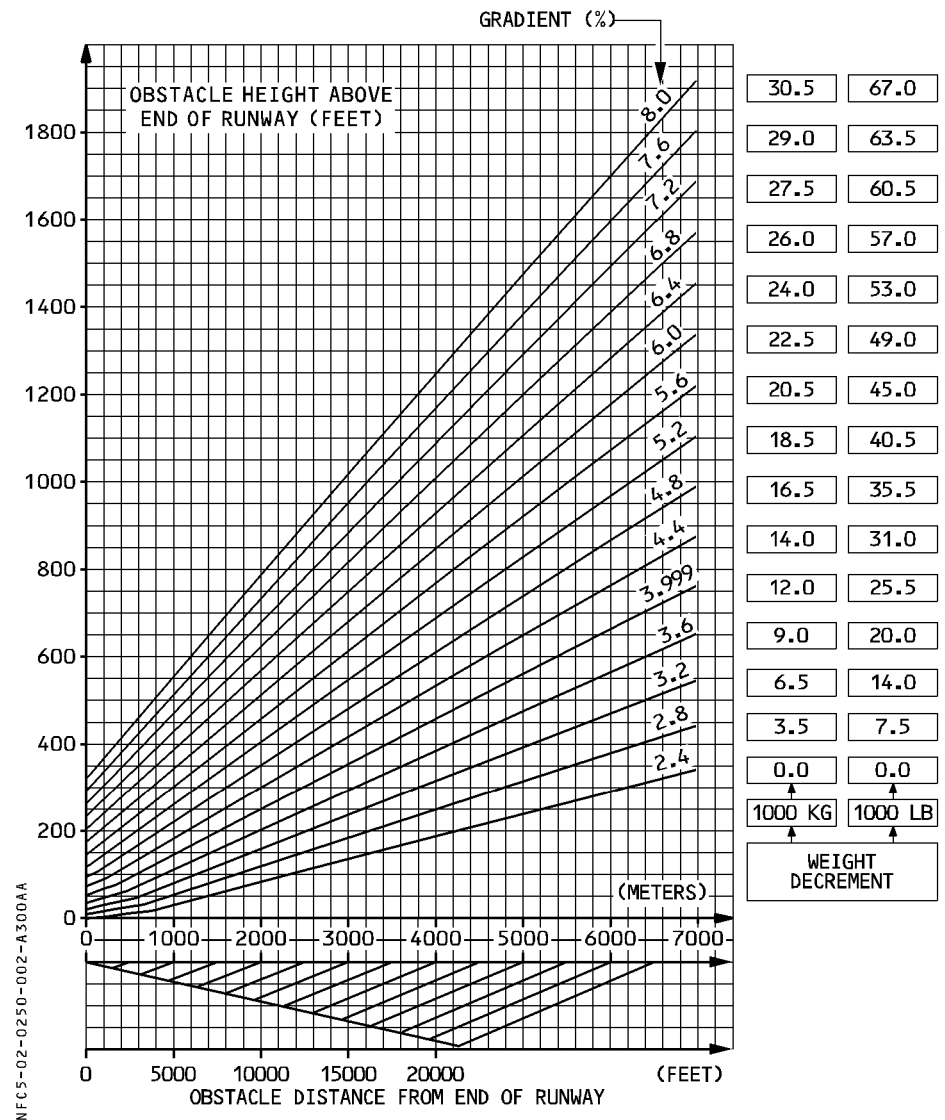
The following graphs enable the crew to quickly determine the takeoff performance out of an airport by positioning obstacles.
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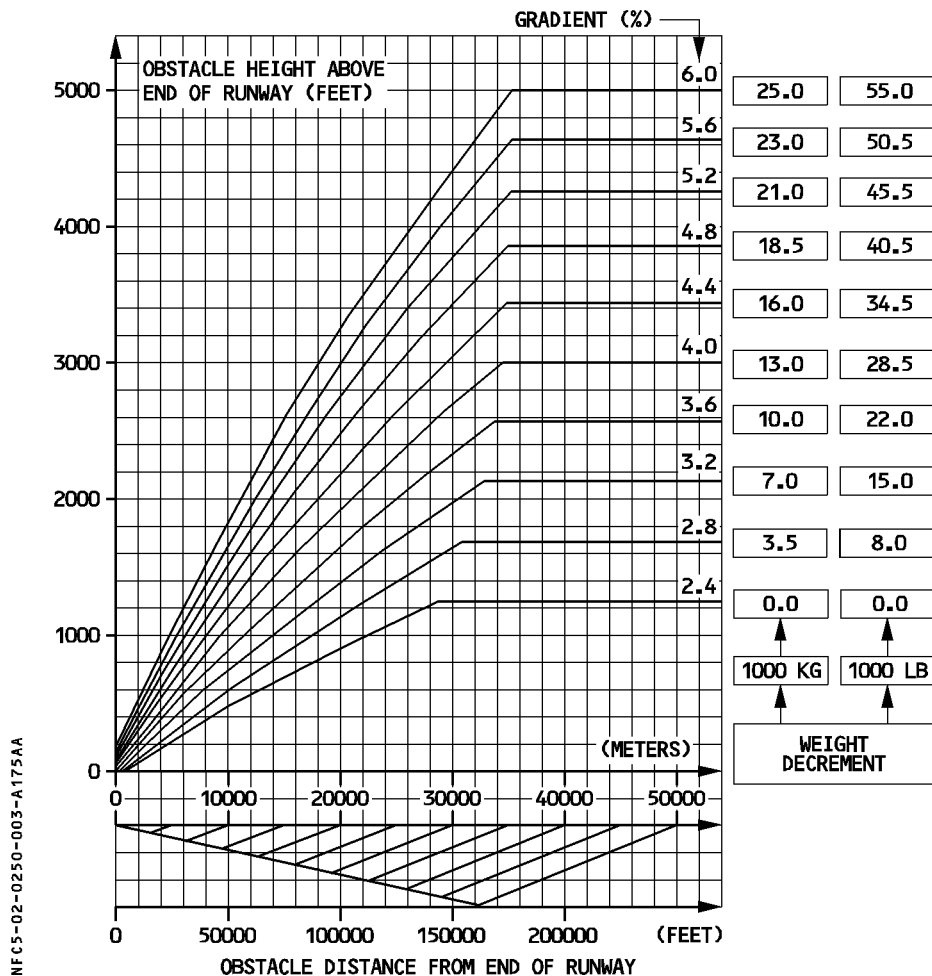
Note : *In case of tailwind, do not use the obstacle clearance graphs.*

CLOSE OBSTACLE CLEARANCE CONF 1 + F



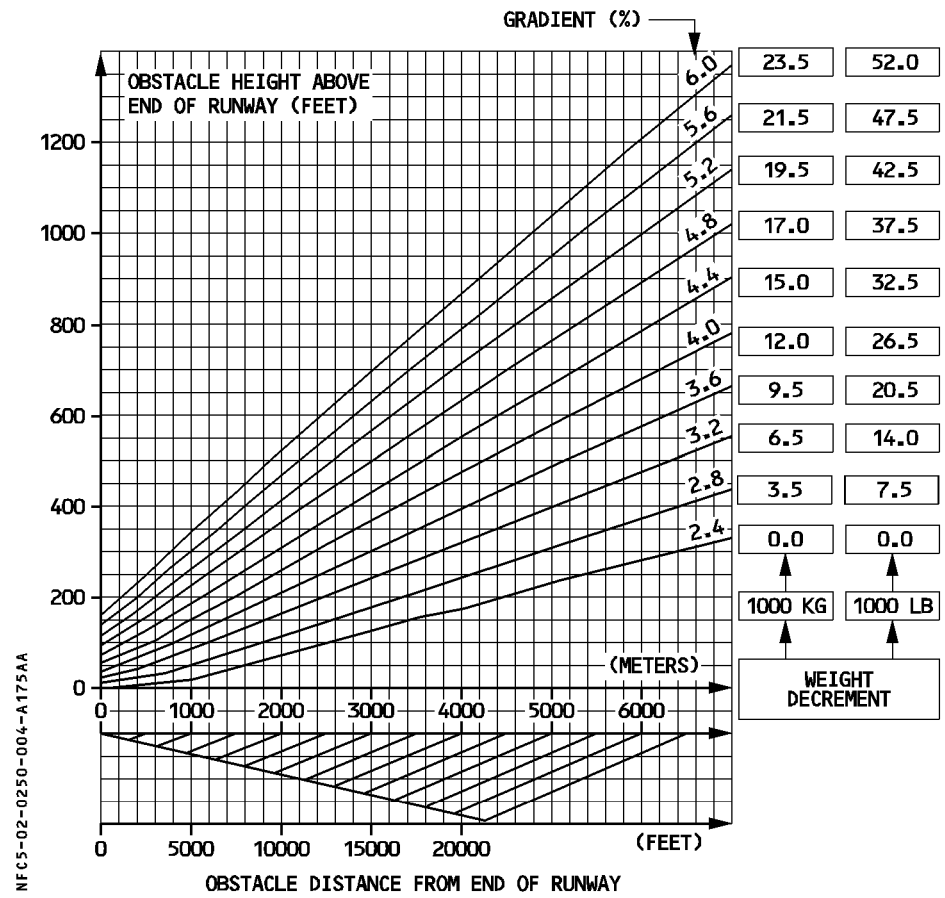
Note : In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 1 + F

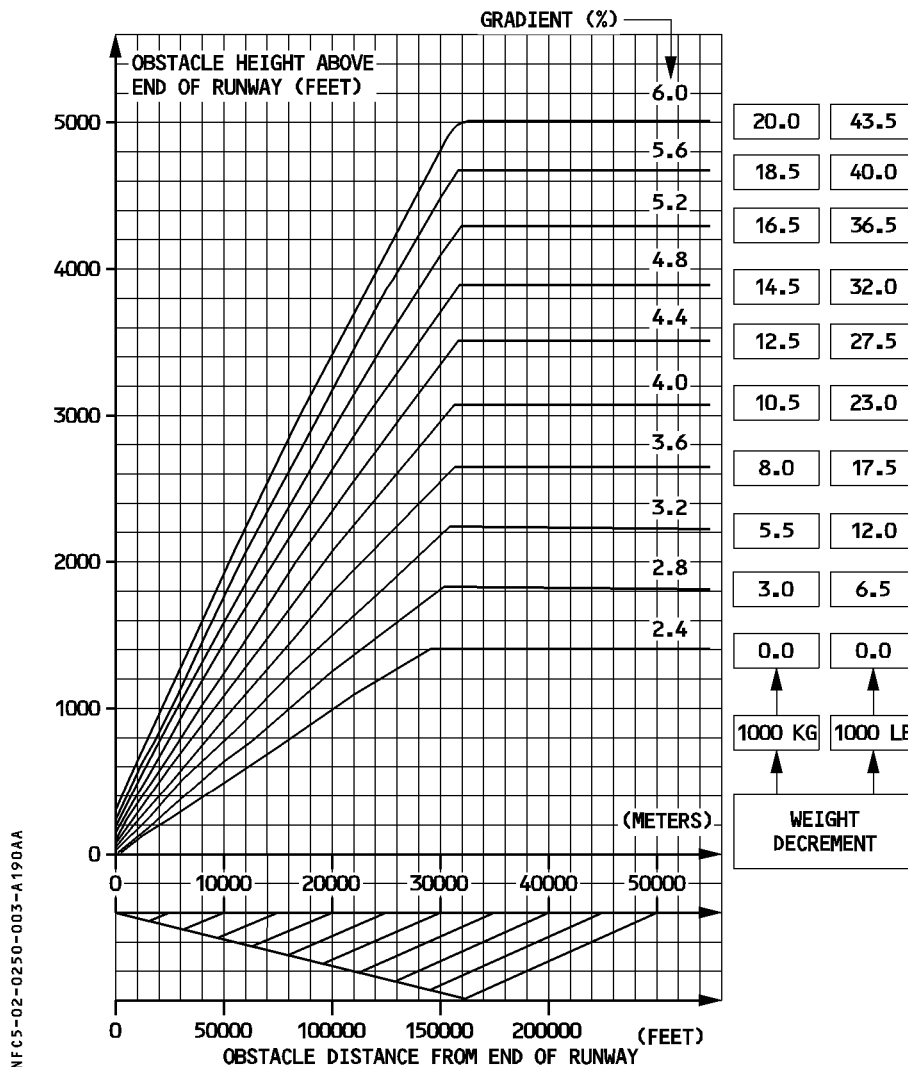


Note : In case of ascending runway, increase obstacle height by 40 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 2

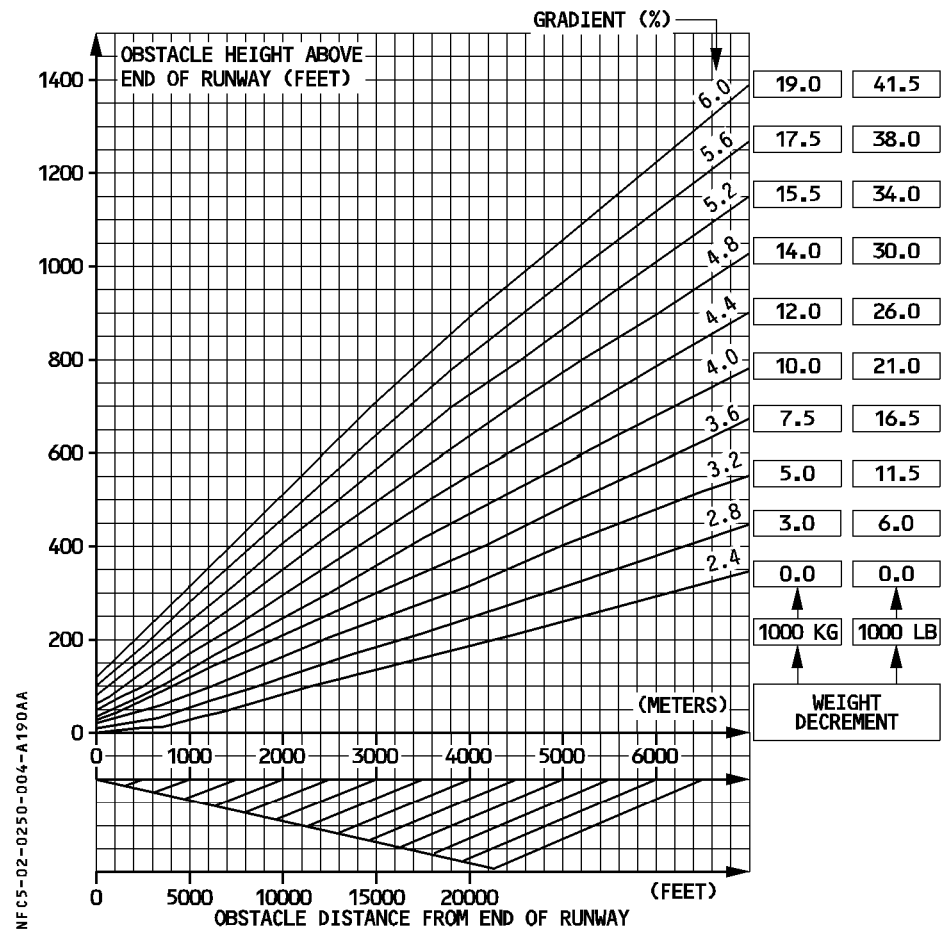


REMOTE OBSTACLE CLEARANCE CONF 1 + F



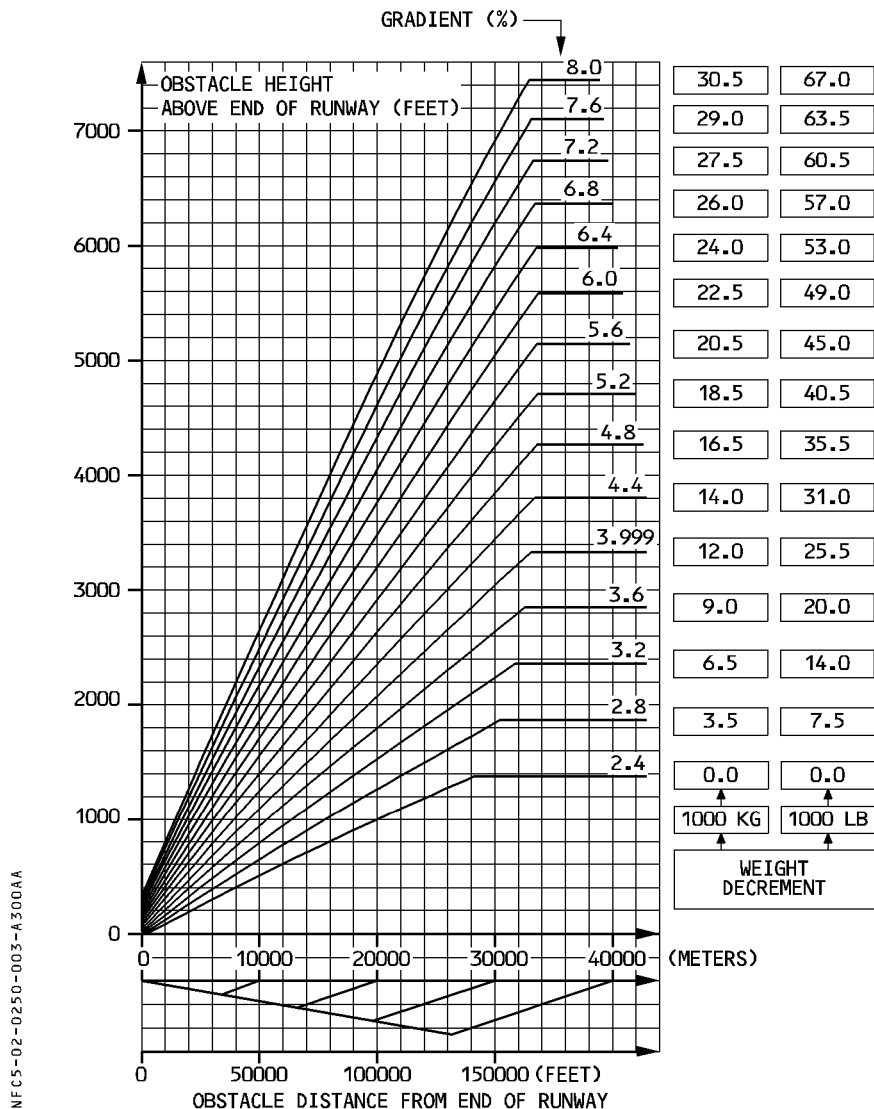
Note: In case of ascending runway, increase obstacle height by 30 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 2



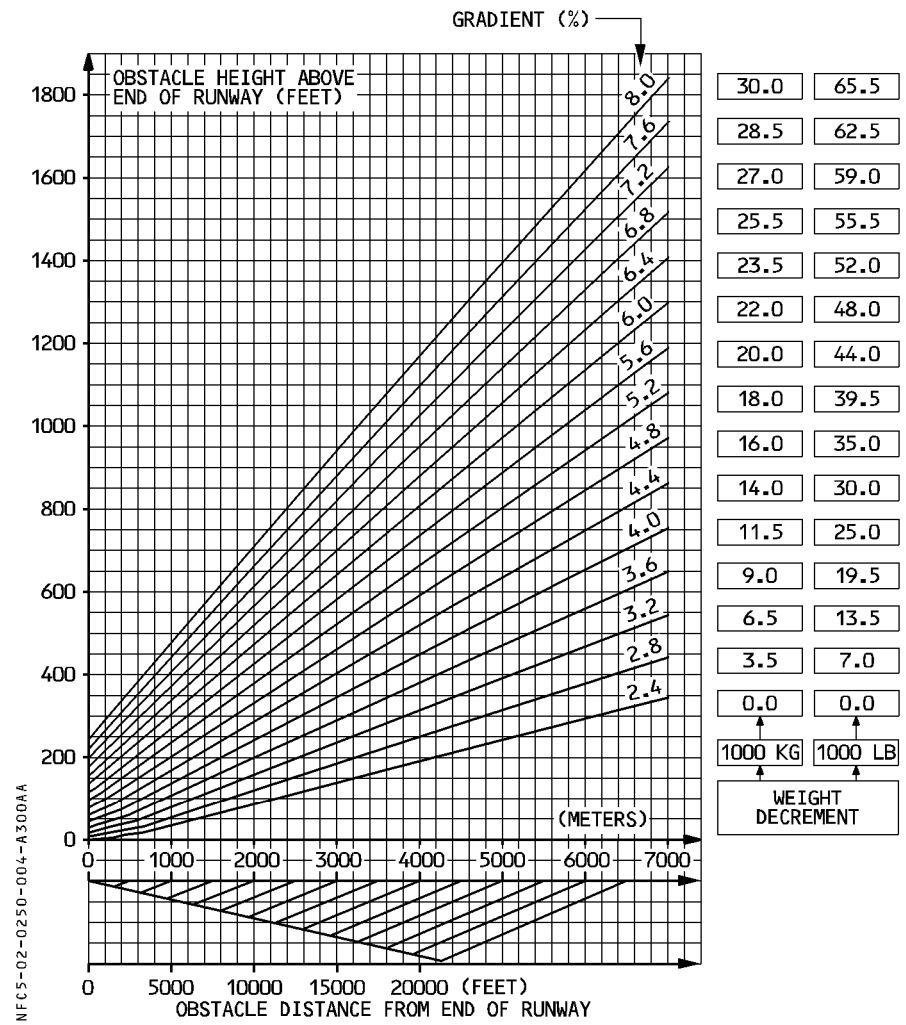
Note : In case of ascending runway, increase obstacle height by 30 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 1 + F



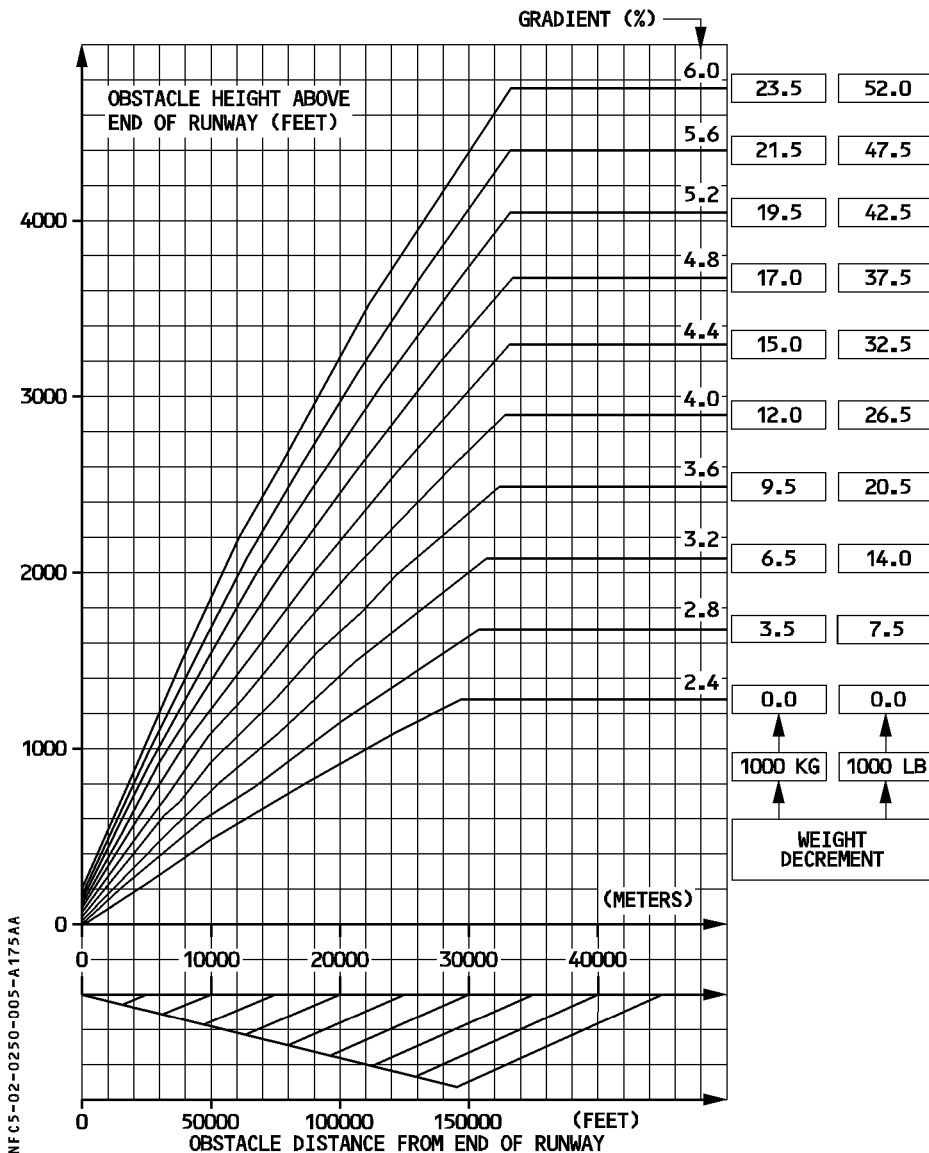
Note: In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 2



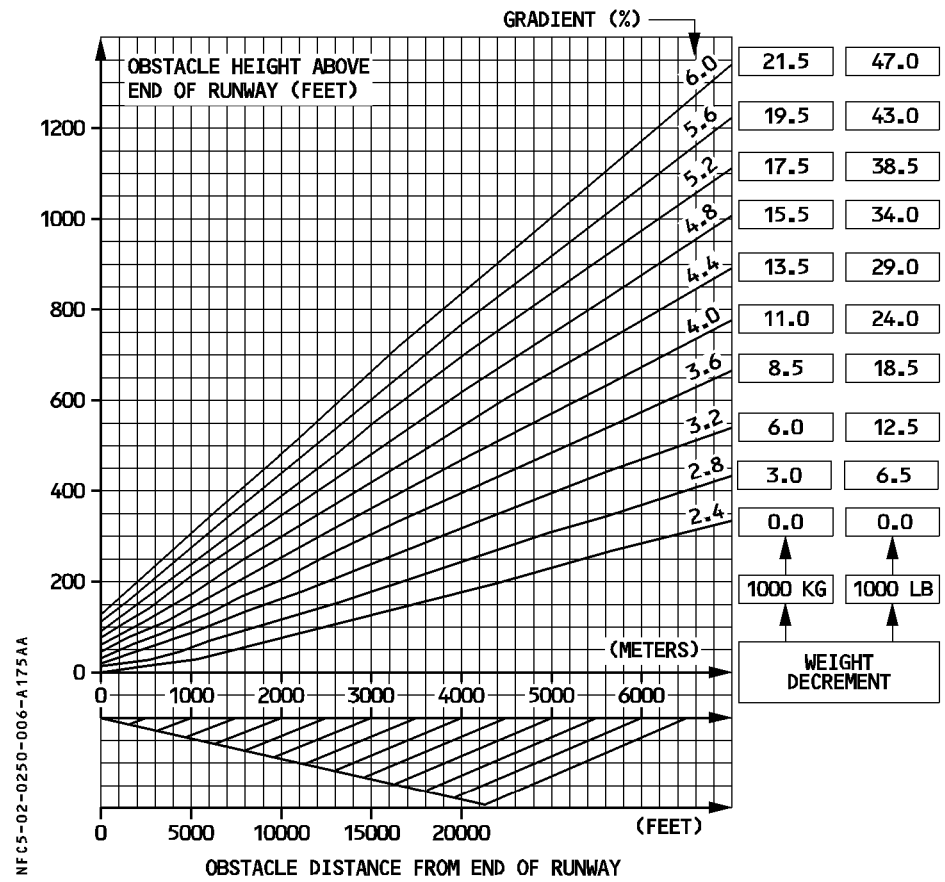
Note : In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 2



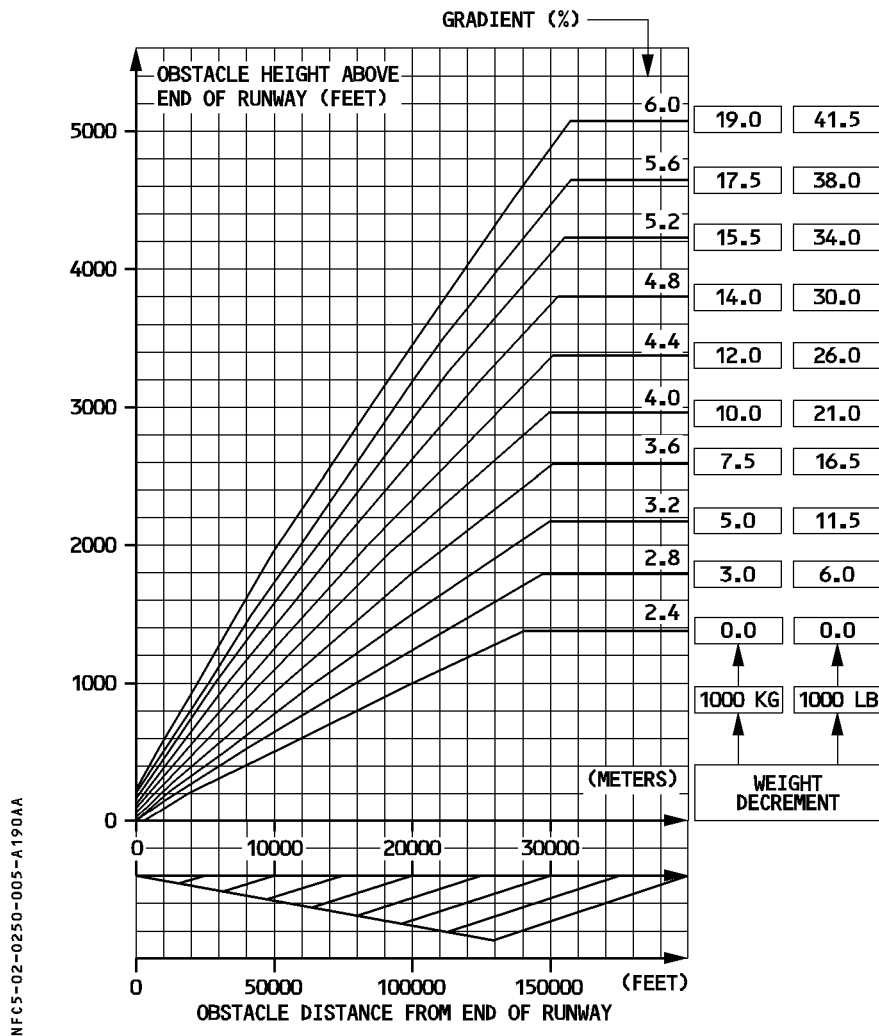
Note: In case of ascending runway, increase obstacle height by 40 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 3



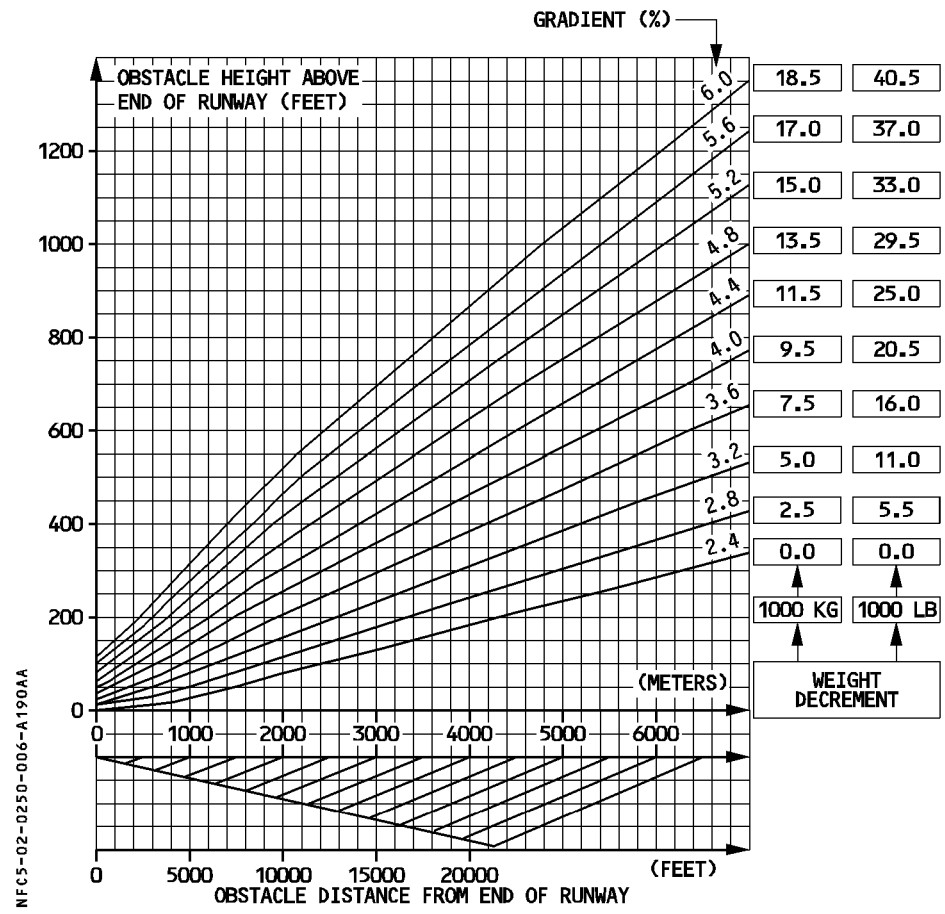
Note : In case of ascending runway, increase obstacle height by 40 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 2



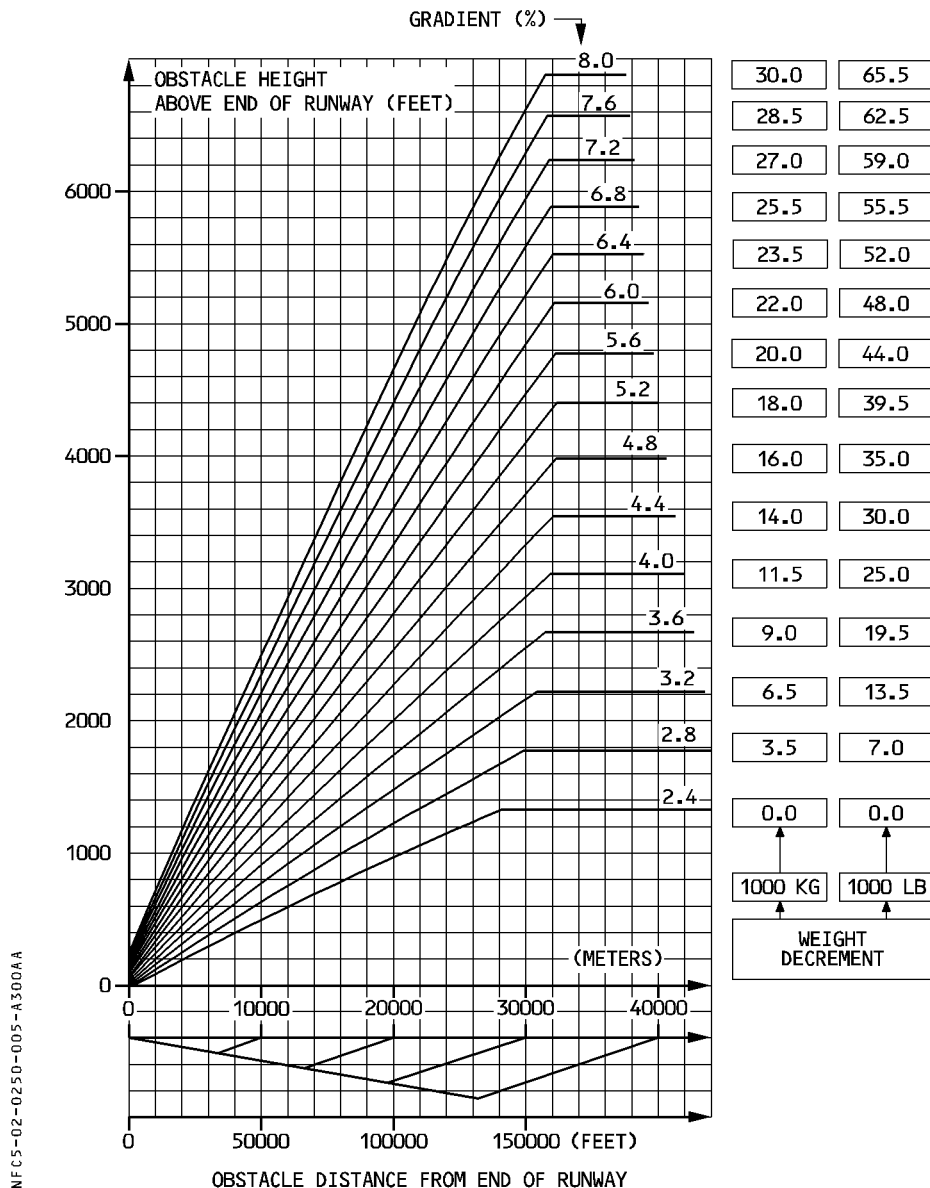
Note : In case of ascending runway, increase obstacle height by 30 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 3



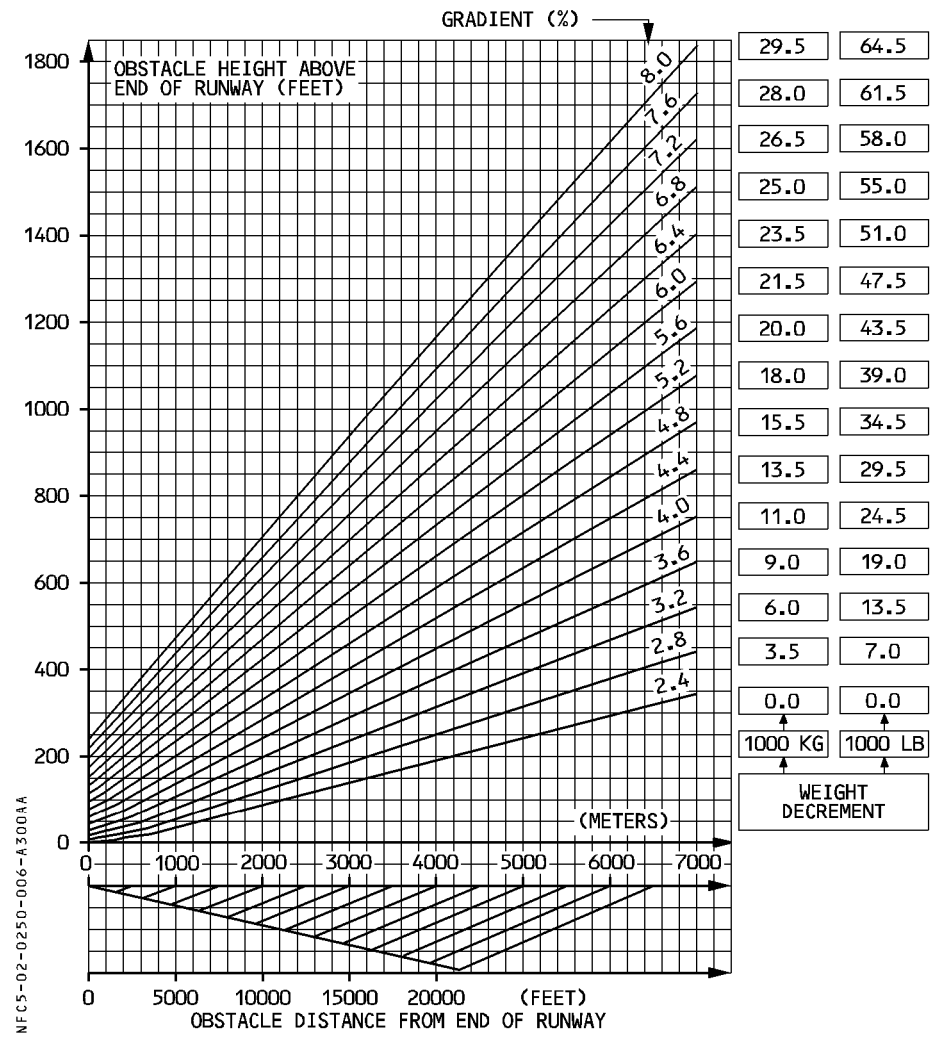
Note : In case of ascending runway, increase obstacle height by 30 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 2



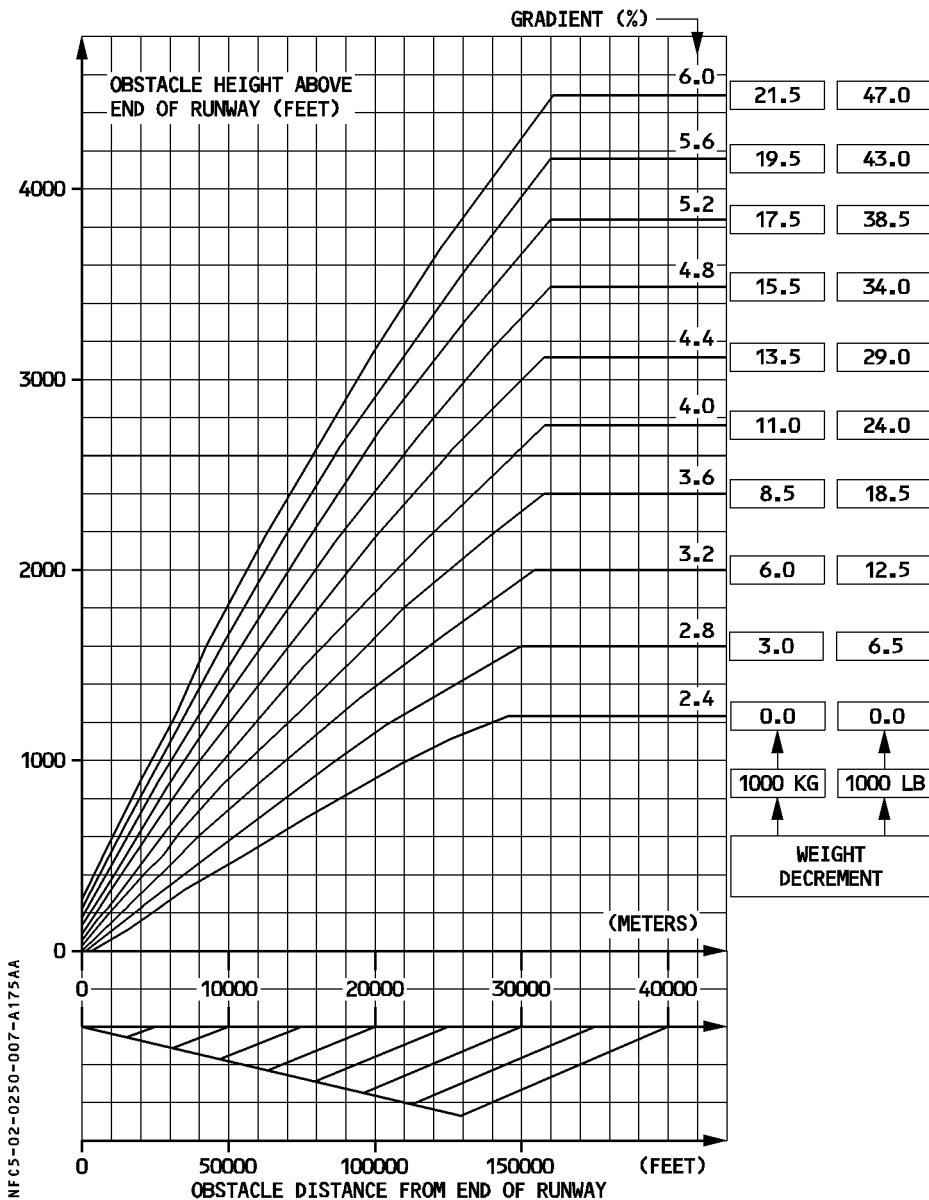
Note: In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

CLOSE OBSTACLE CLEARANCE CONF 3



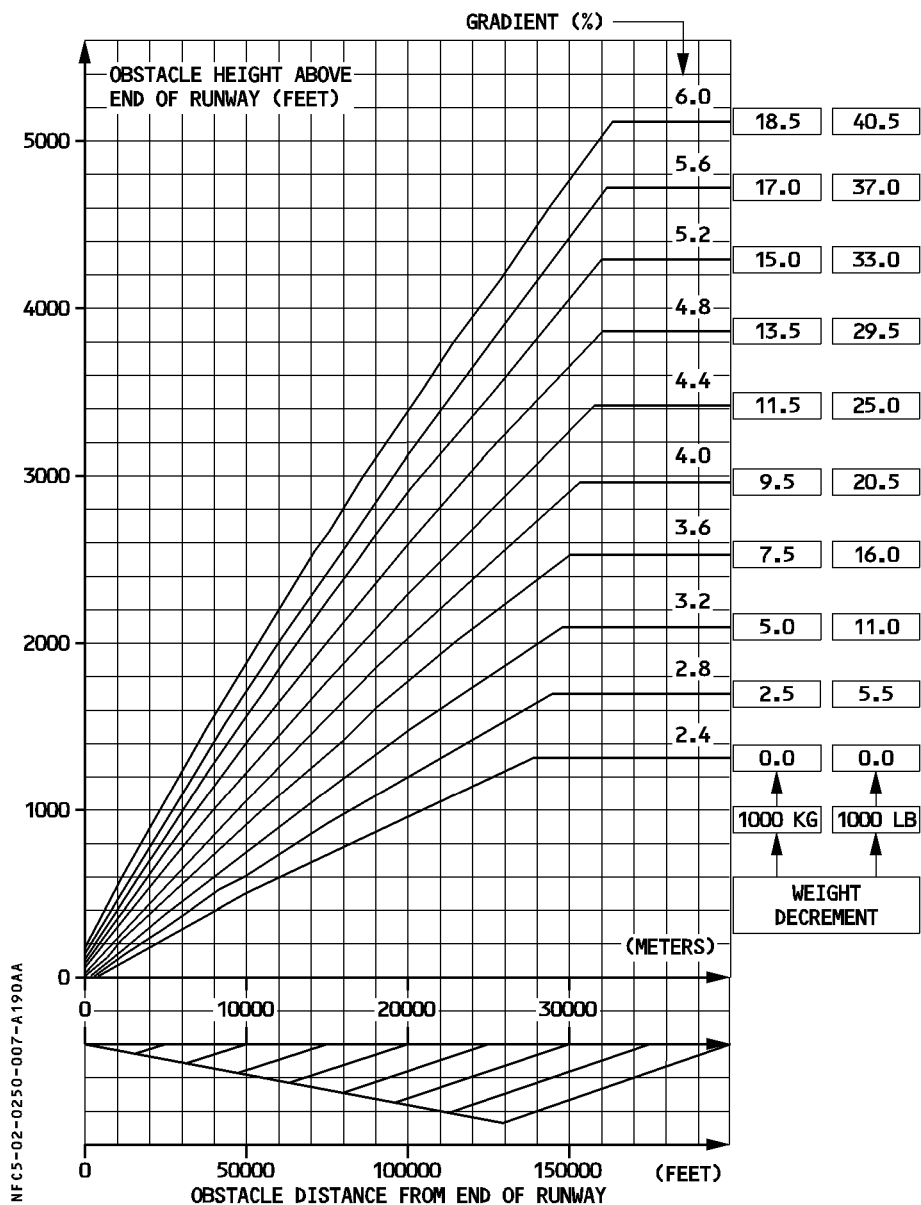
Note : In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 3



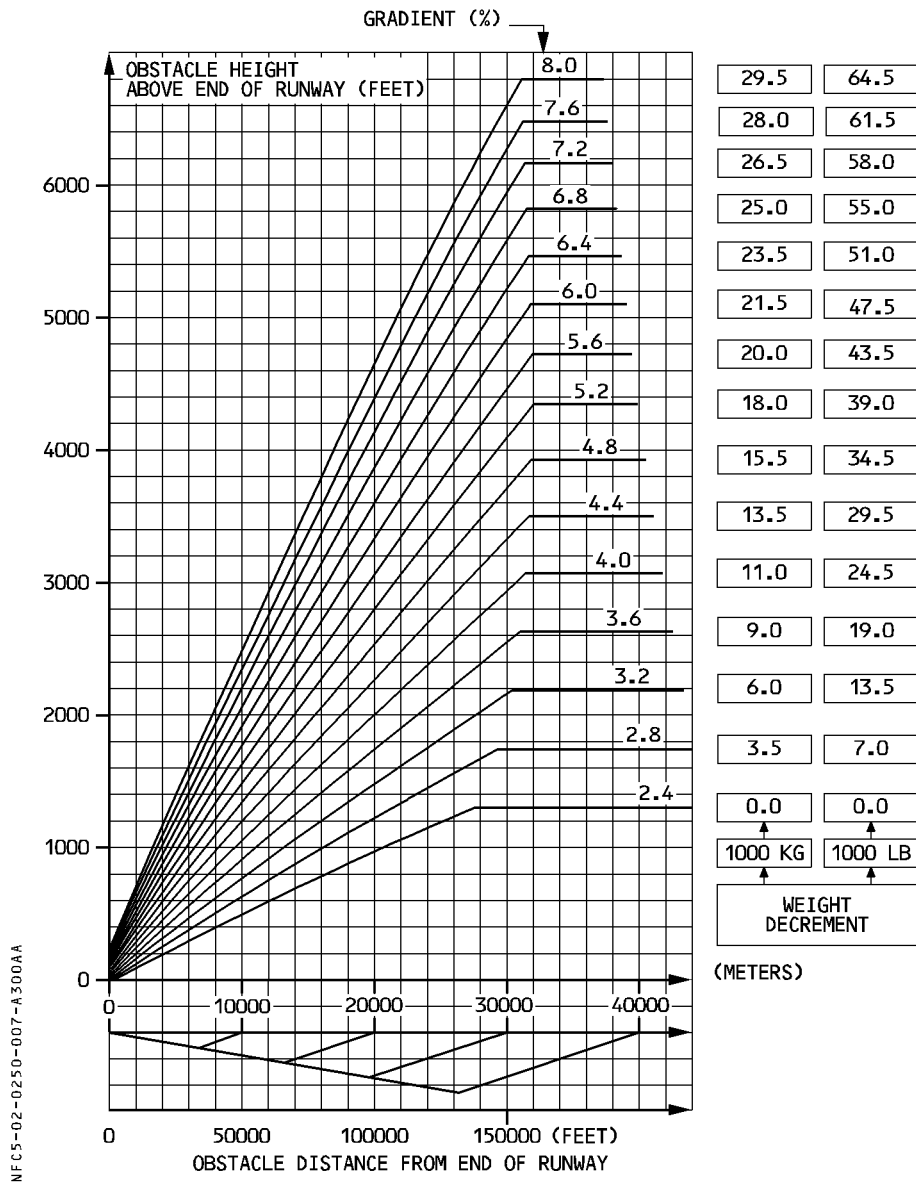
Note : In case of ascending runway, increase obstacle height by 40 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 3



Note : In case of ascending runway, increase obstacle height by 30 feet per percent runway slope.

REMOTE OBSTACLE CLEARANCE CONF 3



Note: In case of ascending runway, increase obstacle height by 50 feet per percent runway slope.

03.00CONTENTS

03.10LANDING

- GENERAL

– DISPATCH

– FAILURE IN FLIGHT

– ACTUAL LANDING DISTANCES

– REQUIRED LANDING DISTANCES
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5

03.20USE OF THE AUTOBRAKE SYSTEM

- GENERAL

– MANUAL LANDING WITH AUTOBRAKE
- 1

2

R

GENERAL

ACTUAL LANDING DISTANCE

The actual landing distance is the distance measured between a point 50 feet above the runway threshold and the point where the complete stop of the aircraft is achieved.

It assumes that :

- the approach speed is :
 - VLS (1.23 VS of the configuration) for manual landing
 - VLS + 5 kt for CAT II/CAT III automatic landing.
- the pilot applies maximum braking and the antiskid system is operating.
- the ground spoilers are operating.

It does not consider the use of reverse thrust.

REQUIRED LANDING DISTANCE

MANUAL LANDING

Regulation defines the required landing distance as the actual landing distance divided by 0.6, assuming the surface is dry.

If the surface is wet, the required landing distance must be at least 115 % of that for a dry surface.

- R For JAR-OPS operators, if the surface is contaminated, the required landing distance must
 R be at least the greater of the required landing distance on wet runway (see previous
 R paragraph) and 115 % of the landing distance determined in accordance with approved
 R contaminated landing distance data.

R AUTOMATIC LANDING

- R Regulation (JAR.AWO 142) defines the required landing distance for automatic landing as
 R the actual landing distance in automatic landing multiplied by 1.15. This distance must be
 R retained for automatic landing whenever it is greater than the required landing distance in
 manual mode.

DISPATCH

The pilot must check before departure that the available runway length at destination is at least equal to the required landing distance for the forecasted landing weight.

In case of aircraft system failure affecting landing distance known before the dispatch, the available runway length must be at least equal to the required landing distance with failure, i.e. the required landing distance without failure multiplied by the coefficient given in the Flight Manual or the MMEL.

FAILURE IN FLIGHT

In case of an aircraft system failure occurring in flight and affecting the landing performance, the runway length to be considered for landing is the actual landing distance without failure multiplied by the landing distance coefficient associated with the failure. The coefficients are given in FCOM 3.02.80 and in the QRH.
The concept of required landing distance no longer applies.

RECOMMENDATIONS

- R For most cases of abnormal landing configuration, the increased actual landing distance does not exceed the required runway length for landing in normal configuration. However, the addition of several of these factors can very quickly lead to an overrun. Special notice should be taken of the runway condition. A slippery runway is the most common reason for overrun at landing. The combination of a slippery runway and a factor such as tailwind or an increase in approach speed should be avoided.
As far as possible, avoid the combination of any failure affecting the braking capability of the aircraft (spoilers, reversers) with landing on a contaminated runway, or prepare for it carefully by checking the available runway length against the forecasted landing distance. During a visual approach, use all means of monitoring the flight path ; use the ILS together with available visual aids such as VASI or PAPI. Monitor the approach speed along with the wind and ground speed, especially during final approach.

ACTUAL LANDING DISTANCES

CONFIGURATION FULL

ACTUAL LANDING DISTANCE (METERS)												
WEIGHT (1000 KG)			40	44	48	52	56	60	64	68	72	76
RUNWAY CONDITION	DRY		680	680	700	730	760	790	820	860	940	1010
	WET		880	880	930	990	1050	1100	1150	1220	1290	1330
	COVERED WITH	6.3 MM (1/4 INCH) WATER	1190	1210	1280	1370	1460	1550	1640	1750	1860	1930
		12.7 MM (1/2 INCH) WATER	1140	1160	1230	1310	1400	1480	1560	1660	1750	1830
		6.3 MM (1/4 INCH) SLUSH	1160	1180	1250	1340	1410	1480	1550	1650	1750	1820
		12.7 MM (1/2 INCH) SLUSH	1120	1140	1210	1290	1360	1420	1490	1580	1680	1740
		COMPACTED SNOW	1150	1160	1220	1290	1340	1400	1460	1520	1590	1630
		ICE	2450	2470	2570	2690	2790	2890	3000	3120	3250	3320

CORRECTIONS

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 3 %	+ 4 %	+ 4 %	+ 5 %	+ 4 %	+ 3 %	+ 3 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 19 %	+ 23 %	+ 25 %	+ 22 %	+ 24 %	+ 21 %	+ 18 %	+ 35 %
2 reversers operative	−3 %	−6 %	−12 %	−10 %	−11 %	−10 %	−9 %	−24 %
Per 5 kt speed increment (and no failure) add 8% (all runways)								

CONFIGURATION 3

ACTUAL LANDING DISTANCE (METERS)												
WEIGHT (1000 KG)			40	44	48	52	56	60	64	68	72	76
RUNWAY CONDITION	DRY		680	710	750	790	820	850	900	980	1070	1150
	WET		910	980	1050	1120	1190	1250	1320	1400	1480	1530
	COVERED WITH	6.3 MM (1/4 INCH) WATER	1250	1350	1460	1590	1700	1800	1910	2050	2170	2270
		12.7 MM (1/2 INCH) WATER	1200	1290	1390	1500	1600	1700	1790	1920	2040	2110
		6.3 MM (1/4 INCH) SLUSH	1220	1320	1420	1510	1600	1690	1800	1910	2050	2130
		12.7 MM (1/2 INCH) SLUSH	1180	1270	1360	1450	1530	1620	1720	1830	1940	2010
		COMPACTED SNOW	1190	1270	1350	1430	1490	1550	1620	1700	1770	1820
		ICE	2780	2900	3030	3170	3290	3400	3520	3670	3830	3910

CORRECTIONS

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 4 %	+ 4 %	+ 4 %	+ 5 %	+ 4 %	+ 3 %	+ 3 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 17 %	+ 24 %	+ 25 %	+ 23 %	+ 24 %	+ 21 %	+ 19 %	+ 34 %
2 reversers operative	−4 %	−8 %	−14 %	−12 %	−12 %	−11 %	−9 %	−26 %
Per 5 kt speed increment (and no failure) add 8% (all runways)								

ACTUAL LANDING DISTANCES

CONFIGURATION FULL

R

ACTUAL LANDING DISTANCE (METERS)												
WEIGHT (1000 KG)			58	62	66	70	74	78	82	86	90	94
RUNWAY CONDITION	DRY		820	850	890	920	960	1010	1080	1280	1370	1460
	WET		1040	1100	1170	1230	1300	1360	1430	1540	1630	1710
	COVERED WITH	6.3 MM (1/4 INCH) WATER	1460	1560	1660	1760	1860	1970	2060	2170	2270	2370
		12.7 MM (1/2 INCH) WATER	1400	1500	1590	1690	1780	1870	1960	2050	2150	2240
		6.3 MM (1/4 INCH) SLUSH	1420	1500	1580	1670	1760	1850	1940	2030	2130	2210
		12.7 MM (1/2 INCH) SLUSH	1370	1450	1530	1610	1690	1780	1860	1950	2050	2130
		COMPACTED SNOW	1330	1400	1460	1530	1590	1640	1700	1760	1820	1870
		ICE	2790	2910	3030	3160	3280	3390	3510	3630	3750	3860

CORRECTIONS

R

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 4 %	+ 4 %	+ 4 %	+ 5 %	+ 4 %	+ 3 %	+ 4 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 17 %	+ 22 %	+ 24 %	+ 22 %	+ 22 %	+ 20 %	+ 16 %	+ 27 %
2 reversers operative	− 4 %	− 7 %	− 11 %	− 10 %	− 11 %	− 10 %	− 8 %	− 21 %
Per 5 kt speed increment (and no failure) add 8 % (all runways)								

CONFIGURATION 3

R

ACTUAL LANDING DISTANCE (METERS)												
WEIGHT (1000 KG)			58	62	66	70	74	78	82	86	90	94
RUNWAY CONDITION	DRY		870	910	950	990	1030	1090	1160	1390	1490	1590
	WET		1150	1220	1290	1370	1440	1510	1590	1710	1810	1900
	COVERED WITH	6.3 MM (1/4 INCH) WATER	1620	1730	1850	1950	2070	2180	2280	2410	2520	2630
		12.7 MM (1/2 INCH) WATER	1540	1650	1740	1860	1960	2060	2160	2270	2380	2480
		6.3 MM (1/4 INCH) SLUSH	1550	1640	1740	1850	1950	2040	2150	2270	2360	2470
		12.7 MM (1/2 INCH) SLUSH	1490	1580	1670	1770	1870	1960	2060	2150	2250	2340
		COMPACTED SNOW	1440	1510	1580	1650	1720	1780	1840	1910	1970	2020
		ICE	3050	3190	3330	3460	3590	3720	3840	3980	4110	4220

CORRECTIONS

R

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 4 %	+ 4 %	+ 4 %	+ 5 %	+ 5 %	+ 3 %	+ 4 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 16 %	+ 21 %	+ 23 %	+ 21 %	+ 22 %	+ 21 %	+ 16 %	+ 26 %
2 reversers operative	− 5 %	− 7 %	− 12 %	− 11 %	− 11 %	− 11 %	− 8 %	− 22 %
Per 5 kt speed increment (and no failure) add 8 % (all runways)								

ACTUAL LANDING DISTANCES

CONFIGURATION FULL

ACTUAL LANDING DISTANCE (METERS)											
WEIGHT (1000 KG)			46	50	54	58	62	66	70	74	78
RUNWAY CONDITION	DRY		700	730	770	800	840	910	990	1080	1170
	WET		920	980	1040	1110	1180	1240	1320	1390	1460
	COVERED WITH	6.3 MM (1/4INCH) WATER	1220	1300	1380	1480	1590	1700	1810	1930	2020
		12.7 MM (1/2INCH) WATER	1190	1260	1340	1430	1530	1630	1730	1840	1930
		6.3 MM (1/4INCH) SLUSH	1180	1260	1340	1420	1500	1580	1670	1770	1860
		12.7 MM (1/2INCH) SLUSH	1150	1220	1300	1370	1450	1530	1610	1700	1780
		COMPACTED SNOW	1190	1270	1340	1410	1480	1550	1620	1700	1750
		ICE	2570	2690	2820	2950	3090	3230	3370	3510	3620

CORRECTIONS

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 3 %	+ 4 %	+ 4 %	+ 5 %	+ 4 %	+ 3 %	+ 4 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 18 %	+ 21 %	+ 23 %	+ 21 %	+ 22 %	+ 20 %	+ 18 %	+ 31 %
forward C.G.	+ 2 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %
2 reversers operative	-3 %	-8 %	-10 %	-10 %	-9 %	-8 %	-8 %	-24 %
Per 5 kt speed increment (and no failure) add 8% (all runways)								

CONFIGURATION 3

ACTUAL LANDING DISTANCE (METERS)											
WEIGHT (1000 KG)			46	50	54	58	62	66	70	74	78
RUNWAY CONDITION	DRY		750	780	820	860	910	1000	1100	1200	1290
	WET		1020	1090	1160	1240	1320	1400	1480	1570	1650
	COVERED WITH	6.3 MM (1/4 INCH) WATER	1340	1430	1540	1660	1790	1930	2060	2200	2310
		12.7 MM (1/2 INCH) WATER	1300	1380	1480	1590	1710	1830	1950	2080	2180
		6.3 MM (1/4 INCH) SLUSH	1300	1390	1470	1560	1650	1760	1890	2010	2110
		12.7 MM (1/2 INCH) SLUSH	1250	1340	1420	1500	1590	1690	1800	1910	2000
		COMPACTED SNOW	1300	1380	1460	1540	1620	1700	1780	1850	1910
		ICE	2970	3110	3260	3410	3560	3720	3880	4040	4170

CORRECTIONS

	CORRECTION ON ACTUAL LANDING DISTANCE							
	dry runway	wet runway	runway covered with					
			1/4 inch water	1/2 inch water	1/4 inch slush	1/2 inch slush	compacted snow	ice
per 1000 ft above SL	+ 3 %	+ 4 %	+ 4 %	+ 4 %	+ 5 %	+ 5 %	+ 3 %	+ 4 %
per 10 kt headwind	No correction for headwind due to wind correction on approach speed							
per 10 kt tailwind	+ 18 %	+ 21 %	+ 24 %	+ 21 %	+ 22 %	+ 20 %	+ 17 %	+ 29 %
forward C.G.	+ 2 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %	+ 3 %
2 reversers operative	−3 %	−9 %	−12 %	−11 %	−11 %	−10 %	−9 %	−26 %
Per 5 kt speed increment (and no failure) add 8% (all runways)								

REQUIRED LANDING DISTANCE

MANUAL LANDING

REQUIRED LANDING DISTANCE (METERS)										
WEIGHT (1000 KG)	40	44	48	52	56	60	64	68	72	76
CONF 3	1130	1190	1250	1310	1360	1420	1490	1630	1780	1920
CONF FULL	1130	1130	1160	1220	1260	1310	1360	1420	1560	1680

Corrections on landing distances

Wind : per 10 kt tailwind add 20 %
 No correction for headwind due to wind correction on approach speed.

Airport elevation : per 1000 ft above sea level add 3 %.

AUTOMATIC LANDING

Determine the corrected required landing distance for manual landing from the data above.

The required landing distance for automatic landing is equal to the corrected required landing distance for manual landing except in the following case :

- In case of landing in Conf FULL with landing weight equal to or less than 60 000 kg and with headwind at or above 10 knots, it is equal to the corrected required landing distance for manual landing increased by 90 meters.

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REQUIRED LANDING DISTANCE

MANUAL LANDING

R

REQUIRED LANDING DISTANCE (METERS)										
WEIGHT (1000 KG)	58	62	66	70	74	78	82	86	90	94
CONF 3	1450	1510	1580	1650	1720	1810	1940	2320	2480	2640
CONF FULL	1360	1420	1480	1540	1600	1680	1790	2130	2280	2430

Corrections on landing distances

Wind
 : per 10 kt tailwind add 17 %
 No correction for headwind due to wind correction on approach speed.

R

Airport elevation
 : per 1000 ft above sea level add 3 %.

AUTOMATIC LANDING

Determine the corrected required landing distance for manual landing from the data above.

The required landing distance for automatic landing is equal to the corrected required landing distance for manual landing except in the following cases :

- R
- In case of landing in Conf 3 with landing weight equal to or less than 75 000 kg and with headwind at or above 10 knots, it is equal to the corrected required landing distance for manual landing increased by 95 meters.
- R
- In case of landing in Conf FULL with landing weight equal to or less than 70 000 kg and with no wind or headwind, it is equal to the corrected required landing distance for manual landing increased by 130 meters.

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REQUIRED LANDING DISTANCE

MANUAL LANDING

REQUIRED LANDING DISTANCE (METERS)									
WEIGHT (1000 KG)	46	50	54	58	62	66	70	74	78
CONF 3	1250	1300	1360	1430	1520	1670	1830	1990	2140
CONF FULL	1170	1220	1270	1330	1390	1510	1650	1800	1940

Corrections on landing distances

Wind : per 10 kt tailwind add 19 %
no correction for headwind due to wind correction on approach speed.

Airport elevation : per 1000 ft above sea level add 3 %.

Forward CG : add 2 %

AUTOMATIC LANDING

Determine the corrected required landing distance for manual landing from the data above.

The required landing distance for automatic landing is equal to the corrected required landing distance for manual landing except in the following case :

- In case of landing in Conf 3 with landing weight equal to or less than 65000 kg, it is equal to the corrected required landing distance for manual landing increased by 125 meters.
- In case of landing in Conf FULL with landing weight equal to or less than 65000 kg, it is equal to the corrected required landing distance for manual landing increased by 70 meters.

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GENERAL

The autobrake system is designed to help the pilot in case of :

- aborted takeoff or
- landing on short runways or
- operation with low visibility weather conditions

Furthermore, it ensures a straight roll-out and optimizes the landing distance on contaminated runways provided the contamination is evenly distributed.

The following tables cover :

- dry runway
- wet runway
- runway covered with water, slush or compacted snow
- icy runway

At landing, select the braking mode according to :

- runway length
- configuration
- runway condition

A correction is necessary :

- if landing is not performed at sea level
- if reverse thrust is used
- in windy conditions
- for forward CG (A320-200 only)

MANUAL LANDING WITH AUTOBRAKE

CONFIGURATION 3

ACTUAL LANDING DISTANCE (METERS)							CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		40	50	60	70	80	PER 1000FT ABOVE SL	2 REV OP	PER 10K TAIL WIND	
RUNWAY CONDITION	MODE									
DRY		MED	860	990	1120	1250	1380	+ 3	0	+16
		LOW	1450	1680	1900	2130	2340	+ 3	-4	+18
WET		MED	920	1100	1270	1450	1630	+ 4	-3	+24
		LOW	1450	1680	1900	2130	2340	+ 3	-4	+18
COVERED	6.3 MM (1/4 INCH) WATER	MED	1250	1530	1800	2110	2390	+ 4	-13	+25
		LOW	1440	1690	1930	2250	2540	+ 4	-6	+22
	12.7 MM (1/2 INCH) WATER	MED	1200	1440	1700	1970	2250	+ 4	-11	+22
		LOW	1380	1620	1840	2110	2380	+ 4	-4	+19
	6.3 MM (1/4 INCH) SLUSH	MED	1220	1460	1690	1990	2240	+ 5	-11	+24
		LOW	1410	1650	1880	2120	2390	+ 5	-5	+21
	12.7 MM (1/2 INCH) SLUSH	MED	1180	1400	1620	1870	2130	+ 5	-11	+22
		LOW	1360	1590	1810	2040	2270	+ 5	-4	+18
WET	COMPACTED SNOW	MED	1190	1390	1550	1730	1890	+ 4	-9	+19
		LOW	1460	1700	1920	2150	2360	+ 4	-4	+18
	ICE	MED	2780	3100	3400	3750	4060	+ 4	-25	+34
		LOW	2890	3210	3520	3880	4190	+ 4	-25	+33

CONFIGURATION FULL

ACTUAL LANDING DISTANCE (METERS)							CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		40	50	60	70	80	PER 1000FT ABOVE SL	2 REV OP	PER 10K TAIL WIND	
RUNWAY CONDITION	MODE									
DRY		MED	850	910	1020	1140	1250	+ 3	0	+16
		LOW	1380	1500	1690	1890	2080	+ 3	-4	+18
WET		MED	890	970	1110	1270	1410	+ 4	-2	+23
		LOW	1380	1500	1690	1890	2080	+ 3	-4	+18
COVERED	6.3 MM (1/4 INCH) WATER	MED	1190	1330	1550	1800	2040	+ 4	-11	+24
		LOW	1370	1510	1710	1930	2160	+ 4	-5	+21
	12.7 MM (1/2 INCH) WATER	MED	1140	1270	1480	1700	1920	+ 4	-10	+23
		LOW	1320	1460	1650	1860	2070	+ 4	-4	+18
	6.3 MM (1/4 INCH) SLUSH	MED	1160	1290	1480	1700	1920	+ 5	-11	+23
		LOW	1340	1480	1670	1880	2060	+ 5	-4	+19
	12.7 MM (1/2 INCH) SLUSH	MED	1120	1250	1420	1630	1830	+ 5	-9	+22
		LOW	1300	1430	1620	1820	2000	+ 4	-3	+17
WITH	COMPACTED SNOW	MED	1150	1250	1400	1560	1690	+ 4	-8	+19
		LOW	1390	1530	1720	1920	2100	+ 4	-4	+18
	ICE	MED	2450	2630	2890	3190	3450	+ 4	-23	+35
		LOW	2530	2720	2990	3290	3560	+ 4	-23	+35

Note : – Max mode is not recommended at landing
 – Per 5 kt speed increment (and no failure) add 8 % (all runways)
 – No correction for headwind due to wind correction on approach speed

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LANDING PERFORMANCE		2.03.20	P 1
	USE OF THE AUTOBRAKE SYSTEM		SEQ. 001	REV 33

GENERAL

The autobrake system is designed to help the pilot in case of :

- aborted takeoff or
- landing on short runways or
- operation with low visibility weather conditions

Furthermore, it ensures a straight roll-out and optimizes the landing distance on contaminated runways provided the contamination is evenly distributed.

The following tables cover :

- dry runway
- wet runway
- runway covered with water, slush or compacted snow
- icy runway

At landing, select the braking mode according to :

- runway length
- configuration
- runway condition

A correction is necessary :

- if landing is not performed at sea level
- if reverse thrust is used
- in windy conditions
- for forward CG (A320-200 only)

MANUAL LANDING WITH AUTOBRAKE

CONFIGURATION 3

R

ACTUAL LANDING DISTANCE (METERS)								CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		54	62	70	78	86	94	PER 1000FT ABOVE SL	2 REV OP	PER 10KT TAIL WIND	
RUNWAY CONDITION	MODE										
DRY	MED	1020	1130	1230	1330	1490	1660	+ 3	0	+16	
	LOW	1570	1750	1930	2090	2260	2430	+ 3	0	+17	
WET	MED	1100	1250	1390	1530	1710	1900	+ 4	-5	+22	
	LOW	1570	1750	1930	2090	2260	2430	+ 3	0	+17	
COVERED	6.3 MM (1/4 INCH) WATER	MED	1510	1730	1950	2180	2410	2630	+ 4	-12	+24
		LOW	1600	1800	2030	2240	2460	2690	+ 4	-1	+21
	12.7 MM (1/2 INCH) WATER	MED	1440	1650	1860	2060	2270	2480	+ 4	-11	+21
		LOW	1570	1750	1950	2140	2330	2540	+ 4	0	+19
	6.3 MM (1/4 INCH) SLUSH	MED	1460	1640	1850	2040	2270	2470	+ 5	-11	+22
		LOW	1550	1740	1930	2120	2330	2530	+ 5	0	+20
	12.7 MM (1/2 INCH) SLUSH	MED	1410	1580	1770	1960	2150	2340	+ 5	-11	+20
		LOW	1530	1710	1890	2060	2230	2420	+ 5	0	+18
WITH	COMPACTED SNOW	MED	1370	1510	1650	1780	1910	2020	+ 4	-8	+16
		LOW	1560	1740	1920	2080	2250	2410	+ 4	0	+16
	ICE	MED	2920	3190	3460	3720	3980	4220	+ 4	-21	+27
		LOW	2940	3210	3490	3740	4010	4250	+ 4	-21	+28

CONFIGURATION FULL

R

ACTUAL LANDING DISTANCE (METERS)								CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		54	62	70	78	86	94	PER 1000FT ABOVE SL	2 REV OP	PER 10K TAIL WIND	
RUNWAY CONDITION	MODE										
DRY	MED	950	1050	1150	1240	1370	1530	+ 4	0	+17	
	LOW	1450	1620	1780	1930	2090	2240	+ 3	0	+18	
WET	MED	1010	1130	1260	1380	1540	1710	+ 4	-3	+22	
	LOW	1450	1620	1780	1930	2090	2240	+ 3	0	+18	
COVERED WITH	6.3 MM (1/4 INCH) WATER	MED	1370	1560	1760	1970	2170	2370	+ 4	-11	+24
		LOW	1480	1650	1840	2030	2220	2430	+ 4	0	+21
	12.7 MM (1/2 INCH) WATER	MED	1320	1500	1690	1870	2050	2240	+ 4	-10	+22
		LOW	1460	1630	1800	1960	2140	2310	+ 4	0	+18
	6.3 MM (1/4 INCH) SLUSH	MED	1340	1500	1670	1850	2030	2210	+ 5	-10	+22
		LOW	1440	1610	1770	1930	2110	2290	+ 5	0	+19
	12.7 MM (1/2 INCH) SLUSH	MED	1300	1450	1610	1780	1950	2130	+ 5	-10	+21
		LOW	1420	1590	1750	1900	2060	2210	+ 5	0	+17
	COMPACTED SNOW	MED	1270	1400	1530	1640	1760	1870	+ 4	-7	+17
		LOW	1450	1610	1780	1930	2080	2230	+ 4	0	+16
	ICE	MED	2660	2910	3160	3390	3630	3860	+ 4	-21	+29
		LOW	2690	2930	3190	3420	3660	3880	+ 4	-21	+28

Note : – Max mode is not recommended at landing
 – Per 5 kt speed increment (and no failure) add 8 % (all runways)
 – No correction for headwind due to wind correction on approach speed

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	LANDING PERFORMANCE		2.03.20	P 1
	USE OF THE AUTOBRAKE SYSTEM		SEQ 001	REV 33

GENERAL

The autobrake system is designed to help the pilot in case of :

- aborted takeoff or
- landing on short runways or
- operation with low visibility weather conditions

Furthermore, it ensures a straight roll-out and optimizes the landing distance on contaminated runways provided the contamination is evenly distributed.

The following tables cover :

- dry runway
- wet runway
- runway covered with water, slush or compacted snow
- icy runway

At landing, select the braking mode according to :

- runway length
- configuration
- runway condition

A correction is necessary :

- if landing is not performed at sea level
- if reverse thrust is used
- in windy conditions
- for forward CG (A320-200 only)

MANUAL LANDING WITH AUTOBRAKE

CONFIGURATION 3

ACTUAL LANDING DISTANCE (METERS)							CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		40	50	60	70	80	PER 1000FT ABOVE SL	2 REV OP	PER 10KT TAIL WIND	FWD CG
RUNWAY CONDITION	MODE									
DRY	MED	970	1080	1230	1390	1540	+ 3	0	+ 16	+ 2
	LOW	1430	1620	1860	2110	2360	+ 3	0	+ 18	+ 2
WET	MED	1010	1150	1340	1540	1740	+ 4	-4	+ 21	+ 3
	LOW	1430	1620	1860	2110	2360	+ 3	-0	+ 18	+ 2
COVERED WITH	6.3 MM (1/4 INCH) WATER	MED	1280	1470	1750	2080	+ 4	-12	+ 23	+ 3
		LOW	1420	1620	1880	2200	+ 4	-2	+ 19	+ 2
	12.7 MM (1/2 INCH) WATER	MED	1240	1420	1670	1970	+ 4	-11	+ 21	+ 3
		LOW	1390	1590	1840	2130	+ 4	-1	+ 17	+ 2
	6.3 MM (1/4 INCH) SLUSH	MED	1240	1420	1640	1900	+ 5	-10	+ 22	+ 3
		LOW	1380	1570	1820	2070	+ 5	0	+ 17	+ 2
	12.7 MM (1/2 INCH) SLUSH	MED	1200	1370	1580	1810	+ 5	-10	+ 20	+ 3
		LOW	1350	1550	1790	2030	+ 4	0	+ 16	+ 2
WITH	COMPACTED SNOW	MED	1270	1430	1620	1820	+ 4	-9	+ 17	+ 3
		LOW	1420	1610	1860	2110	+ 4	0	+ 17	+ 2
WITH	ICE	MED	2850	3130	3510	3900	+ 4	-25	+ 32	+ 4
		LOW	2890	3170	3540	3940	+ 4	-25	+ 31	+ 3

CONFIGURATION FULL

ACTUAL LANDING DISTANCE (METERS)							CORRECTIONS (%) ON LANDING DISTANCE			
WEIGHT (1000 KG)		40	50	60	70	80	PER 1000FT ABOVE SL	2 REV OP	PER 10KT TAIL WIND	FWD CG
RUNWAY CONDITION	MODE									
DRY	MED	950	1010	1150	1290	1430	+ 3	0	+ 16	+ 2
	LOW	1390	1490	1710	1950	2170	+ 3	0	+ 18	+ 2
WET	MED	960	1040	1200	1380	1550	+ 4	0	+ 20	+ 3
	LOW	1390	1490	1710	1950	2170	+ 3	0	+ 18	+ 2
COVERED WITH	6.3 MM (1/4 INCH) WATER	MED	1230	1340	1550	1830	+ 4	-10	+ 23	+ 3
		LOW	1390	1500	1740	1990	+ 4	-1	+ 18	+ 2
	12.7 MM (1/2 INCH) WATER	MED	1190	1290	1490	1750	+ 4	-9	+ 21	+ 3
		LOW	1360	1480	1710	1940	+ 4	0	+ 16	+ 2
	6.3 MM (1/4 INCH) SLUSH	MED	1190	1290	1490	1700	+ 5	-9	+ 21	+ 3
		LOW	1350	1460	1690	1920	+ 4	0	+ 16	+ 2
	12.7 MM (1/2 INCH) SLUSH	MED	1150	1250	1440	1640	+ 5	-8	+ 19	+ 3
		LOW	1320	1430	1660	1880	+ 4	0	+ 16	+ 2
WITH	COMPACTED SNOW	MED	1210	1300	1490	1670	+ 4	-8	+ 18	+ 3
		LOW	1380	1490	1720	1950	+ 4	0	+ 18	+ 2
WITH	ICE	MED	2530	2710	3040	3390	+ 4	-23	+ 33	+ 3
		LOW	2560	2740	3070	3420	+ 4	-23	+ 33	+ 3

Note : – Max mode is not recommended at landing.
 – Per 5 knot speed increment (and no failure) add 8 % (all runways).
 – No correction for headwind due to wind correction on approach speed.

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R
R

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R

R

R

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- GENERAL 1

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04.10 FLUID CONTAMINATED RUNWAY

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 - 6.3 MM (1/4 INCH) SLUSH COVERED RUNWAY 7
 - 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY 8
 - COMPACTED SNOW COVERED RUNWAY 9
- SPRAY PATTERN 11
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04.25 FLIGHT WITH GEAR DOWN

- GENERAL 1
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- PROCEDURES 1
- PERFORMANCE 4
- GROSS CEILING AT LONG RANGE AND GREEN DOT
- SPEEDS-ONE ENGINE OUT 12

R
R

04.30 HIGH ALTITUDE OPERATION ◀

04.35 FLIGHT OVER MOUNTAINOUS AREA

– INTRODUCTION	1
– ENGINE FAILURE	1
– DEPRESSURIZATION	2
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04.40 EXTENDED RANGE OPERATIONS

– GENERAL	1
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R

04.45 ENGINE INTERMIX OPERATIONS ◀

– GENERAL	1
– ENGINE PARAMETERS	1
– CROSSBLEED ENG START	1
– TAKEOFF PROCEDURE	1
– ENGINE RESPONSE	1
– ENGINE RELIGHT	1

R

R

R

04.50 REDUCED VERTICAL SEPARATION MINIMUM (RVSM)

– GENERAL	1
– OPERATIONAL APPROVAL	1
– REQUIRED EQUIPMENT FOR RVSM	1
– PROCEDURES	1

04.51 RNP

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GENERAL

This section presents the recommendations of Airbus Industrie for operations from wet runways or from runways which are covered with contaminants such as standing water, slush or snow.

CAUTION

Take off from an icy runway is not recommended.

DEFINITIONS

- DAMP** : A runway is damp when the surface is not dry, but when the water on it does not give it a shiny appearance.
- WET** : A runway is considered as wet when the surface has a shiny appearance due to a thin layer of water. When this layer does not exceed 3 mm depth, there is no substantial risk of hydroplaning.
- STANDING WATER** : is caused by heavy rainfall and /or insufficient runway drainage with a depth of more than 3 mm.
- SLUSH** : is water saturated with snow which spatters when stepping firmly on it. It is encountered at temperatures around 5° C and its density is approximately 0.85 kg/liter (7.1 lb/US GAL).
- WET SNOW** : is a condition where, if compacted by hand, snow will stick together and tend to form a snowball. Its density is approximately 0.4 kg/liter (3.35 lb/US GAL).
- DRY SNOW** : is a condition where snow can be blown if loose, or if compacted by hand, will fall apart again upon release. Its density is approximately 0.2 kg/liter (1.7 lb/US GAL).
- COMPACTED SNOW** : is a condition where snow has been compressed (a typical friction coefficient is 0.2).
- ICY** : is a condition where the friction coefficient is 0.05 or below.

The performance given in this chapter has been divided into two categories which are determined by the depth of the contaminant. For each of these categories an equivalent depth of contaminant has been defined for which the performance deterioration is the same.

1. WET RUNWAY and EQUIVALENT

Equivalent of a wet runway is a runway covered with or less than :

- 2 mm (0.08 inch) slush
- 3 mm (0.12 inch) water
- 4 mm (0.16 inch) wet snow
- 15 mm (0.59 inch) dry snow

R

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2. CONTAMINATED RUNWAY

- R An equivalence between depth of slush and snow has been defined :
- 12.7 mm (1/2 inch) wet snow is equivalent to 6.3 mm (1/4 inch) slush
- R
- 25.4 mm (1 inch) wet snow is equivalent to 12.7 mm (1/2 inch) slush
- R
- 50.8 mm (2 inches) dry snow is equivalent to 6.3 mm (1/4 inch) slush
- R
- 101.6 mm (4 inches) dry snow is equivalent to 12.7 mm (1/2 inch) slush

Note : 1. On a damp runway no performance degradation should be considered.
2. It is not recommended to take off from a runway covered with more than 4 inches of dry snow or 1 inch of wet snow.

OPERATIONAL CONDITIONS

Performance penalties for takeoff as published in this section are computed with the following assumptions :

- The contaminant is in a layer of uniform depth and density over the entire length of the runway.
- Antiskid and spoilers are operative.
- The friction coefficient is based on studies and checked by actual tests.
- The screen height at the end of takeoff segment is 15 feet, not 35 feet.

In addition, for contaminated runways only :

- There is drag due to rolling resistance of the wheels.
- There is drag due to spray on the airframe and gears.
- Reverse thrust is used for the deceleration phase.
- Maximum thrust is used for takeoff.

Note : The net flight path clears obstacles by 15 feet instead of 35 feet.

TAKEOFF PERFORMANCE

CAUTION

The method is based on the use of the RTOW charts established at optimum V2/VS and optimum V1/VR. In addition, when applying corrections for a wet runway, the RTOW charts should also have been established with V1 min (minimum V1 of the V1 range). The method should not be used with takeoff charts computed for other conditions. All tables have been established for TOGA (and Flexible Takeoff for wet runways). Do not use them for Derated thrust.

Correct the determined maximum takeoff weight on dry runway to take into account QNH and bleed effects, then apply the corrections given on the following pages.

- Note :
- 1. The results obtained with this method may be different from the influence given at the bottom of the RTOW chart.*
 - 2. On contaminated runway, in some cases, no MTOW can be determined with this method (box dashed below a given weight). A specific RTOW chart must then be computed.*

TAKEOFF PERFORMANCE

CAUTION

The method is based on the use of the RTOW charts established at optimum V2/VS and optimum V1/VR. In addition, when applying corrections for a wet runway, the RTOW charts should also have been established with V1 min (minimum V1 of the V1 range). The method should not be used with takeoff charts computed for other conditions. All tables have been established for TOGA (and Flexible Takeoff for wet runways). Do not use them for Derated thrust.

Correct the determined maximum takeoff weight on dry runway to take into account QNH and bleed effects, then apply the corrections given on the following pages.

Note : 1. The results obtained with this method may be different from the influence given at the bottom of the RTOW chart.

2. On contaminated runway, in some cases, no MTOW can be determined with this method (box dashed below a given weight). A specific RTOW chart must then be computed.

3. The published corrections are valid for charts calculated with forward CG and basic CG.

R
R

TAKEOFF FROM A WET RUNWAY

1. Determine the maximum takeoff weight or flexible temperature and associated speeds on dry runway.
2. Two sets of tables are given depending on the use of thrust reversers and the presence of clearway. Select the table to use as applicable to your case.
The runway length in the table corresponds to the available takeoff run (TORA)
3. Apply the corrections shown in the table to the maximum takeoff weight or flexible temperature and associated speeds determined on dry runway.
4. Check that takeoff speeds are greater than the minimum values shown on the RTOW chart.
If one or more speeds are lower than these minimum values, apply the following procedure :
 - Actual TOW = maximum TOW
 - If V1 is lower than minimum V1 (V1 limited by VMCG), take this last value as V1 and further decrease weight by 3000 kg (6600 lb) per kt difference between both values. Check that VR and V2 are higher or equal to minimum values.
 - If VR or/and V2 falls below the minimum values, takeoff is not possible.
 - Actual TOW lower than maximum TOW
 - If V1 corresponding to actual TOW is lower than the minimum V1 (V1 limited by VMCG) :
 - * If maximum TOW has a V1 equal to or above minimum V1, retain minimum V1 as V1 and decrease the flexible temperature by 4°C per knot difference between them.
 - * In the rare case when the V1 corresponding to maximum TOW falls below the minimum V1, decrease maximum TOW by 3000 kg (6600 lb) per knot difference between them. Limit the actual TOW to the value found after this decrement. Take V1 equal to minimum V1 and decrease the flexible temperature by 4°C per knot difference between this last value and the V1 corresponding to the actual TOW. Check that VR and V2 are higher than or equal to the minimum values.
 - If VR or V2 corresponding to actual TOW falls below the minimum values, and if VR and V2 corresponding to maximum TOW are above the minimum values, retain the minimum speed value for VR and V2.
5. Check that V2 is above the minimum V2 value due to VMU. (refer to 2.02.25).
6. Check that the corrected flexible temperature is higher than OAT and Tref.

Note : · Do not extrapolate below the shortest runway length provided in the table.
 · If no minimum speed value is available, use the conservative values provided on 2.02.25.

NO THRUST REVERSERS OPERATIVE (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	4	3	2	3	4	4	2	3	3
MAX TO Weight decrement (1000 kg) (1000 lb)	1.4 3.1	1.1 2.5	0.9 2.0	0.8 1.8	1.4 3.1	1.4 3.1	0.4 0.9	1.1 2.5	1.3 2.9
V1 decrement (kt)	17	15	16	16	16	16	15	15	15
VR and V2 decrement (kt)	4	4	5	3	4	5	2	3	4

ALL THRUST REVERSERS OPERATIVE (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	2	1	1	1	2	2	0	1	2
MAX TO Weight decrement (1000 kg) (1000 lb)	0.5 1.2	0.5 1.2	0.3 0.7	0.2 0.5	0.7 1.6	0.7 1.6	0.0 0.0	0.4 0.9	0.6 1.4
V1 decrement (kt)	11	10	10	10	11	10	10	10	10
VR and V2 decrement (kt)	1	0	2	1	2	3	0	1	2

NO THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	7	5	4	7	5	4	7	7	6
MAX TO Weight decrement (1000 kg) (1000 lb)	2.5 5.6	1.8 4.0	1.4 3.1	2.3 5.1	2.3 5.1	1.6 3.6	2.4 5.3	2.4 5.3	2.2 4.9
V1 decrement (kt)	16	15	15	15	15	15	14	15	15
VR and V2 decrement (kt)	7	7	7	7	7	8	6	7	7

ALL THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	5	3	2	5	4	2	5	5	4
MAX TO Weight decrement (1000 kg) (1000 lb)	1.8 4.0	1.2 2.7	0.7 1.6	1.7 3.8	1.7 3.8	0.8 1.8	1.7 3.8	1.7 3.8	1.5 3.4
V1 decrement (kt)	10	10	9	9	10	10	9	9	10
VR and V2 decrement (kt)	5	5	4	5	5	5	4	5	5

R DECELERATING WITHOUT REVERSE THRUST (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	5	2	2	6	3	2	6	4	2
MAX TO Weight decrement (1000 kg) (1000 lb)	2.5 5.5	1.0 2.2	0.8 1.8	2.5 5.5	1.8 4.0	1.0 2.2	2.5 5.5	1.8 4.0	1.0 2.2
V1 decrement (kt)	14	15	15	15	15	15	14	13	13
VR and V2 decrement (kt)	2	3	4	3	3	4	2	3	4

R DECELERATING WITH REVERSE THRUST (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	2	1	1	2	1	1	1	1	1
MAX TO Weight decrement (1000 kg) (1000 lb)	0.9 2.0	0.4 0.9	0.4 0.9	0.7 1.6	0.4 0.9	0.4 0.9	0.4 0.9	0.3 0.7	0.3 0.7
V1 decrement (kt)	10	10	11	9	9	10	8	8	9
VR and V2 decrement (kt)	1	1	2	1	1	2	0	0	1

DECELERATING WITHOUT REVERSE THRUST (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	NO FLEX	7	7	NO FLEX	NO FLEX	6	NO FLEX	NO FLEX	6
MAX TO Weight decrement (1000 kg) (1000 lb)	5.1 11.2	3.8 8.3	3.8 8.3	5.2 11.4	4.5 9.9	2.3 5.0	5.1 11.2	4.6 10.1	2.2 4.8
V1 decrement (kt)	15	15	15	15	15	16	12	12	12
VR and V2 decrement (kt)	5	5	10	3	3	5	3	3	5

DECELERATING WITH REVERSE THRUST (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	8	5	3	NO FLEX	7	4	NO FLEX	7	4
MAX TO Weight decrement (1000 kg) (1000 lb)	3.1 6.8	1.7 3.7	1.3 2.8	3.2 7.0	2.7 5.9	1.5 3.3	3.7 8.1	2.3 5.0	1.3 2.8
V1 decrement (kt)	9	10	11	8	9	10	6	6	7
VR and V2 decrement (kt)	3	4	5	1	2	3	1	2	3

NO THRUST REVERSERS OPERATIVE (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	8	5	3	8	6	2	6	6	2
MAX TO Weight decrement (1000 kg) (1000 lb)	2.6 5.8	2.0 4.5	1.3 2.9	2.5 5.6	2.2 4.9	0.7 1.6	2.1 4.7	2.1 4.7	0.7 1.6
V1 decrement (kt)	15	14	14	16	14	14	14	15	13
VR and V2 decrement (kt)	2	1	1	2	1	2	1	2	0

ALL THRUST REVERSERS OPERATIVE (NO CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	3	2	0	3	1	0	2	1	1
MAX TO Weight decrement (1000 kg) (1000 lb)	1.0 2.3	0.6 1.4	0.0 0.0	0.8 1.8	0.3 0.7	0.0 0.0	0.6 1.4	0.2 0.5	0.1 0.3
V1 decrement (kt)	9	9	9	10	8	9	10	9	8
VR and V2 decrement (kt)	0	0	0	0	0	0	0	0	0

NO THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	15	9	9	14	11	4	15	12	5
MAX TO Weight decrement (1000 kg) (1000 lb)	5.4 12.0	4.1 9.1	3.8 8.4	4.6 10.2	4.2 9.3	1.6 3.6	4.5 10.0	4.5 10.0	2.2 4.9
V1 decrement (kt)	14	15	15	14	14	15	13	13	14
VR and V2 decrement (kt)	4	3	6	4	4	6	3	4	5

ALL THRUST REVERSERS OPERATIVE (WITH CLEARWAY)

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO Temperature decrement (°C)	11	5	2	10	8	3	11	9	3
MAX TO Weight decrement (1000 kg) (1000 lb)	3.9 8.6	2.3 5.1	0.9 2.0	3.3 7.3	3.1 6.9	1.0 2.3	3.3 7.3	3.3 7.3	1.3 2.5
V1 decrement (kt)	9	10	12	9	9	10	8	9	9
VR and V2 decrement (kt)	3	2	3	3	3	4	2	2	4

TAKEOFF FROM A 6.3 MM (1/4 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 6500	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg)									
With clearway	12.1	9.3	6.8	14.5	12.0	8.7	13.2	12.7	10.3
Without clearway	11.2	8.8	6.5	13.4	11.3	8.5	12.2	11.7	9.9

- Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<47.8	47.8	50	50 to 76															
	MTOW (1000 kg)	–	42.7	50	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158
	VR (kt IAS)	115	115	117	120	123	126	128	130	133	135	137	139	141	144	146	148	150	153	154
	V1 (kt IAS)	110	110	110	110	110	110	112	114	117	119	121	123	125	128	130	132	134	137	138

CONF 2	CORRECTED WEIGHT (1000 kg)	<47.8	47.8	50	50 to 76															
	MTOW (1000 kg)	–	42.7	50	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	126	129	131	133	135	138	140	142	144	147	149	151	153	156	157
	VR (kt IAS)	115	115	117	119	122	125	127	129	131	134	136	138	140	143	145	147	149	152	153
	V1 (kt IAS)	110	110	110	110	110	110	112	114	116	119	121	123	125	128	130	132	134	137	138

CONF 3	CORRECTED WEIGHT (1000 kg)	<50.9	50.9	52	53	53 to 76														
	MTOW (1000 kg)	–	44.7	49	53	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<44.7	44.7	46	48	50	52	53	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	126	128	129	130	132	134	136	138	141	143	145	147	150	152	153
	VR (kt IAS)	115	115	117	119	122	124	125	126	128	130	132	134	137	139	141	143	146	148	149
	V1 (kt IAS)	110	110	110	110	110	110	111	113	115	117	119	122	124	126	128	131	133	134	

TAKEOFF FROM A 12.7 MM (1/2 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 6500	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg)									
With clearway	17.3	15.7	13.7	17.9	17.1	15.4	17.4	16.6	15.4
Without clearway	16.4	15.2	13.4	16.8	16.4	15.2	16.4	15.6	15.0

- Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<45.4	46	46 to 76															
	MTOW (1000 kg)	42.7	46	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	121	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158
	VR (kt IAS)	115	117	120	123	126	128	130	133	135	137	139	141	144	146	148	150	153	154
	V1 (kt IAS)	110	110	110	113	116	118	120	123	125	127	129	131	134	136	138	140	143	144

CONF 2	CORRECTED WEIGHT (1000 kg)	<45.9	45.9	46	46.7	46.7 to 76															
	MTOW (1000 kg)	–	42.7	43	46.7	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	46.7	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	124	126	129	131	133	135	138	140	142	144	147	149	151	153	156	157
	VR (kt IAS)	115	115	117	119	120	122	125	127	129	131	134	136	138	140	143	145	147	149	152	153
	V1 (kt IAS)	110	110	110	110	110	112	115	117	119	121	124	126	128	130	133	135	137	139	142	143

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<47.2	47.2	48	48 to 76															
	MTOW (1000 kg)	–	44.7	48	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<44.7	44.7	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	
	V2 (kt IAS)	119	119	121	123	126	128	130	132	134	136	138	141	143	145	147	150	152	153	
	VR (kt IAS)	116	116	118	120	123	125	127	129	131	133	135	138	140	142	144	147	149	150	
	V1 (kt IAS)	110	110	110	110	113	115	117	119	121	123	125	128	130	132	134	137	139	140	

TAKEOFF FROM A 6.3 MM (1/4 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 lb) With clearway Without clearway	14.5 13.8	12.3 11.8	9.4 9.4	8.1 8.1	13.7 12.3	12.4 12.1	12.4 12.1	13.0 12.3	13.0 12.3	8.3 8.0

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<61.5	61.5	62	64	64 to 94																	
	MTOW (1000 kg)	–	54	56	64	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<54	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94
	V2 (kt IAS)	131	131	134	136	139	141	143	146	148	150	152	154	156	158	160	162	164	166	168	169	171	173
	VR (kt IAS)	128	128	131	133	136	138	140	143	145	147	149	151	153	155	157	159	161	163	165	166	168	170
	V1 (kt IAS)	115	115	115	115	115	115	115	118	120	122	124	126	128	130	132	134	136	138	140	141	143	145

C O N F 2	CORRECTED WEIGHT (1000 kg)	<65.8	65.8	66	68	69	69 to 94																	
	MTOW (1000 kg)	—	56	57	65	69	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<56	56	58	60	62	64	66	68	69	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	125	125	127	129	131	134	136	138	139	140	142	144	145	147	149	151	152	154	156	157	159	160	
	VR (kt IAS)	123	123	125	127	129	132	134	136	137	138	140	142	143	145	147	149	150	152	154	155	157	158	
	V1 (kt IAS)	115	115	115	115	115	115	115	115	116	118	120	121	123	125	127	128	130	132	133	135	136	138	

CONF 3	CORRECTED WEIGHT (1000 kg)	<69.8	69.8	70	72	73	73 to 94																	
	MTOW (1000 kg)	—	60	61	69	73	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<60	60	62	64	66	68	70	72	73	74	76	78	80	82	84	86	88	90	92	94			
	V2 (kt IAS)	125	125	127	129	131	133	135	137	138	139	141	142	144	146	147	149	151	152	154	155			
	VR (kt IAS)	121	121	123	125	127	129	131	133	134	135	137	138	140	142	143	145	147	148	150	151			
	V1 (kt IAS)	113	113	113	113	113	113	113	113	113	114	116	117	119	121	122	124	126	127	129	130			

TAKEOFF FROM A 12.7 MM (1/2 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	17.6 16.9	16.0 15.5	13.3 13.3	9.8 9.8	16.3 15.6	16.3 15.6	13.8 13.5	16.0 15.3	16.0 15.3	12.6 12.3

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<57.8	57.8	58	58.7	58.7 to 94																			
	MTOW (1000 kg)	–	54	55	58.7	EQUAL TO CORRECTED WEIGHT																			
	ACTUAL WEIGHT (1000 kg)	<54	54	56	58	58.7	60	62	64	66	58	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	131	131	134	136	137	139	141	143	146	148	150	152	154	156	158	160	162	164	166	168	169	171	173	
	VR (kt IAS)	128	128	131	133	134	136	138	140	143	145	147	149	151	153	155	157	159	161	163	165	166	168	170	
	V1 (kt IAS)	115	115	115	115	115	117	119	121	124	126	128	130	132	134	136	138	140	142	144	146	147	149	151	

C O N F 2	CORRECTED WEIGHT (1000 kg)	<62.5		62.5		64		64 to 94															
	MTOW (1000 kg)	—		56		64		EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<56	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	125	125	127	129	131	134	136	138	140	142	144	145	147	149	151	152	154	156	157	159	160	
	VR (kt IAS)	124	124	126	128	130	133	135	137	139	141	143	144	146	148	150	151	153	155	156	158	159	
V1 (kt IAS)	115	115	115	115	115	115	117	119	121	123	125	126	128	130	132	133	135	137	138	140	141		

CONF 3	CORRECTED WEIGHT (1000 kg)	<65.3	65.3	66	67	67 to 94																
	MTOW (1000 kg)	—	60	63	67	EQUAL TO CORRECTED WEIGHT																
	ACTUAL WEIGHT (1000 kg)	<60	60	62	64	66	67	68	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	125	125	127	129	131	132	133	135	137	139	141	142	144	146	147	149	151	152	154	155	
	VR (kt IAS)	121	121	123	125	127	128	129	131	133	135	137	138	140	142	143	145	147	148	150	151	
V1 (kt IAS)	113	113	113	113	113	113	114	116	118	120	122	123	125	127	128	130	132	133	135	136		

TAKEOFF FROM A 6.3 MM (1/4 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

R

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RWY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	12.8 10.5	11.7 10.1	9.8 9.0	9.8 9.0	13.9 11.1	13.2 11.1	11.4 10.4	14.9 11.4	14.5 11.8	13.1 11.8

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

R

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<55.2	55.2	56	58	58 to 78														
	MTOW (1000 kg)	—	46.7	50	58	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<46.7	46.7	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161	
	VR (kt IAS)	121	121	123	126	128	131	133	135	138	140	142	145	147	149	152	154	156	158	
	V1 (kt IAS)	117	117	117	117	117	117	117	117	120	122	124	127	129	131	134	136	138	140	

R

C O N F 2	CORRECTED WEIGHT (1000 kg)	<56.8	56.8	58	59	59 to 78														
	MTOW (1000 kg)	—	48.7	55	59	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48.7	48.7	50	52	54	56	58	59	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	125	125	127	129	132	134	137	138	139	141	143	146	148	150	153	155	157	159	
	VR (kt IAS)	119	119	121	123	126	128	131	132	133	135	137	140	142	144	147	149	151	153	
	V1 (kt IAS)	115	115	115	115	115	115	115	115	116	118	120	123	125	127	130	132	134	136	

R

CONF 3	CORRECTED WEIGHT (1000 kg)	<57.8	57.8	58	60	60 to 78														
	MTOW (1000 kg)	—	48	49	60	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78		
	V2 (kt IAS)	123	123	126	128	131	133	135	138	140	142	145	147	149	151	153	155	157		
	VR (kt IAS)	118	118	121	123	126	128	130	133	135	137	140	142	144	146	148	150	152		
	V1 (kt IAS)	114	114	114	114	114	114	114	114	116	118	121	123	125	127	129	131	133		

TAKEOFF FROM A 12.7 MM (1/2 INCH) WATER COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

R

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RWY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
ΔWEIGHT (1000 kg) With clearway Without clearway	16.7 14.4	15.7 14.1	12.9 12.0	10.4 9.6	17.3 13.3	16.6 14.5	15.5 14.5	17.5 14.0	17.5 14.8	16.3 15.0

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

R

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<51.4	51.4	52	52.7	52.7 to 78															
	MTOW (1000 kg)	–	46.7	49	52.7	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<46.7	46.7	48	50	52	52.7	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	126	129	131	132	134	136	138	141	143	145	148	150	152	155	157	159	161	
	VR (kt IAS)	122	122	124	127	129	130	132	134	136	139	141	143	146	148	150	153	155	157	159	
	V1 (kt IAS)	117	117	117	117	117	117	119	121	123	126	128	130	133	135	137	140	142	144	146	

R

CONF 2	CORRECTED WEIGHT (1000 kg)	<52.9	52.9	54	54 to 78															
	MTOW (1000 kg)	–	48	54	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78		
	V2 (kt IAS)	124	124	127	129	132	134	137	139	141	143	146	148	150	153	155	157	159		
	VR (kt IAS)	119	119	122	124	127	129	132	134	136	138	141	143	145	148	150	152	154		
	V1 (kt IAS)	115	115	115	115	115	117	120	122	124	126	129	131	133	136	138	140	142		

R

CONF 3	CORRECTED WEIGHT (1000 kg)	<54	54	56	56 to 78															
	MTOW (1000 kg)	–	48	56	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78		
	V2 (kt IAS)	123	123	126	128	131	133	135	138	140	142	145	147	149	151	153	155	157		
	VR (kt IAS)	118	118	121	123	126	128	130	133	135	137	140	142	144	146	148	150	152		
	V1 (kt IAS)	114	114	114	114	114	114	116	119	121	123	126	128	130	132	134	136	138		

TAKEOFF FROM A 6.3 MM (1/4 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg)									
With clearway	12.3	8.6	6.2	14.2	11.3	8.5	13.7	12.4	10.6
Without clearway	11.4	8.1	5.9	13.1	10.6	8.3	12.7	11.4	10.2

- Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<47	47	48	48 to 76															
	MTOW (1000 kg)	–	42.7	48	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158
	VR (kt IAS)	115	115	117	120	123	126	128	130	133	135	137	139	141	144	146	148	150	153	154
	V1 (kt IAS)	110	110	110	110	110	113	115	117	120	122	124	126	128	131	133	135	137	140	141

CONF 2	CORRECTED WEIGHT (1000 kg)	<47.6	47.6	48	48.7	48.7 to 76															
	MTOW (1000 kg)	–	42.7	45	48.7	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	48.7	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	126	127	129	131	133	135	138	140	142	144	147	149	151	153	156	157
	VR (kt IAS)	115	115	117	119	122	123	125	127	129	131	134	136	138	140	143	145	147	149	152	153
	V1 (kt IAS)	110	110	110	110	110	110	112	114	116	118	121	123	125	127	130	132	134	136	139	140

CONF 3	CORRECTED WEIGHT (1000 kg)	<50.2	50.2	52	52 to 76															
	MTOW (1000 kg)	–	44.7	52	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<44.7	44.7	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	
	V1 (kt IAS)	119	119	121	123	126	128	130	132	134	136	138	141	143	145	147	150	152	153	
	VR (kt IAS)	116	116	118	120	123	125	127	129	131	133	135	138	140	142	144	147	149	150	
	V1 (kt IAS)	110	110	110	110	110	110	112	114	116	118	120	123	125	127	129	132	134	135	

TAKEOFF FROM A 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg)									
With clearway	15.6	13.2	12.0	17.8	14.8	13.0	17.4	15.4	14.9
Without clearway	14.7	12.7	11.7	16.7	14.1	12.8	16.4	14.4	14.5

- Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<42.7	42.7	42.7 to 76																
	MTOW (1000 kg)	–	42.7	EQUAL TO CORRECTED WEIGHT																
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158
	VR (kt IAS)	116	116	118	121	124	127	129	131	134	136	138	140	142	145	147	149	151	154	155
V1 (kt IAS)	110	110	112	115	118	121	123	125	128	130	132	134	136	139	141	143	145	148	149	

CONF 2	CORRECTED WEIGHT (1000 kg)	<42.7	42.7	42.7 to 76																
	MTOW (1000 kg)	—	42.7	EQUAL TO CORRECTED WEIGHT																
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	126	129	131	133	135	138	140	142	144	147	149	151	153	156	157
	VR (kt IAS)	116	116	118	120	123	126	128	130	132	135	137	139	141	144	146	148	150	153	154
	V1 (kt IAS)	110	110	112	114	117	120	122	124	126	129	131	133	135	138	140	142	144	147	148

CONF 3	CORRECTED WEIGHT (1000 kg)	<45.8	45.8	46	46 to 76															
	MTOW (1000 kg)	–	44.7	46	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<44.7	44.7	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	
	V2 (kt IAS)	119	119	121	123	126	128	130	132	134	136	138	141	143	145	147	150	152	153	
	VR (kt IAS)	116	116	118	120	123	125	127	129	131	133	135	138	140	142	144	147	149	150	
	V1 (kt IAS)	110	110	110	112	115	117	119	121	123	125	127	130	132	134	136	139	141	142	

TAKEOFF FROM A 6.3 MM (1/4 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	15.6 14.9	12.4 11.9	9.6 9.6	8.1 8.1	14.0 12.6	10.9 10.2	9.2 8.9	13.2 12.1	11.2 10.5	8.5 8.2

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<59.5	59.5	60	61	61 to 94																							
	MTOW (1000 kg)	—	54	57	61	EQUAL TO CORRECTED WEIGHT																							
	ACTUAL WEIGHT (1000 kg)	<54	54	56	58	60	61	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94					
	V2 (kt IAS)	131	131	134	136	139	140	141	143	146	148	150	152	154	156	158	160	162	164	166	168	169	171	173					
	VR (kt IAS)	128	128	131	133	136	137	138	140	143	145	147	149	151	153	155	157	159	161	163	165	166	168	170					
	V1 (kt IAS)	115	115	115	115	115	115	116	118	121	123	125	127	129	131	133	135	137	139	141	143	144	146	148					

CONF 2	CORRECTED WEIGHT (1000 kg)	<64.3	64.3	66	67	67 to 94																	
	MTOW (1000 kg)	–	56	63	67	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<56	56	58	60	62	64	66	67	68	70	72	74	76	78	80	82	84	86	88	90	92	94
	V2 (kt IAS)	125	125	127	129	131	134	136	137	138	140	142	144	145	147	149	151	152	154	156	157	159	160
	VR (kt IAS)	124	124	126	128	130	133	135	136	137	139	141	143	144	146	148	150	151	153	155	156	158	159
	V1 (kt IAS)	115	115	115	115	115	115	115	115	116	118	120	122	123	125	127	129	130	132	134	135	137	138

C O N F 3	CORRECTED WEIGHT (1000 kg)	<68.3	68.3	70	71	71 to 94																	
	MTOW (1000 kg)	—	60	67	71	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<60	60	62	64	66	68	70	71	72	74	76	78	80	82	84	86	88	90	92	94		
	V2 (kt IAS)	125	125	127	129	131	133	135	136	137	139	141	142	144	146	147	149	151	152	154	155		
	VR (kt IAS)	121	121	123	125	127	129	131	132	133	135	137	138	140	142	143	145	147	148	150	151		
V1 (kt IAS)	113	113	113	113	113	113	113	113	114	116	118	119	121	123	124	126	128	129	131	132			

TAKEOFF FROM A 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
ΔWEIGHT (1000 kg) With clearway Without clearway	18.8 18.1	15.3 14.8	12.8 12.8	9.2 9.2	17.1 15.7	14.7 14.0	13.2 12.9	15.9 14.8	14.9 14.2	12.3 12.0

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<55.1		55.1	55.3	55.3 to 94																			
	MTOW (1000 kg)	–		54	55.3	EQUAL TO CORRECTED WEIGHT																			
	ACTUAL WEIGHT (1000 kg)	<54	54	55.3	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	131	131	133	134	136	139	141	143	146	148	150	152	154	156	158	160	162	164	166	168	169	171	173	
	VR (kt IAS)	129	129	131	132	134	137	139	141	144	146	148	150	152	154	156	158	160	162	164	166	167	169	171	
	V1 (kt IAS)	115	115	115	116	118	121	123	125	128	130	132	134	136	138	140	142	144	146	148	150	151	153	155	

C O N F 2	CORRECTED WEIGHT (1000 kg)	<60.5	60.5	62	62 to 94																			
	MTOW (1000 kg)	—	56	62	EQUAL TO CORRECTED WEIGHT																			
	ACTUAL WEIGHT (1000 kg)	<56	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94		
	V2 (kt IAS)	125	125	127	129	131	134	136	138	140	142	144	145	147	149	151	152	154	156	157	159	160		
	VR (kt IAS)	124	124	126	128	130	133	135	137	139	141	143	144	146	148	150	151	153	155	156	158	159		
V1 (kt IAS)	115	115	115	115	115	118	120	122	124	126	128	129	131	133	135	136	138	140	141	143	144			

CONF 3	CORRECTED WEIGHT (1000 kg)	<64.5	64.5	66	66 to 94															
	MTOW (1000 kg)	–	60	66	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<60	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94
	V2 (kt IAS)	125	125	127	129	131	133	135	137	139	141	142	144	146	147	149	151	152	154	155
	VR (kt IAS)	122	122	124	126	128	130	132	134	136	138	139	141	143	144	146	148	149	151	152
	V1 (kt IAS)	113	113	113	113	113	115	117	119	121	123	124	126	128	129	131	133	134	136	137

TAKEOFF FROM A 6.3 MM (1/4 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

R

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RWY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	13.2 10.9	11.8 10.2	9.8 9.0	9.8 9.0	14.5 11.7	13.8 11.7	11.6 10.6	15.2 11.5	15.2 12.5	13.9 12.6

Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

R

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<53.2	53.2	54	55	55 to 78														
	MTOW (1000 kg)	–	46.7	51	55	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<46.7	46.7	48	50	52	54	55	56	58	60	62	64	66	68	70	72	74	76	78
	V2 (kt IAS)	124	124	126	129	131	134	135	136	138	141	143	145	148	150	152	155	157	159	161
	VR (kt IAS)	122	122	124	127	129	132	133	134	136	139	141	143	146	148	150	153	155	157	159
	V1 (kt IAS)	117	117	117	117	117	117	117	118	120	123	125	127	130	132	134	137	139	141	143

R

CONF 2	CORRECTED WEIGHT (1000 kg)	<54.8	54.8	56	56.7	56.7 to 78														
	MTOW (1000 kg)	—	48	53	56.7	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	56.7	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	127	129	132	134	135	137	139	141	143	146	148	150	153	155	157	159	
	VR (kt IAS)	119	119	122	124	127	129	130	132	134	136	138	141	143	145	148	150	152	154	
	V1 (kt IAS)	115	115	115	115	115	115	115	117	119	121	123	126	128	130	133	135	137	139	

R

CONF 3	CORRECTED WEIGHT (1000 kg)	<56.3	56.3	58	58.7	58.7 to 78														
	MTOW (1000 kg)	—	48	55	58.7	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	58.7	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	123	123	126	128	131	133	135	136	138	140	142	145	147	149	151	153	155	157	
	VR (kt IAS)	118	118	121	123	126	128	130	131	133	135	137	140	142	144	146	148	150	152	
	V1 (kt IAS)	114	114	114	114	114	114	114	114	116	118	120	123	125	127	129	131	133	135	

TAKEOFF FROM A 12.7 MM (1/2 INCH) SLUSH COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

R

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RWY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
ΔWEIGHT (1000 kg) With clearway Without clearway	18.9 17.3	18.9 17.3	16.3 15.4	15.4 14.6	18.7 14.7	18.7 16.6	17.9 16.9	18.9 15.4	18.4 15.7	18.3 17.0

Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

R

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<47.8	47.8	48	48 to 78															
	MTOW (1000 kg)	–	46.7	48	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<46.7	46.7	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161	
	VR (kt IAS)	123	123	125	128	130	133	135	137	140	142	144	147	149	151	154	156	158	160	
	V1 (kt IAS)	117	117	117	120	122	125	127	129	132	134	136	139	141	143	146	148	150	152	

R

CONF 2	CORRECTED WEIGHT (1000 kg)	<49.5	49.5	50	50 to 78															
	MTOW (1000 kg)	–	47	50	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<47	47	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	123	123	124	127	129	132	134	137	139	141	143	146	148	150	153	155	157	159	
	VR (kt IAS)	119	119	120	123	125	128	130	133	135	137	139	142	144	146	149	151	153	155	
	V1 (kt IAS)	115	115	115	115	117	120	122	125	127	129	131	134	136	138	141	143	145	147	

R

CONF 3	CORRECTED WEIGHT (1000 kg)	<51	51	52	52 to 78															
	MTOW (1000 kg)	–	48	52	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78		
	V2 (kt IAS)	123	123	126	128	131	133	135	138	140	142	145	147	149	151	153	155	157		
	VR (kt IAS)	119	119	122	124	127	129	131	134	136	138	141	143	145	147	149	151	153		
	V1 (kt IAS)	114	114	114	114	117	119	121	124	126	128	131	133	135	137	139	141	143		

TAKEOFF FROM A COMPACTED SNOW COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT(1000 kg)									
With clearway	6.5	4.5	4.5	10.7	5.7	2.6	10.5	8.1	5.1
Without clearway	5.6	4.5	4.5	9.6	5.0	2.5	9.5	7.1	4.7

- Enter the following tables with the corrected weight to determine MTOW. Then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<47.6	47.6	48	48.7	48.7 to 76															
	MTOW (1000 kg)	–	42.7	45	48.7	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	48.7	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	124	127	128	130	132	134	137	139	141	143	145	148	150	152	154	157	158
	VR (kt IAS)	114	114	116	119	122	123	125	127	129	132	134	136	138	140	143	145	147	149	152	153
	V1 (kt IAS)	110	110	110	110	110	110	112	114	116	119	121	123	125	127	130	132	134	136	139	140

CONF 2	CORRECTED WEIGHT (1000 kg)	<48.1	48.1	49.3	49.3 to 76																
	MTOW (1000 kg)	–	42.7	49.3	EQUAL TO CORRECTED WEIGHT																
	ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	49.3	50	52	54	56	58	60	62	64	66	68	70	72	74	76
	V2 (kt IAS)	119	119	121	123	126	128	129	131	133	135	138	140	142	144	147	149	151	153	156	157
	VR (kt IAS)	115	115	117	119	122	124	125	127	129	131	134	136	138	140	143	145	147	149	152	153
	V1 (kt IAS)	110	110	110	110	110	110	111	113	115	117	120	122	124	126	129	131	133	135	138	139

CONF 3	CORRECTED WEIGHT (1000 kg)	<50.9	50.9	52	53	53 to 76															
	MTOW (1000 kg)	–	44.7	49	53	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	< 44.7	44.7	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	119	119	121	123	126	128	129	130	132	134	136	138	141	143	145	147	150	152	153	
	VR (kt IAS)	115	115	117	119	122	124	125	126	128	130	132	134	137	139	141	143	146	148	149	
	V1 (kt IAS)	110	110	110	110	110	110	110	111	113	115	117	119	122	124	126	128	131	133	134	

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TAKEOFF FROM A COMPACTED SNOW COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	9.6 8.9	8.1 8.1	8.1 8.1	8.1 8.1	10.7 9.3	8.1 7.8	8.1 7.8	9.8 8.7	7.4 6.7	5.3 5.3

- Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<57	57	58	58 to 94																			
	MTOW (1000 kg)	—	54	58	EQUAL TO CORRECTED WEIGHT																			
	ACTUAL WEIGHT (1000 kg)	<54	54	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	131	131	134	136	139	141	143	146	148	150	152	154	156	158	160	162	164	166	168	169	171	173	
	VR (kt IAS)	128	128	131	133	136	138	140	143	145	147	149	151	153	155	157	159	161	163	165	166	168	170	
	V1 (kt IAS)	115	115	115	115	118	120	122	125	127	129	131	133	135	137	139	141	143	145	147	148	150	152	

CONF 2	CORRECTED WEIGHT (1000 kg)	<62.5	62.5	64	64 to 94																	
	MTOW (1000 kg)	–	56	64	EQUAL TO CORRECTED WEIGHT																	
	ACTUAL WEIGHT (1000 kg)	<56	56	58	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94
	V2 (kt IAS)	125	125	127	129	131	134	136	138	140	142	144	145	147	149	151	152	154	156	157	159	160
	VR (kt IAS)	124	124	126	128	130	133	135	137	139	141	143	144	146	148	150	151	153	155	156	158	159

C O N F 3	CORRECTED WEIGHT (1000 kg)	<67.5	67.5	68	70	70 o 94															
	MTOW (1000 kg)	—	60	62	70	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<60	60	62	64	66	68	70	72	74	76	78	80	82	84	86	88	90	92	94	
	V2 (kt IAS)	125	125	127	129	131	133	135	137	139	141	142	144	146	147	149	151	152	154	155	
VR (kt IAS)	121	121	123	125	127	129	131	133	135	137	138	140	142	143	145	147	148	150	151		
V1 (kt IAS)	113	113	113	113	113	113	113	115	117	119	120	122	124	125	127	129	130	132	133		

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TAKEOFF FROM A COMPACTED SNOW COVERED RUNWAY

- Determine maximum takeoff weight on dry runway.
- Apply the following weight decrement versus takeoff configuration, runway length and clearway availability to determine a corrected weight.

R

TAKEOFF CONFIGURATION	CONF 1 + F				CONF 2			CONF 3		
RWY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
△WEIGHT (1000 kg) With clearway Without clearway	8.6 6.3	8.5 6.3	8.5 7.4	9.8 9.0	10.5 7.7	7.4 5.3	5.6 4.6	13.1 9.6	10.3 7.6	8.2 6.9

Enter the following tables with the corrected weight to determine MTOW then determine takeoff speeds associated with actual TOW.

R

CONF 1 + F	CORRECTED WEIGHT (1000 kg)	<52.7	52.7	54	54 to 78															
	MTOW (1000 kg)	—	46.7	54	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<46.7	46.7	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161	
	VR (kt IAS)	123	123	125	128	130	133	135	137	140	142	144	147	149	151	154	156	158	160	
	V1 (kt IAS)	117	117	117	117	117	117	119	121	124	126	128	131	133	135	138	140	142	144	

R

CONF 2	CORRECTED WEIGHT (1000 kg)	<54.8	54.8	56	56.7	56.7 to 78														
	MTOW (1000 kg)	—	48	53	56.7	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	56.7	58	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	124	124	127	129	132	134	135	137	139	141	143	146	148	150	153	155	157	159	
	VR (kt IAS)	119	119	122	124	127	129	130	132	134	136	138	141	143	145	148	150	152	154	
	V1 (kt IAS)	115	115	115	115	115	115	115	117	119	121	123	126	128	130	133	135	137	139	

R

CONF 3	CORRECTED WEIGHT (1000 kg)	<56.3	56.3	58	58.7	58.7 to 78														
	MTOW (1000 kg)	—	48	55	58.7	EQUAL TO CORRECTED WEIGHT														
	ACTUAL WEIGHT (1000 kg)	<48	48	50	52	54	56	58	58.7	60	62	64	66	68	70	72	74	76	78	
	V2 (kt IAS)	123	123	126	128	131	133	135	136	138	140	142	145	147	149	151	153	155	157	
	VR (kt IAS)	119	119	122	124	127	129	131	132	134	136	138	141	143	145	147	149	151	153	
	V1 (kt IAS)	114	114	114	114	114	114	114	114	116	118	120	123	125	127	129	131	133	135	

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SPRAY PATTERN

There is a little chance of the engines ingesting fluid which, in any case, should not jeopardize safety. The risk of ingestion is independent of the thickness/depth of the contaminant.

CROSSWIND

To optimize directional control during the low speed phase of the takeoff and landing roll and, depending on the reported braking action given by the control tower, it is not recommended to takeoff or to land with a crosswind component higher than :

For CIS airports

Reported braking action	Reported runway friction coefficient	Maximum crosswind (kt)	
		Takeoff	Landing
Good	0.60 – 0.50	29 *	33 *
Good/medium	0.49 – 0.45	29	29
Medium	0.44 – 0.40	25	
Medium/poor	0.39 – 0.35	20	
Poor	0.34 – 0.30	15	

It is not permitted to operate on runways covered with ice, or with a friction coefficient of $\mu < 0.3$.

For other airports

Reported braking action	Reported runway friction coefficient	Maximum crosswind (knots)		Equivalent runway condition **
		Takeoff	Landing	
Good	≥ 0.4	29 *	33 *	1
Good/medium	0.39 to 0.36	29	29	1
Medium	0.35 to 0.3	25		2/3
Medium/poor	0.29 to 0.26	20		2/3
Poor	≤ 0.25	15		3/4
Unreliable		5		4/5

- * This is the maximum crosswind demonstrated for dry and wet runways.
- ** Equivalent runway conditions (only valid for maximum crosswind determination) :
1. Dry, damp or wet runway (less than 3 mm water depth)
2. Runway covered with slush
3. Runway covered with dry snow
4. Runway covered with standing water, with risk of hydroplaning, or wet snow
5. Icy runway, or high risk of hydroplaning

TAXIING

— FOLLOWING TAXIING PROCEDURES

CONSIDER

- Avoid high thrust settings.

— When taxiing on slippery surfaces, stay well behind preceding aircraft.

— Taxi at low speed. Note that antiskid does not operate at low taxi speeds.

— On slippery taxiways during turns with large nose wheel steering angles, noise and vibration may result from the wheels slipping sideways. Keep speed as low as possible to make a smooth turn with minimum radius. Differential power may be needed.

— If taxiing in icing conditions with precipitation on runways and taxiways contaminated with slush or snow :

· Before takeoff keep flaps/slats retracted until reaching the holding point on the takeoff runway to avoid contaminating the mechanism. Hold the BEFORE TO checklist at FLAP SETTING and finish it after extending flaps/slats.

· When taxiing in after landing, do not retract the flaps/slats to avoid damage of the structure.

After engine shutdown make a visual inspection to determine that the flap/slat mechanism is free of contamination.

· When the mechanism is clean, use the following procedure to retract the flaps/slats before the aircraft electric network is de-energized :

* Set the YELLOW ELEC PUMP to ON

* Check that the BLUE ELEC PUMP is in the AUTO position

* Set the BLUE PUMP OVRD to ON

* Retract the FLAPS and monitor retraction on ECAM page.

* Select off the YELLOW ELEC PUMP and BLUE PUMP OVRD and resume with normal procedure.

Note : — On contaminated runways and taxiways, the radio altitude indications may fluctuate and auto call outs or GPWS warnings may be activated. Disregard them.

— During taxi on snowy runways, the radio altimeters may not compute any data and the ECAM warnings 'DUAL ENG FAILURE', 'ANTI ICE CAPT TAT FAULT', 'ANTI ICE F/O TAT FAULT', 'L/G SHOCK ABSORBER FAULT' may be triggered. Disregard these warnings.

R

TAKEOFF

- R
- FOLLOWING TAKEOFF PROCEDURES

CONSIDER

— For contaminated runways, select MAX TO.

— Do not abort takeoff for minor deficiencies even at low speeds.

If you have to abort takeoff, maintain directional control with the rudder and small inputs to the nose wheel. If necessary, use differential braking to regain the center line when stopping distance permits.

— Do not lift the nose wheel before VR in an attempt to avoid splashing slush on the aircraft, because this produces additional aerodynamic drag.

— Rotate, lift off and retract gear and high lift devices in the normal manner.
- LANDING
- FOLLOWING LANDING PROCEDURES

CONSIDER

— Avoid landing on contaminated runways if the antiskid is not functioning. The use of autobrake LOW or MED is recommended provided that the contamination is evenly distributed.

— Approach at the normal speed.

— Make a positive touchdown after a brief flare.

— As soon as the aircraft has touched down, lower the nose wheel onto the runway and select maximum reverse thrust.

Do not hold the nose wheel off the ground.

— If necessary, the maximum reverse thrust can be used until the aircraft is fully stopped.

— If the runway length is limiting, apply the brakes before lowering the nose gear onto the runway, but be prepared to apply back stick to counter the nose down pitch produced by the brakes application. (The strength of this pitching moment will depend on the brake torque attainable on the slippery runway).

— Maintain directional control with the rudder as long as possible, use nose wheel steering with care.

— When the aircraft is at taxi speed, follow the recommendations for taxiing.

Note : If there is snow, visibility may be reduced by snow blowing forward at low speeds if reversers are not cancelled.

AFL MSN 2052-2093 2179-2222 2243 3281-3298 3336

EXAMPLES

TAKEOFF PERFORMANCE ON DRY RUNWAY

Data

Runway length : 3 000 m, OAT = 36°C, no wind, CONF 1+F
– Determine maximum takeoff weight on dry runway from RTOW chart (Refer to FCOM 2.02.10 p 6)

NFC5-02-04.10-014-A204AA

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
34.0	68.1 3/4 147/47/50	69.1 3/4 150/50/53	70.2 4/4 151/51/54	70.8 4/4 152/52/55	71.6 4/4 152/52/55
36.0	68.0 3/4 147/47/50	69.0 3/4 150/50/52	70.1 4/4 151/51/54	70.7 4/4 152/52/55	71.5 4/4 152/52/55

Maximum TOW = 70100 kg, V1 = 151 kt, VR = 151 kt, V2 = 154 kt.

TAKEOFF PERFORMANCE ON WET RUNWAY

With no thrust reversers operating and assuming that no clearway was used to compute the dry RTOW chart, use the table from 2.04.10 p 3.

NFC5-02-04.10-014-B204AA

TAKEOFF CONFIGURATION	1+F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 AND ABOVE	2000 6500	2500 8000	3000 10000 AND ABOVE	1750 5750	2000 6500	2500 8000 AND ABOVE
FLEX TO TEMPERATURE DECREMENT (°C)	4	3	2	3	4	4	2	3	3
MAX TO WEIGHT DECREMENT (1000 kg) (1000 lb)	1.4 3.1	1.1 2.5	0.9 2.0	0.8 1.8	1.4 3.1	1.4 3.1	0.4 0.9	1.1 2.5	1.3 2.9
V1 DECREMENT (kt)	17	15	16	16	16	16	15	15	15
VR AND V2 DECREMENT (kt)	4	4	5	3	4	5	2	3	4

- Maximum takeoff weight correction :
MTOW = 70100 – 1100 = 69000 kg, V1 = 151 – 15 = 136 kt,
VR = 151 – 4 = 147 kt, V2 = 154 – 4 = 150 kt.
- Flex temperature correction :
Assuming an actual takeoff weight of 69000 kg and an initial flex temperature of 45°C.
TOW = 69000 kg ⇒ Flex temperature = 45 – 3 = 42°C
V1 = 149 – 15 = 134 kt, VR = 150 – 4 = 146 kt, V2 = 153 – 4 = 149 kt.
Check the resulting speeds against the minimum speeds as per procedure 2.04.10 p 2a.

R **TAKEOFF**

- R — **FOLLOWING TAKEOFF PROCEDURES CONSIDER**
- R — For contaminated runways, select MAX TO.
- R — Do not abort takeoff for minor deficiencies even at low speeds.
- R If you have to abort takeoff, maintain directional control with the rudder and small
- R inputs to the nose wheel. If necessary, use differential braking to regain the center
- R line when stopping distance permits.
- R — Do not lift the nose wheel before VR in an attempt to avoid splashing slush on the
- R aircraft, because this produces additional aerodynamic drag.
- R — Rotate, lift off and retract gear and high lift devices in the normal manner.

LANDING

- **FOLLOWING LANDING PROCEDURES CONSIDER**
- Avoid landing on contaminated runways if the antiskid is not functioning. The use of autobrake LOW or MED is recommended provided that the contamination is evenly distributed.
- Approach at the normal speed.
- Make a positive touchdown after a brief flare.
- As soon as the aircraft has touched down, lower the nose wheel onto the runway and select maximum reverse thrust.
- Do not hold the nose wheel off the ground.
- If necessary, the maximum reverse thrust can be used until the aircraft is fully stopped.
- If the runway length is limiting, apply the brakes before lowering the nose gear onto the runway, but be prepared to apply back stick to counter the nose down pitch produced by the brakes application. (The strength of this pitching moment will depend on the brake torque attainable on the slippery runway).
- Maintain directional control with the rudder as long as possible, use nose wheel steering with care.
- When the aircraft is at taxi speed, follow the recommendations for taxiing.

Note : If there is snow, visibility may be reduced by snow blowing forward at low speeds if reversers are not cancelled.

EXAMPLES

TAKEOFF PERFORMANCE ON DRY RUNWAY

Data
 Runway length : 3000 m, OAT = 36°C, no wind, CONF 1+F
 – Determine maximum takeoff weight on dry runway from RTOW chart (Refer to FCOM 2.02.10 p 6).

NFC5-02-04.10-014-A226AB

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
34.0	80.1 3/4 142/50/52	82.1 3/4 147/52/54	83.9 3/4 151/54/55	85.3 3/4 154/55/57	86.6 3/4 157/58/59
36.0	79.0 3/4 142/49/51	81.0 3/4 146/51/53	82.8 3/4 151/53/54	84.2 3/4 154/54/56	85.4 3/4 157/57/58
38.0	78.0 3/4 141/48/50	79.9 3/4 146/50/52	81.7 3/4 151/52/53	83.0 3/4 153/54/55	84.2 3/4 156/57/58

Maximum TOW = 82800 kg, V1 = 151 kt, VR = 153 kt, V2 = 154 kt.

TAKEOFF PERFORMANCE ON WET RUNWAY

With no thrust reversers operating and assuming that no clearway was used to compute the dry RTOW chart, use the table from 2.04.10 p 3.

NFC5-02-04.10-014-B226AB

TAKEOFF CONFIGURATION	1+F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 AND ABOVE	2000 6500	2500 8000	3000 10000 AND ABOVE	1750 5750	2000 6500	2500 8000 AND ABOVE
FLEX TO TEMPERATURE DECREMENT (°C)	5	2	2	6	3	2	6	4	2
MAX TO WEIGHT DECREMENT (1000 kg) (1000 lb)	2.5 5.5	1.0 2.2	0.8 1.8	2.5 5.5	1.8 4.0	1.0 2.2	2.5 5.5	1.8 4.0	1.0 2.2
V1 DECREMENT (kt)	14	15	15	15	15	15	14	13	13
VR AND V2 DECREMENT (kt)	2	3	4	3	3	4	2	3	4

- Maximum takeoff weight correction :
 MTOW = 82800 – 1000 = 81800 kg, V1 = 151 – 15 = 136 kt, VR = 153 – 3 = 150 kt, V2 = 154 – 3 = 151 kt.
- Flex temperature correction :
 Assuming an actual takeoff weight of 75000 kg and an initial flex temperature of 47°C
 TOW = 75000 kg ⇒ Flex temperature = 47 – 2 = 45°C
 V1 = 149 – 15 = 134 kt, VR = 150 – 3 = 147 kt, V2 = 151 – 3 = 148 kt.

R **TAKEOFF**

- R — **FOLLOWING TAKEOFF PROCEDURES CONSIDER**
- R — For contaminated runways, select MAX TO.
- R — Do not abort takeoff for minor deficiencies even at low speeds.
- R If you have to abort takeoff, maintain directional control with the rudder and small
- R inputs to the nose wheel. If necessary, use differential braking to regain the center
- R line when stopping distance permits.
- R — Do not lift the nose wheel before VR in an attempt to avoid splashing slush on the
- R aircraft, because this produces additional aerodynamic drag.
- R — Rotate, lift off and retract gear and high lift devices in the normal manner.

LANDING

- **FOLLOWING LANDING PROCEDURES CONSIDER**
- Avoid landing on contaminated runways if the antiskid is not functioning. The use of autobrake LOW or MED is recommended provided that the contamination is evenly distributed.
- Approach at the normal speed.
- Make a positive touchdown after a brief flare.
- As soon as the aircraft has touched down, lower the nose wheel onto the runway and select maximum reverse thrust.
- Do not hold the nose wheel off the ground.
- If necessary, the maximum reverse thrust can be used until the aircraft is fully stopped.
- If the runway length is limiting, apply the brakes before lowering the nose gear onto the runway, but be prepared to apply back stick to counter the nose down pitch produced by the brakes application. (The strength of this pitching moment will depend on the brake torque attainable on the slippery runway).
- Maintain directional control with the rudder as long as possible, use nose wheel steering with care.
- When the aircraft is at taxi speed, follow the recommendations for taxiing.

Note : If there is snow, visibility may be reduced by snow blowing forward at low speeds if reversers are not cancelled.

EXAMPLES

TAKEOFF PERFORMANCE ON DRY RUNWAY

Data

Runway length : 3000 m, OAT = 36°C, no wind, CONF 1+F
 – Determine maximum takeoff weight on dry runway from RTOW chart (Refer to FCOM 2.02.10 p 6).

NFC5-02-0410-014-A348AA

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
34.0	76.7 4/6 143/50/52	78.4 4/6 148/53/55	80.2 4/6 154/56/58	81.5 4/6 157/57/60	82.8 4/6 160/60/62
36.0	76.5 4/6 143/49/52	78.4 4/6 148/52/54	80.1 4/6 153/56/58	81.4 4/6 156/57/59	82.7 4/6 160/60/62

Maximum TOW = 80100 kg, V1 = 153 kt, VR = 156 kt, V2 = 158 kt

TAKEOFF PERFORMANCE ON WET RUNWAY

With no thrust reversers operating and assuming that no clearway was used to compute the dry RTOW chart, use the lower table from 2.04.10 p 3.

NFC5-02-0410-014-B348AA

TAKEOFF CONFIGURATION	CONF 1+F			CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
FLEX TO TEMPERATURE DECREMENT (°C)	8	5	3	8	6	2	6	6	2
MAX TO WEIGHT DECREMENT (1000 kg) (1000 lb)	2.6 5.8	2.0 4.5	1.3 2.9	2.5 5.6	2.2 4.9	0.7 1.6	2.1 4.5	2.1 4.7	0.7 1.6
V1 DECREMENT (kt)	15	14	14	16	14	14	14	15	13
VR AND V2 DECREMENT (kt)	2	1	1	2	1	2	1	2	0

- Maximum takeoff weight correction :
 MTOW = 80100 – 2000 = 78100 kg, V1 = 153 – 14 = 139 kt, VR = 156 – 1 = 155 kt, V2 = 158 – 1 = 157 kt.
- Flex temperature correction :
 Assuming an actual takeoff weight of 78400 kg and an initial flex temperature of 47°C
 TOW = 78400 kg ⇒ Flex temperature = 47 – 5 = 42°C
 V1 = 152 – 14 = 138 kt, VR = 154 – 1 = 153 kt, V2 = 156 – 1 = 155 kt.
 Check the resulting speeds against the minimum speeds as per procedure 2.04.10 p2a.

TAKEOFF PERFORMANCE ON RUNWAY COVERED WITH 1/2 INCH SLUSH

Data

Runway length : 3000 m (no clearway), OAT = 5°C, no wind, CONF 1 + F
– Determine maximum takeoff weight on dry runway (refer to FCOM 2.02.10 p 6)

NFC5-02-0410-015-A204AA

OAT °C	CONF 1+F				
	TAILWIND -10 kt	TAILWIND -5 kt	WIND 0 kt	HEADWIND 10 kt	HEADWIND 20 kt
0	69.7 3/4 152/52/55	70.7 4/4 153/53/56	71.7 4/4 154/54/56	72.6 4/4 155/55/58	73.4 4/4 155/55/58
10	69.3 3/4 152/52/55	70.3 4/4 152/52/55	71.3 4/4 153/53/56	72.1 4/4 154/54/57	72.9 4/4 155/55/58

Maximum takeoff weight on dry runway = 71500 kg
– Determine a corrected weight (refer to FCOM 2.04.10 p 8). As no clearway, use the correction displayed on the second line (without clearway).

NFC5-02-0410-015-B204AA

TAKEOFF CONFIGURATION	1 + F			2			3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
ΔWEIGHT (1000 kg) With clearway Without clearway	15.6 14.7	13.2 12.7	12.0 11.7	17.8 16.7	14.8 14.1	13.0 12.8	17.4 16.4	15.4 14.4	14.9 14.5

Corrected weight = 71500 – 12700 = 58800 kg
– Determine maximum takeoff weight and associated speeds :

NFC5-02-0410-015-C204AA

CORRECTED WEIGHT (1000 kg)	<42.7	42.7	42.7 to 76																
MTOW (1000 kg)	-	42.7	EQUAL TO CORRECTED WEIGHT																
ACTUAL WEIGHT (1000 kg)	<42.7	42.7	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76
V2 (kt IAS)	119	119	121	124	127	130	132	134	137	139	141	143	145	148	150	152	154	157	158
VR (kt IAS)	116	116	118	121	124	127	129	131	134	136	138	140	142	145	147	149	151	154	155
V1 (kt IAS)	110	110	112	115	118	121	123	125	128	130	132	134	136	139	138	141	143	148	149

MTOW = 58800 kg
V1 = 130 kt, VR = 137 kt, V2 = 140 kt

TAKEOFF PERFORMANCE ON RUNWAY COVERED WITH 1/2 INCH SLUSH

Data

Runway length 3000 m (no clearway), OAT = 5°C, 5 kt tailwind, CONF 1+F
 — Determine maximum takeoff weight on dry runway (Refer to FCOM 2.02.10 p 6).

NF5-02-0410-015-A348AA

OAT °C	CONF 1 + F				
	TAILWIND -10 KT	TAILWIND -5 KT	WIND 0 KT	HEADWIND 10 KT	HEADWIND 20 KT
0.0	78.8 4/6 151/54/57	80.6 4/6 156/57/59	82.5 4/6 162/62/64	83.7 3/4 165/65/67	84.7 3/4 168/68/70
10.0	78.2 4/6 148/53/55	80.0 4/6 154/57/59	81.8 4/6 159/60/62	83.1 4/6 163/63/65	84.2 3/4 166/66/67

Maximum takeoff weight on dry runway = 80300 kg

— Determine a corrected weight (Refer to FCOM 2.04.10 p 8). As no clearway, use the correction displayed on the second line (without clearway).

R

NF5-02-0410-015-B348AA

TAKEOFF CONFIGURATION	CONF 1+F				CONF 2			CONF 3		
RUNWAY LENGTH (m) (ft)	2500 8000	3000 10000	3500 11500	4000 13000 and above	2000 6500	2500 8000	3000 10000 and above	1750 5750	2000 6500	2500 8000 and above
Δ WEIGHT (1000 kg) With clearway	18.9	18.9	16.3	15.4	18.7	18.7	17.9	18.9	18.4	18.3
Without clearway	17.3	17.3	15.4	14.6	14.7	16.6	16.9	15.4	15.7	17.0

Corrected weight = 80300 – 17300 = 63000 kg

— Determine maximum takeoff weight and associated speeds :

R

NF5-02-0410-015-C348AA

CONF 1+F	CORRECTED WEIGHT (1000 kg)	<47.8	47.8	48	48 to 78															
	MTOW (1000 kg)	-	46.7	48	EQUAL TO CORRECTED WEIGHT															
	ACTUAL WEIGHT (1000 kg)	<46.7	47.3	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	
CONF 1+F	V2 (kt IAS)	124	124	126	129	131	134	136	138	141	143	145	148	150	152	155	157	159	161	
	VR (kt IAS)	123	123	125	128	130	133	135	137	140	142	144	147	149	151	154	156	158	160	
	V1 (kt IAS)	117	117	117	120	122	125	127	129	132	134	136	139	141	143	146	148	150	152	

MTOW = 63000 kg

V1 = 135 kt, VR = 143 kt, V2 = 144 kt

FERRY FLIGHT WITH NO SLATS

TO BE ISSUED LATER

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS		2.04.20	P 1
	FLIGHT WITHOUT CAB PRESSURIZATION		SEQ 001	REV 21

GENERAL

The aircraft may fly without cabin pressurization because of an aircraft system deficiency (see MEL) or after a decompression in flight. The pilot’s choice of flight level and airspeed depends on the cause of the depressurization, the distance to fly, the topographic conditions and the meteorological conditions.

OXYGEN REQUIREMENTS

CREW MEMBERS

See FAR 121.329 or JAR-OPS 1.770

PASSENGERS

For flight at cabin pressure altitudes above 10000 feet, up to and including 14000 feet, there must be enough oxygen to supply 10% of the passengers for the flight at those altitudes that lasts more than 30 minutes.

For flight at cabin pressure altitudes above 14000 feet, up to and including 15000 feet, there must be enough oxygen for 30 % of the passengers.

For flight at cabin pressure altitudes above 15000 feet, there must be enough oxygen for all passengers.

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FLIGHT PLANNING AND EXECUTION

ALTITUDE

Flight route planning should consider the above-stated restriction in cabin altitude. If cabin altitude exceeds 9550 ± 350 feet, the EXCESS CAB ALT warning on the ECAM will be activated. When above 14000 feet, the passenger oxygen masks will drop automatically. Therefore, the recommended maximum altitude for prolonged flight is FL100. The minimum altitude should be selected by respecting :

- The Minimum Safe Altitude (MSA),
- Turbulence, which is uncomfortable for passengers and,
- Low Outside Air Temperature (OAT), which can be uncomfortable for passengers when the cabin is ventilated by ram air only.

AIRSPEED

If decompression is due to structural damage, consider airspeed reduction. Use slats and flaps, as necessary, to establish low speed conditions. In addition, turbulent conditions are uncomfortable for passengers, and gust response should be minimized by reducing airspeed.

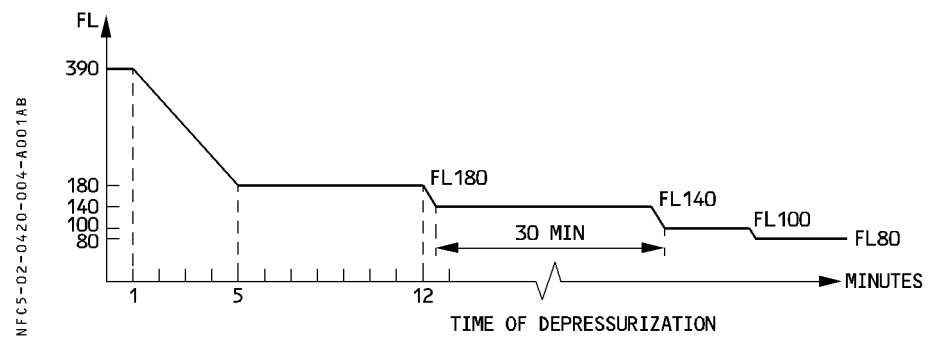
CLIMB AND DESCENT RATE

Takeoff must be performed normally, and the rate of climb must be limited to about 500 feet/minute, to ease the pressure change felt by passengers and crew.

- R Likewise, the rate of descent must be limited to about 1000 feet/minute, except for the final approach which must be performed normally. Notify the ATC of any performance deficiency by a remark in the flight plan.

EMERGENCY DESCENT IN CASE OF RAPID DEPRESSURIZATION

In the event of depressurization, oxygen is supplied to passengers through an individual mask. The capacity of the units is such that the aircraft must descend and remain below the following profile.



SYSTEMS

FAILURE OCCURRING IN FLIGHT

Apply the abnormal and emergency procedures required by ECAM.

FAILURE PRESENT AT DISPATCH

● **If flight with both packs inoperative**

- **PACK 1 and 2** **OFF**
- **RAM AIR** **ON**

Note : If the «AVIONICS SMOKE» procedure has to be applied, the following flight time limitations have to be considered to protect the avionic equipment :
At ISA + 40 : 0.5 hour
At ISA + 30 : 1.5 hour
At ISA + 20 : 4 hours
At ISA + 10 and below : No limitation.

(*) Between FL 80 and FL 150, oxygen must be provided for 2 % of the passengers. This is provided by the portable oxygen system. When it is no longer available, descend to FL 80. For performance at FL 80/250 knots : Use data for FL 100/LRC given in 3.05.15, and increase fuel consumption by 6 %.

● **If both CAB PRESS systems are inoperative, or if there is structural damage :**

- **PACK 1 and 2** **ON**
- **MODE SEL** **MAN**
- **V/S CTL** **AS RQRD**
 Use V/S CTL to set the outflow valve opening to 50 %.
- **OUTFLOW VALVE HALF OPEN** **CHECK**
 The outflow valve opening is limited to 50 %, to prevent the cabin air suction effect.
- **MAX FL** **100 or MSA**

A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS FLIGHT WITHOUT CAB PRESSURIZATION	2.04.20	P 5a
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TAKEOFF

Limit the aircraft’s rate of climb to about 500 feet/minute.

CLIMB

*Note : The EXCESS CAB ALT warning may occur.
Use the ECAM CLR pushbutton to clear the warning.*

DESCENT

Limit the aircraft’s rate of descent to about 1000 feet/minute. Perform the final approach normally.

PERFORMANCE DATA

The following table enables the fuel consumption and the time needed from takeoff to landing to be determined in case of flight without cabin pressurization.

The table is established for :

- Takeoff
- Climb from 1500 ft at 250 kt
- Long range cruise speed at FL100
- Descent to 1500 ft at 250 kt
- Approach and landing : IMC procedure 120 kg or 260 lb (6 min)
- ISA temperature
- CG = 25 %
- Normal air conditioning
- Anti ice OFF

The table on page 8 gives the conversion from ground distance to air distance

Note : For each degree Celcius above ISA temperature apply a correction of 0.01 (kg/°C/NM) or 0.022 (lb/°C/NM).

PERFORMANCE DATA

The following table enables the fuel consumption and the time needed from takeoff to landing to be determined in case of flight without cabin pressurization.

The table is established for :

- Takeoff
- Climb from 1500 ft at 250 kt
- Long range cruise speed at FL100
- Descent to 1500 ft at 250 kt
- Approach and landing : IMC procedure 140 kg or 310 lb (6 min)
- ISA temperature
- CG = 25 %
- Normal air conditioning
- Anti ice OFF

The table on page 8 gives the conversion from ground distance to air distance

Note : For each degree Celcius above ISA temperature apply a correction of 0.01 (kg/°C/NM) or 0.022 (lb/°C/NM).

PERFORMANCE DATA

The following table enables the fuel consumption and the time needed from takeoff to landing to be determined in case of flight without cabin pressurization.

The table is established for :

- Takeoff
- Climb from 1500 ft at 250 kt
- Long range cruise speed at FL100
- Descent to 1500 ft at 250 kt
- Approach and landing : IMC procedure 110 kg or 240 lb (6 min)
- ISA temperature
- CG = 25 %
- Normal air conditioning
- Anti ice OFF

The table on page 8 gives the conversion from ground distance to air distance

Note : For each degree Celcius above ISA temperature apply a correction of 0.01 (kg/°C/NM) or 0.022 (lb/°C/NM).

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING							
CLIMB : 250 KT - CRUISE : LONG RANGE - DESCENT : 250KT							
IMC PROCEDURE : 110 KG (6MIN)							
FL100							
NORMAL AIR CONDITIONING			ISA		FUEL CONSUMED (KG)		
ANTI-ICING OFF			CG = 25.0%		TIME (H.MIN)		
AIR DIST. (NM)	INITIAL WEIGHT (1000KG)						
	45	50	55	60	65	70	75
220	1820 0.56	1883 0.55	1954 0.54	2026 0.51	2093 0.51	2163 0.50	2235 0.50
240	1958 1.00	2027 1.00	2104 0.58	2182 0.55	2254 0.54	2327 0.54	2402 0.54
260	2095 1.05	2170 1.04	2254 1.03	2339 0.59	2414 0.58	2491 0.57	2570 0.57
280	2233 1.10	2314 1.09	2404 1.07	2494 1.02	2574 1.01	2655 1.00	2737 1.00
300	2370 1.14	2457 1.13	2553 1.11	2650 1.06	2735 1.05	2819 1.04	2905 1.04
320	2507 1.19	2600 1.18	2703 1.16	2806 1.10	2895 1.08	2983 1.07	3072 1.07
340	2644 1.23	2742 1.22	2852 1.20	2961 1.13	3055 1.12	3146 1.11	3239 1.10
360	2780 1.28	2885 1.27	3001 1.24	3117 1.17	3214 1.15	3310 1.14	3406 1.14
380	2917 1.32	3027 1.31	3149 1.29	3272 1.21	3374 1.19	3473 1.17	3572 1.17
400	3053 1.37	3169 1.36	3298 1.33	3427 1.25	3533 1.22	3636 1.21	3739 1.20
420	3190 1.42	3311 1.40	3446 1.37	3582 1.28	3693 1.26	3799 1.24	3906 1.24
440	3326 1.46	3453 1.44	3594 1.42	3737 1.32	3852 1.29	3962 1.28	4072 1.27
460	3462 1.51	3595 1.49	3742 1.46	3892 1.36	4011 1.33	4125 1.31	4238 1.30
480	3598 1.55	3736 1.53	3889 1.50	4046 1.39	4170 1.36	4288 1.34	4405 1.34
500	3733 2.00	3878 1.58	4037 1.55	4201 1.43	4329 1.40	4450 1.38	4571 1.37
520	3869 2.05	4019 2.02	4184 1.59	4354 1.47	4488 1.43	4613 1.41	4737 1.40
540	4004 2.09	4160 2.07	4331 2.03	4508 1.51	4647 1.47	4775 1.45	4903 1.44
560	4139 2.14	4301 2.11	4478 2.08	4661 1.55	4805 1.50	4937 1.48	5069 1.47
580	4274 2.18	4441 2.16	4624 2.12	4814 1.58	4964 1.54	5099 1.52	5234 1.50
600	4409 2.23	4582 2.21	4771 2.17	4967 2.02	5122 1.57	5261 1.55	5400 1.54
620	4544 2.28	4722 2.25	4917 2.21	5120 2.06	5280 2.01	5423 1.59	5566 1.57
640	4679 2.32	4862 2.30	5063 2.25	5273 2.10	5439 2.04	5584 2.02	5731 2.01
660	4813 2.37	5002 2.34	5208 2.30	5425 2.14	5596 2.08	5746 2.05	5896 2.04
680	4948 2.41	5142 2.39	5354 2.34	5577 2.18	5754 2.12	5907 2.09	6061 2.07
700	5082 2.46	5282 2.43	5499 2.39	5729 2.22	5911 2.15	6069 2.12	6226 2.11
AIR CONDITIONING OFF			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON	
ΔFUEL = - 2.5 %			ΔZFUEL = + 4.5 %			ΔFUEL = + 8.5 %	

GROUND DISTANCE/AIR DISTANCE CONVERSION

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+150	+100	+ 50	0	−50	−100	−150
40	27	30	34	40	48	59	77
60	41	45	52	60	71	88	115
80	54	61	69	80	95	117	153
100	68	76	86	100	119	147	192
120	81	91	103	120	143	176	230
140	95	106	121	140	167	206	268
160	108	121	138	160	190	235	307
180	122	136	155	180	214	264	345
200	135	152	172	200	238	294	384
220	149	167	190	220	262	323	422
240	162	182	207	240	286	352	460
260	176	197	224	260	309	382	499
280	189	212	241	280	333	411	537
300	203	227	259	300	357	441	575
320	216	243	276	320	381	470	614
340	230	258	293	340	405	499	652
360	243	273	310	360	428	529	690
380	257	288	328	380	452	558	729
400	271	303	345	400	476	587	767
420	284	318	362	420	500	617	805
440	298	334	379	440	524	646	844
460	311	349	397	460	547	675	882
480	325	364	414	480	571	705	920
500	338	379	431	500	595	734	959
520	352	394	448	520	619	764	997
540	365	409	466	540	642	793	1036
560	379	425	483	560	666	822	1074
580	392	440	500	580	690	852	1112
600	406	455	517	600	714	881	1151

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING							
CLIMB : 250 KT - CRUISE : LONG RANGE - DESCENT : 250KT							
IMC PROCEDURE : 140 KG (6MIN)							
FL 100							
NORMAL AIR CONDITIONING			ISA		FUEL CONSUMED (KG)		
ANTI-ICING OFF			CG = 25.0%		TIME (H.MIN)		
AIR DIST. (NM)	INITIAL WEIGHT (1000KG)						
	65	70	75	80	85	90	95
220	2281 0.51	2345 0.51	2418 0.51	2501 0.51	2595 0.50	2692 0.50	2793 0.49
240	2453 0.55	2521 0.54	2597 0.54	2685 0.54	2784 0.53	2886 0.53	2991 0.53
260	2624 0.58	2696 0.58	2776 0.58	2868 0.58	2972 0.57	3079 0.56	3189 0.56
280	2796 1.02	2871 1.01	2955 1.01	3051 1.01	3160 1.00	3273 0.59	3387 0.59
300	2968 1.05	3046 1.05	3134 1.05	3234 1.05	3348 1.04	3466 1.03	3584 1.02
320	3139 1.09	3221 1.08	3313 1.08	3417 1.08	3536 1.07	3658 1.06	3782 1.05
340	3310 1.12	3396 1.12	3491 1.12	3600 1.12	3724 1.10	3851 1.09	3979 1.09
360	3481 1.16	3571 1.15	3670 1.15	3782 1.15	3911 1.14	4043 1.12	4176 1.12
380	3652 1.19	3745 1.19	3848 1.19	3964 1.18	4098 1.17	4236 1.16	4373 1.15
400	3823 1.23	3920 1.23	4026 1.22	4147 1.22	4285 1.20	4428 1.19	4569 1.18
420	3994 1.27	4094 1.26	4205 1.26	4329 1.25	4472 1.24	4620 1.22	4766 1.21
440	4164 1.30	4268 1.30	4382 1.29	4511 1.29	4658 1.27	4811 1.26	4962 1.24
460	4334 1.34	4442 1.33	4560 1.33	4692 1.32	4845 1.31	5003 1.29	5158 1.28
480	4504 1.37	4616 1.37	4738 1.36	4874 1.36	5031 1.34	5194 1.32	5354 1.31
500	4674 1.41	4790 1.40	4915 1.40	5055 1.39	5217 1.38	5385 1.35	5549 1.34
520	4844 1.45	4963 1.44	5093 1.43	5237 1.43	5403 1.41	5576 1.39	5745 1.37
540	5014 1.48	5137 1.47	5270 1.47	5418 1.46	5588 1.44	5767 1.42	5940 1.40
560	5184 1.52	5310 1.51	5447 1.50	5599 1.50	5774 1.48	5957 1.45	6135 1.44
580	5353 1.56	5483 1.54	5624 1.54	5780 1.53	5959 1.51	6148 1.49	6330 1.47
600	5522 1.59	5656 1.58	5801 1.57	5960 1.57	6144 1.55	6338 1.52	6525 1.50
620	5692 2.03	5829 2.01	5978 2.01	6141 2.00	6329 1.58	6528 1.55	6719 1.53
640	5861 2.06	6002 2.05	6154 2.04	6321 2.04	6514 2.02	6718 1.59	6914 1.57
660	6030 2.10	6175 2.09	6331 2.08	6501 2.07	6698 2.05	6907 2.02	7108 2.00
680	6198 2.14	6347 2.12	6507 2.11	6681 2.11	6882 2.08	7097 2.05	7302 2.03
700	6367 2.17	6520 2.16	6683 2.15	6861 2.14	7066 2.12	7286 2.09	7496 2.06
AIR CONDITIONING OFF ΔFUEL = - 3 %			ENGINE ANTI ICE ON ΔFUEL = + 4 %		TOTAL ANTI ICE ON ΔFUEL = + 8.5 %		

GROUND DISTANCE/AIR DISTANCE CONVERSION

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+150	+100	+ 50	0	−50	−100	−150
40	27	31	35	40	47	58	74
60	41	46	52	60	71	87	112
80	55	61	69	80	95	116	149
100	68	76	87	100	118	145	186
120	82	92	104	120	142	173	223
140	96	107	121	140	166	202	260
160	109	122	139	160	189	231	298
180	123	138	156	180	213	260	335
200	137	153	173	200	236	289	372
220	150	168	191	220	260	318	409
240	164	183	208	240	284	347	446
260	178	199	225	260	307	376	484
280	191	214	243	280	331	405	521
300	205	229	260	300	355	434	558
320	219	245	277	320	378	463	595
340	232	260	295	340	402	492	633
360	246	275	312	360	426	520	670
380	260	290	329	380	449	549	707
400	274	306	347	400	473	578	744
420	287	321	364	420	497	607	781
440	301	336	381	440	520	636	819
460	315	352	399	460	544	665	856
480	328	367	416	480	567	694	893
500	342	382	433	500	591	723	930
520	356	397	451	520	615	752	967
540	369	413	468	540	638	781	1005
560	383	428	485	560	662	810	1042
580	397	443	503	580	686	839	1079
600	410	459	520	600	709	867	1116

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250 KT - CRUISE : LONG RANGE - DESCENT : 250KT IMC PROCEDURE : 120 KG (6MIN)								FL 100
NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG = 25.0%		FUEL CONSUMED (KG) TIME (H.MIN)			
AIR DIST. (NM)	INITIAL WEIGHT (1000KG)							
	50	55	60	65	70	75	80	
220	1895 0.55	1968 0.53	2040 0.52	2110 0.51	2183 0.51	2257 0.50	2336 0.50	
240	2039 0.59	2119 0.57	2197 0.55	2271 0.55	2348 0.54	2426 0.54	2509 0.54	
260	2183 1.04	2270 1.01	2353 0.59	2432 0.58	2513 0.58	2595 0.57	2682 0.57	
280	2326 1.08	2420 1.05	2509 1.03	2593 1.02	2678 1.01	2763 1.01	2854 1.01	
300	2470 1.13	2571 1.09	2665 1.07	2753 1.05	2842 1.04	2932 1.04	3026 1.04	
320	2613 1.17	2721 1.13	2821 1.10	2914 1.09	3007 1.08	3100 1.07	3199 1.07	
340	2756 1.21	2871 1.17	2977 1.14	3074 1.12	3171 1.11	3269 1.11	3371 1.11	
360	2899 1.26	3020 1.21	3133 1.18	3234 1.16	3336 1.15	3437 1.14	3543 1.14	
380	3042 1.30	3170 1.25	3288 1.21	3394 1.20	3500 1.18	3605 1.18	3715 1.17	
400	3185 1.35	3319 1.30	3444 1.25	3554 1.23	3664 1.22	3773 1.21	3886 1.21	
420	3327 1.39	3468 1.34	3599 1.29	3713 1.27	3828 1.25	3941 1.24	4058 1.24	
440	3469 1.44	3616 1.38	3754 1.33	3873 1.30	3992 1.29	4108 1.28	4229 1.28	
460	3611 1.48	3765 1.42	3909 1.36	4032 1.34	4155 1.32	4276 1.31	4400 1.31	
480	3753 1.53	3913 1.46	4064 1.40	4192 1.38	4319 1.36	4443 1.35	4572 1.34	
500	3895 1.57	4061 1.50	4219 1.44	4351 1.41	4482 1.39	4611 1.38	4743 1.38	
520	4036 2.01	4209 1.55	4373 1.48	4510 1.45	4645 1.43	4778 1.41	4913 1.41	
540	4177 2.06	4357 1.59	4528 1.52	4668 1.48	4808 1.46	4945 1.45	5084 1.45	
560	4318 2.10	4505 2.03	4682 1.55	4827 1.52	4971 1.50	5112 1.48	5255 1.48	
580	4459 2.15	4652 2.07	4836 1.59	4986 1.56	5134 1.53	5279 1.52	5425 1.51	
600	4600 2.19	4799 2.12	4990 2.03	5144 1.59	5297 1.57	5446 1.55	5595 1.55	
620	4741 2.24	4946 2.16	5144 2.07	5302 2.03	5460 2.00	5612 1.58	5766 1.58	
640	4881 2.28	5093 2.20	5298 2.11	5460 2.07	5622 2.04	5779 2.02	5936 2.01	
660	5021 2.33	5240 2.25	5451 2.14	5618 2.10	5784 2.07	5945 2.05	6106 2.05	
680	5161 2.37	5386 2.29	5605 2.18	5776 2.14	5946 2.11	6112 2.09	6275 2.08	
700	5301 2.42	5532 2.34	5758 2.22	5934 2.18	6108 2.14	6278 2.12	6445 2.12	
AIR CONDITIONING OFF ΔFUEL = - 2.5 %			ENGINE ANTI ICE ON ΔFUEL = + 5 %		TOTAL ANTI ICE ON ΔFUEL = + 9 %			

GROUND DISTANCE/AIR DISTANCE CONVERSION

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+150	+100	+ 50	0	−50	−100	−150
40	27	30	35	40	48	59	76
60	41	46	52	60	71	88	115
80	54	61	69	80	95	117	153
100	68	76	86	100	119	146	191
120	81	91	104	120	143	176	229
140	95	106	121	140	166	205	267
160	108	121	138	160	190	234	305
180	122	137	155	180	214	264	344
200	135	152	173	200	238	293	382
220	149	167	190	220	261	322	420
240	163	182	207	240	285	352	458
260	176	197	224	260	309	381	496
280	190	213	242	280	333	410	534
300	203	228	259	300	357	439	573
320	217	243	276	320	380	469	611
340	230	258	293	340	404	498	649
360	244	273	311	360	428	527	687
380	257	288	328	380	452	557	725
400	271	304	345	400	475	586	763
420	285	319	362	420	499	615	802
440	298	334	380	440	523	645	840
460	312	349	397	460	547	674	878
480	325	364	414	480	571	703	916
500	339	380	432	500	594	732	954
520	352	395	449	520	618	762	992
540	366	410	466	540	642	791	1031
560	379	425	483	560	666	820	1069
580	393	440	501	580	689	850	1107
600	406	455	518	600	713	879	1145

GENERAL

This Chapter applies to dispatch with landing gear down. However, the limitations and inflight performance also apply in case of an inflight landing gear retraction failure. Revenue flight is permitted, with the landing gear down and the gear doors closed, in the conditions stated below.

LIMITATIONS

- Do not fly into expected icing conditions.
- Ditching with the landing gear down has not been demonstrated.
- R – Disregard FM fuel predictions. Other predictions should also be disregarded (altitude, R speed and time), except time predictions at waypoints when in cruise.
- R – Do not use managed speed (except in approach) and CLB and DES autopilot modes.
- ALTITUDE ALERT is not available.

PROCEDURES

PREFLIGHT

VMO/MMO with the landing gear down is 235 knots/M.60. In the avionics compartment, on 188 VU, the VMO-MM0 switch must be set to the «L/G DOWN» position.

INTENTIONALLY LEFT BLANK

ABN AND EMER PROCEDURES

FLIGHT CONTROLS

Failure cases, which would normally lead to ALTN law, will degrade F/CTL laws down to DIRECT law, if the landing gear is extended.

FAILURE OF BOTH ENGINES

- R When both engines are failed, to ease the handling of all the different ECAM procedures
R resulting from this all engine flame out situation, it is recommended to use the ENG DUAL
R FAILURE QRH paper procedure, and if time permits, to clear the ECAM.
R Follow all the steps of the QRH paper procedure, except those that are modified by the
R procedure below :
- If the APU is not available :
 - Attempt an APU start
 - If APU start is unsuccessful, a windmilling relight can be performed, as long as the speed is above 300 knots (corresponding N2 above 12%).

In this case, increase the aircraft speed and disregard the VMO warning.
 - If the APU is available : Perform an assisted relight, when below FL 200.
 - Flight controls are in direct law. Use manual pitch trim, as necessary (not indicated on PFD, if APU GEN not available).
 - In approach, set CONF 1 at or above 200 knots.
Do not select flaps/slats below 200 knots.

PERFORMANCE

Consider the increase in drag to determine the takeoff weight and fuel consumption.
CONF 1 + F is the recommended takeoff configuration.

Note : Takeoff with tail wind is not recommended.

Penalties on takeoff performance affect second segment gradient condition, final takeoff condition and en-route conditions. The takeoff weight to be retained is the most limiting of these three conditions.

SECOND SEGMENT GRADIENT CONDITION

The RTOW charts or the quick reference tables give the basic information for normal takeoff. To simplify, a constant weight reduction is applied whatever the limitation. This weight reduction covers the most critical case presented for flying over an obstacle.

Takeoff configuration	1 + F	2	3
Weight reduction	20 %	16 %	13 %

METHOD

Use the RTOW chart or the quick-reference tables to define the maximum takeoff weight for the conditions on the airport (temperature, pressure, wind, runway...), then apply the above weight reduction.

FINAL TAKEOFF CONDITION

The final takeoff speed is VLS.

ABN AND EMER PROCEDURES

FLIGHT CONTROLS

Failure cases, which would normally lead to ALTN law, will degrade F/CTL laws down to DIRECT law, if the landing gear is extended.

FAILURE OF BOTH ENGINES

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Takeoff configuration	1 + F	2	3
Weight reduction	20 %	17 %	16 %

METHOD

Use the RTOW chart or the quick-reference tables to define the maximum takeoff weight for the conditions on the airport (temperature, pressure, wind, runway...), then apply the above weight reduction.

FINAL TAKEOFF CONDITION

The final takeoff speed is VLS.

ABN AND EMER PROCEDURES

FLIGHT CONTROLS

Failure cases, which would normally lead to ALTN law, will degrade F/CTL laws down to DIRECT law, if the landing gear is extended.

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R Follow all the steps of the QRH paper procedure, except those that are modified by the
R procedure below :
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 - If APU start is unsuccessful, a windmilling relight can be performed, as long as the speed is above 300 knots (corresponding N2 above 12%).
In this case, increase the aircraft speed and disregard the VMO warning.
 - If the APU is available : Perform an assisted relight, when below FL 200.
 - Flight controls are in direct law. Use manual pitch trim, as necessary (not indicated on PFD, if APU GEN not available).
 - In approach, set CONF 1 at or above 200 knots.
Do not select flaps/slats below 200 knots.

PERFORMANCE

Consider the increase in drag to determine the takeoff weight and fuel consumption.
 CONF 1 + F is the recommended takeoff configuration.

Note : Takeoff with tail wind is not recommended.

Penalties on takeoff performance affect second segment gradient condition, final takeoff condition and en-route conditions. The takeoff weight to be retained is the most limiting of these three conditions.

SECOND SEGMENT GRADIENT CONDITION

The RTOW charts or the quick reference tables give the basic information for normal takeoff. To simplify, a constant weight reduction is applied whatever the limitation. This weight reduction covers the most critical case presented for flying over an obstacle.

Takeoff configuration	1 + F	2	3
Weight reduction	22 %	19 %	19 %

METHOD

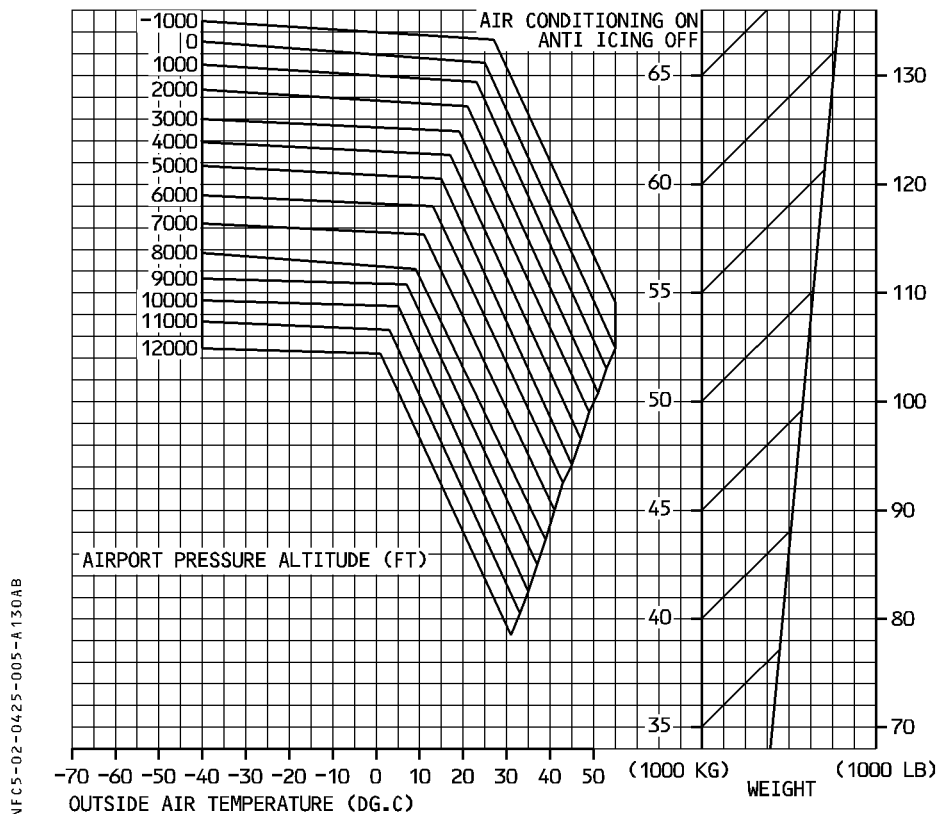
Use the RTOW chart or the quick-reference tables to define the maximum takeoff weight for the conditions on the airport (temperature, pressure, wind, runway...), then apply the above weight reduction.

FINAL TAKEOFF CONDITION

The final takeoff speed is VLS.

Use the graph below to determine the maximum takeoff weight associated with the final takeoff condition.

R



A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS		2.04.25	P 6
	FLIGHT WITH GEAR DOWN		SEQ 135	REV 27

EN ROUTE CONDITION

Retain the lowest weight according to the most limiting condition (second segment or final takeoff). Use the en route net flight path on page 11 to check that in case of engine failure the aircraft can clear the terrain on the route by 1000 feet (climbing) or 2000 feet (descending). If necessary, reduce the takeoff weight. Read the speeds corresponding to this weight in the RTOW chart or in the quick reference tables.

GO AROUND PERFORMANCE

See 3.05.35 for go-around requirements.
Further decrease the basic limiting weight by 14 %.

FLIGHT PLANNING

CLIMB

Climb at 230 kt/M.50 with both engines at maximum climb thrust. The table on page 7 gives the time, distance and fuel consumption according to takeoff weight.

CRUISE/DESCENT

The recommended cruise/descent speed is 230 kt/M.50.
The ceiling on one engine may be a limiting factor, and the choice of the route should reflect this concern.

ENGINE FAILURE

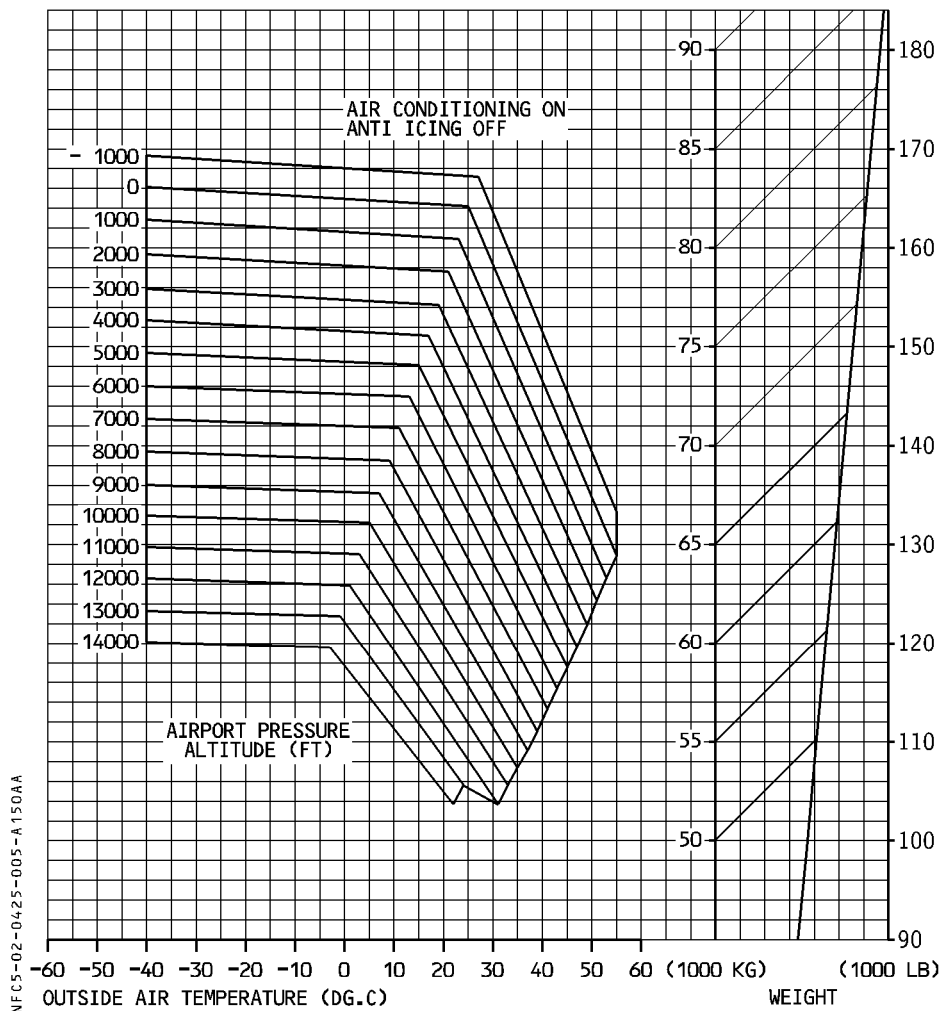
In case of engine failure, the airplane will drift down to the ceiling shown on page 12.
The thrust for drift down will be Maximum Continuous.
The drift down speed is equal to green dot speed.

HOLDING

Page 10 gives the holding parameters with slats out, this configuration being the least penalizing for holding.

Use the graph below to determine the maximum takeoff weight associated with the final takeoff condition.

R



A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS		2.04.25	P 6
	FLIGHT WITH GEAR DOWN		SEQ 126	REV 27

EN ROUTE CONDITION

Retain the lowest weight according to the most limiting condition (second segment or final takeoff). Use the en route net flight path on page 11 to check that in case of engine failure the aircraft can clear the terrain on the route by 1000 feet (climbing) or 2000 feet (descending). If necessary, reduce the takeoff weight. Read the speeds corresponding to this weight in the RTOW chart or in the quick reference tables.

GO AROUND PERFORMANCE

See 3.05.35 for go-around requirements.
Further decrease the basic limiting weight by 12 %.

FLIGHT PLANNING

CLIMB

Climb at 230 kt/M.50 with both engines at maximum climb thrust. The table on page 7 gives the time, distance and fuel consumption according to takeoff weight.

CRUISE/DESCENT

The recommended cruise/descent speed is 230 kt/M.50.
The ceiling on one engine may be a limiting factor, and the choice of the route should reflect this concern.

ENGINE FAILURE

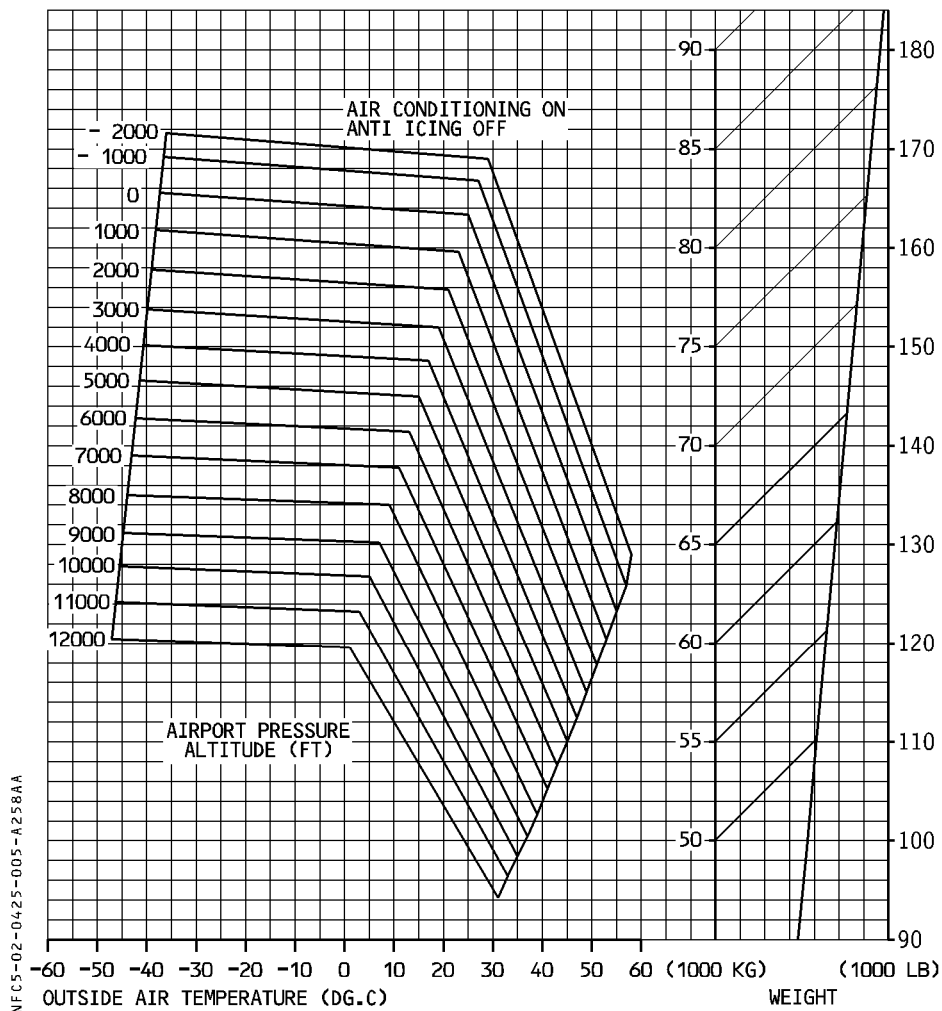
In case of engine failure, the airplane will drift down to the ceiling shown on page 12.
The thrust for drift down will be Maximum Continuous.
The drift down speed is equal to green dot speed.

HOLDING

Page 10 gives the holding parameters with slats out, this configuration being the least penalizing for holding.

Use the graph below to determine the maximum takeoff weight associated with the final takeoff condition.

R



A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS		2.04.25	P 6
	FLIGHT WITH GEAR DOWN		SEQ 126	REV 27

EN ROUTE CONDITION

Retain the lowest weight according to the most limiting condition (second segment or final takeoff). Use the en route net flight path on page 11 to check that in case of engine failure the aircraft can clear the terrain on the route by 1000 feet (climbing) or 2000 feet (descending). If necessary, reduce the takeoff weight. Read the speeds corresponding to this weight in the RTOW chart or in the quick reference tables.

GO AROUND PERFORMANCE

See 3.05.35 for go-around requirements.
Further decrease the basic limiting weight by 12 %.

FLIGHT PLANNING

CLIMB

Climb at 230 kt/M.50 with both engines at maximum climb thrust. The table on page 7 gives the time, distance and fuel consumption according to takeoff weight.

CRUISE/DESCENT

The recommended cruise/descent speed is 230 kt/M.50.
The ceiling on one engine may be a limiting factor, and the choice of the route should reflect this concern.

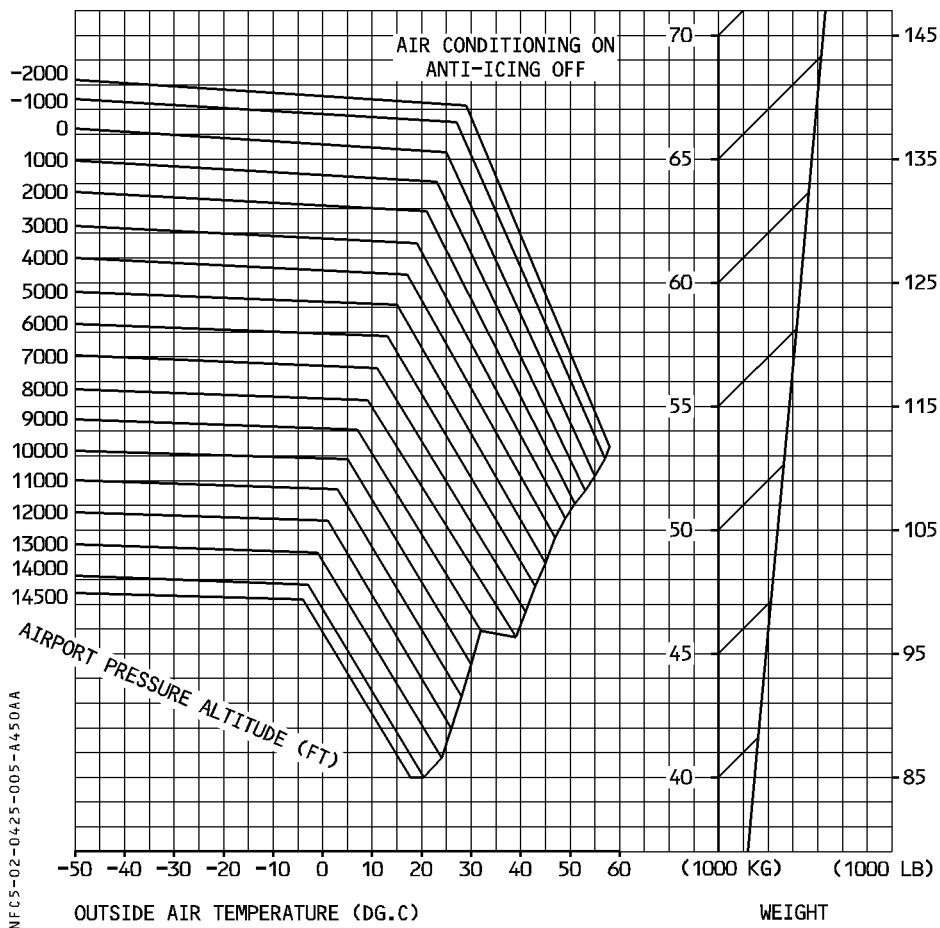
ENGINE FAILURE

In case of engine failure, the airplane will drift down to the ceiling shown on page 12.
The thrust for drift down will be Maximum Continuous.
The drift down speed is equal to green dot speed.

HOLDING

Page 10 gives the holding parameters with slats out, this configuration being the least penalizing for holding.

Use the graph below to determine the maximum takeoff weight associated with the final takeoff condition. This graph is established for 25 % CG location.
 In case of forward CG the weight must be decreased by 400 kg (900 lb).



A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS		2.04.25	P 6
	FLIGHT WITH GEAR DOWN		SEQ 215	REV 34

EN ROUTE CONDITION

Retain the lowest weight according to the most limiting condition (second segment or final takeoff). Use the en route net flight path on page 11 to check that in case of engine failure the aircraft can clear the terrain on the route by 1000 feet (climbing) or 2000 feet (descending). If necessary, reduce the takeoff weight. Read the speeds corresponding to this weight in the RTOW chart or in the quick reference tables.

GO AROUND PERFORMANCE

See 3.05.35 for go-around requirements.
Further decrease the basic limiting weight by 15 %.

FLIGHT PLANNING

CLIMB

Climb at 230 kt/M.50 with both engines at maximum climb thrust. The table on page 7 gives the time, distance and fuel consumption according to takeoff weight.

CRUISE/DESCENT

The recommended cruise/descent speed is 230 kt/M.50.
The ceiling on one engine may be a limiting factor, and the choice of the route should reflect this concern.

ENGINE FAILURE

In case of engine failure, the airplane will drift down to the ceiling shown on page 12.
The thrust for drift down will be Maximum Continuous.
The drift down speed is equal to green dot speed.

HOLDING

Page 10 gives the holding parameters with slats out, this configuration being the least penalizing for holding.

R

CLIMB - 230 KT/M.50 - ALL ENGINES - L/G DOWN										
MAX. CLIMB THRUST LIMITS				ISA		FROM BRAKE RELEASE				
NORMAL AIR CONDITIONING				CG=25.0%		TIME (MIN)		FUEL (KG)		
ANTI-ICING OFF						DISTANCE (NM)		TAS (KT)		
	WEIGHT AT BRAKE RELEASE (1000KG)									
FL	58	62	66	70	74	78	82	86	90	
290	24 2081	29 2458								
	111 281	135 283								
270	20 1847	23 2124	28 2489							
	93 278	109 280	131 282							
250	17 1660	20 1882	23 2158	27 2522						
	80 275	92 276	107 278	127 280						
240	16 1575	19 1777	21 2024	25 2340	30 2785					
	74 273	85 274	98 276	115 278	140 280					
220	14 1410	16 1579	18 1779	21 2025	24 2353					
	64 268	72 270	82 271	95 273	112 275					
200	12 1243	14 1384	15 1544	17 1735	20 1978	23 2294				
	53 262	60 263	67 265	76 266	88 268	104 270				
180	10 1064	11 1175	12 1300	14 1444	16 1618	18 1831	20 2097			
	42 253	47 254	53 255	59 256	67 258	76 259	89 261			
160	8 911	9 1002	10 1102	11 1215	12 1349	14 1506	16 1692	18 1919	21 2186	
	34 244	38 245	42 246	46 247	52 248	58 250	66 251	76 253	88 255	
140	7 780	8 855	8 936	9 1027	10 1132	11 1254	13 1394	14 1558	16 1744	
	27 236	30 237	33 238	37 239	41 240	45 241	51 242	57 244	65 245	
120	6 664	6 725	7 791	8 864	8 948	9 1043	10 1151	11 1275	12 1412	
	22 227	24 228	26 229	29 230	32 231	35 232	39 233	44 235	49 236	
100	5 556	5 606	6 660	6 718	7 784	7 858	8 941	9 1035	10 1137	
	17 217	18 218	20 219	22 220	24 221	27 222	30 224	33 225	37 227	
50	2 317	3 343	3 371	3 400	3 433	4 468	4 507	4 548	5 593	
	7 182	8 183	9 184	10 185	10 187	11 188	12 190	14 192	15 194	
15	1 166	1 178	1 191	1 204	2 218	2 233	2 248	2 264	2 280	
	2 118	2 118	3 119	3 121	3 122	3 124	4 126	4 128	4 130	

11.1-08FOA321-211 CFM56-5B3/P SA21101000C5KG250 0 018590 0 0 2 1.0 500.0 300.00 1 02230.000 .500 .000 0 FCOM-NO-02-04-25-007-138

R

CRUISE - 230KT/M.50 - ALL ENGINES - L/G DOWN											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF						ISA CG=25.0%	N1 (%) KG/H/ENG NM/1000KG	MACH IAS (KT) TAS (KT)			
WEIGHT (1000KG)	FL100		FL180		FL200		FL220	FL240		FL270	
50	76.7	.417	84.2	.485	85.4	.500	85.2	.500	85.2	.500	
	1916	230	1933	230	1911	228	1784	219	1670	210	1523 197
	69.4	266	77.7	300	80.3	307	85.4	305	90.5	302	98.0 298
54	77.2	.417	84.6	.485	85.8	.500	85.7	.500	85.7	.500	86.2 .500
	1944	230	1964	230	1945	228	1822	219	1712	210	1588 197
	68.4	266	76.5	300	79.0	307	83.6	305	88.3	302	94.0 298
58	77.8	.417	85.1	.485	86.2	.500	86.2	.500	86.4	.500	87.3 .500
	1975	230	1999	230	1982	228	1863	219	1761	210	1665 197
	67.3	266	75.1	300	77.5	307	81.8	305	85.8	302	89.6 298
62	78.4	.417	85.5	.485	86.7	.500	86.8	.500	87.2	.500	88.4 .500
	2009	230	2037	230	2024	228	1910	219	1829	210	1754 197
	66.2	266	73.7	300	75.9	307	79.7	305	82.6	302	85.1 298
66	78.9	.417	86.0	.485	87.2	.500	87.6	.500	88.2	.500	89.6 .500
	2046	230	2081	230	2069	228	1973	219	1907	210	1842 197
	65.0	266	72.2	300	74.2	307	77.2	305	79.2	302	81.0 298
70	79.5	.417	86.5	.485	87.9	.500	88.4	.500	89.2	.500	
	2090	230	2130	230	2123	228	2048	219	1996	210	
	63.6	266	70.5	300	72.3	307	74.4	305	75.7	302	
74	80.2	.417	87.2	.485	88.6	.500	89.3	.500	90.2	.500	
	2142	230	2188	230	2195	228	2132	219	2086	210	
	62.1	266	68.7	300	70.0	307	71.5	305	72.5	302	
78	81.0	.417	87.8	.485	89.4	.500	90.2	.500			
	2197	230	2250	230	2275	228	2223	219			
	60.5	266	66.8	300	67.5	307	68.5	305			
82	81.8	.417	88.6	.485							
	2255	230	2321	230							
	59.0	266	64.7	300							

R

CLIMB 230KT/M.50 - ALL ENGINES - L/G DOWN										
MAX. CLIMG THRUST LIMITS				ISA		FROM BRAKE RELEASE				
NORMAL AIR CONDITIONING				CG=25.0%		TIME (MIN)		FUEL (KG)		
ANTI-ICING OFF						DISTANCE (NM)		TAS (KT)		
	WEIGHT AT BRAKE RELEASE (1000KG)									
FL	50	52	54	56	58	60	62	64	66	
290	21 1651	23 1778	25 1921	27 2085	30 2277	33 2507				
	98 279	106 280	116 281	127 282	140 283	156 284				
270	18 1500	20 1607	21 1725	23 1858	25 2009	27 2183	30 2389			
	85 277	92 278	99 279	108 279	117 280	129 281	143 282			
250	16 1356	17 1447	19 1546	20 1655	21 1778	23 1915	25 2073	28 2257	31 2475	
	74 274	79 275	85 275	92 276	99 277	107 278	117 279	129 280	143 282	
240	15 1285	16 1369	17 1459	18 1559	20 1669	21 1792	23 1932	25 2091	27 2277	
	68 272	73 273	78 273	84 274	91 275	98 276	106 277	116 278	128 279	
220	13 1143	14 1214	15 1289	16 1371	17 1461	18 1559	19 1668	21 1790	22 1928	
	58 267	62 268	66 268	70 269	75 270	81 271	87 272	94 273	102 274	
200	11 999	12 1057	12 1119	13 1185	14 1256	15 1333	16 1417	17 1509	18 1610	
	48 260	51 260	54 261	57 262	61 263	65 263	69 264	74 265	80 266	
180	9 845	9 892	10 940	11 992	11 1047	12 1105	12 1167	13 1233	14 1304	
	37 250	40 250	42 251	44 251	47 252	50 253	53 253	56 254	59 255	
160	7 718	8 756	8 795	9 837	9 880	10 926	10 975	11 1026	11 1080	
	29 240	31 240	33 241	35 241	37 242	38 242	41 243	43 244	45 244	
140	6 611	6 642	7 675	7 709	7 744	8 781	8 820	9 861	9 904	
	23 230	25 231	26 231	27 232	29 232	30 233	32 233	34 234	35 234	
120	5 517	5 543	6 570	6 598	6 627	6 657	7 689	7 722	7 756	
	19 220	20 221	21 221	22 222	23 222	24 223	25 223	26 224	28 224	
100	4 432	4 454	5 475	5 498	5 522	5 546	5 572	6 598	6 626	
	14 209	15 210	16 211	17 211	18 212	18 212	19 213	20 213	21 214	
50	2 243	2 254	2 266	3 278	3 290	3 303	3 317	3 330	3 344	
	6 171	7 172	7 173	7 173	8 174	8 175	9 175	9 176	9 177	
15	1 123	1 128	1 133	1 139	1 145	1 151	1 157	2 163	2 170	
	2 108	2 109	2 110	2 110	3 111	3 112	3 113	3 113	3 114	

11.0-08FOA320-214 CFM56-5B4/P SA21101000C5KG250 0 018590 0 0 2 1.0 500.0 300.00 1 02230.000 .500.000 0 FCOM-N0-02-04-25-007-140

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CRUISE - 230KT/M.50 - ALL ENGINES - L/G DOWN											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF						ISA CG=25.0%	N1 (%) KG/H/ENG NM/1000KG	MACH IAS (KT) TAS (KT)			
WEIGHT (1000KG)	FL100		FL200		FL220		FL240		FL270		FL290
48	73.9	.417	83.4	.500	83.2	.500	83.2	.500	83.3	.500	83.5 .500
	1768	230	1810	228	1687	219	1577	210	1435	197	1359 188
	75.2	266	84.8	307	90.3	305	95.8	302	104.0	298	108.9 296
50	74.2	.417	83.6	.500	83.5	.500	83.5	.500	83.6	.500	84.0 .500
	1781	230	1825	228	1704	219	1596	210	1459	197	1387 188
	74.6	266	84.1	307	89.4	305	94.7	302	102.3	298	106.7 296
52	74.4	.417	83.8	.500	83.7	.500	83.8	.500	84.0	.500	84.5 .500
	1795	230	1841	228	1722	219	1616	210	1485	197	1417 188
	74.1	266	83.4	307	88.5	305	93.5	302	100.5	298	104.4 296
54	74.6	.417	84.0	.500	84.0	.500	84.1	.500	84.5	.500	85.1 .500
	1810	230	1857	228	1741	219	1638	210	1513	197	1454 188
	73.4	266	82.7	307	87.5	305	92.3	302	98.6	298	101.7 296
56	74.9	.417	84.3	.500	84.3	.500	84.4	.500	84.9	.500	85.7 .500
	1826	230	1875	228	1761	219	1662	210	1543	197	1497 188
	72.8	266	81.9	307	86.5	305	90.9	302	96.7	298	98.9 296
58	75.1	.417	84.5	.500	84.6	.500	84.8	.500	85.4	.500	86.3 .500
	1843	230	1894	228	1782	219	1687	210	1574	197	1541 188
	72.1	266	81.1	307	85.5	305	89.6	302	94.8	298	96.0 296
60	75.4	.417	84.8	.500	84.9	.500	85.1	.500	86.0	.500	
	1861	230	1914	228	1805	219	1714	210	1616	197	
	71.5	266	80.2	307	84.4	305	88.2	302	92.3	298	
62	75.7	.417	85.1	.500	85.2	.500	85.5	.500	86.6	.500	
	1879	230	1935	228	1829	219	1742	210	1660	197	
	70.8	266	79.4	307	83.3	305	86.8	302	89.9	298	
64	76.0	.417	85.3	.500	85.5	.500	85.9	.500			
	1898	230	1957	228	1856	219	1772	210			
	70.0	266	78.5	307	82.1	305	85.3	302			
66	76.3	.417	85.6	.500	85.9	.500	86.3	.500			
	1918	230	1981	228	1883	219	1804	210			
	69.3	266	77.5	307	80.9	305	83.7	302			
68	76.6	.417	85.9	.500	86.2	.500					
	1939	230	2005	228	1912	219					
	68.6	266	76.6	307	79.7	305					

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CLIMB - 230KT/M.50 - ALL ENGINES - L/G DOWN										
MAX. CLIMB THRUST LIMITS				ISA		FROM BRAKE RELEASE				
NORMAL AIR CONDITIONING				CG=25.0%		TIME (MIN)		FUEL (KG)		
ANTI-ICING OFF						DISTANCE (NM)		TAS (KT)		
FL	WEIGHT AT BRAKE RELEASE (1000KG)									
	44	48	52	56	60	64	68	72	76	
290	17 1336	19 1528	22 1761	27 2054	32 2450					
	78 277	90 279	105 280	125 282	152 284					
270	15 1228	17 1396	20 1594	23 1835	27 2144	33 2570				
	69 275	79 276	91 278	106 279	126 281	154 283				
250	13 1121	15 1268	17 1437	20 1638	23 1886	27 2211				
	60 271	69 273	78 274	90 276	106 278	126 280				
240	12 1067	14 1204	16 1361	18 1544	21 1767	25 2052	30 2441			
	56 269	64 271	73 272	83 274	96 276	114 278	138 280			
220	11 958	12 1075	14 1209	16 1361	18 1540	20 1762	24 2048			
	48 265	54 266	61 267	70 269	80 270	92 272	109 275			
200	9 844	10 944	12 1055	13 1179	15 1322	17 1491	19 1699			
	40 258	45 259	50 260	57 262	64 263	73 265	84 267			
180	8 720	9 802	9 891	11 989	12 1098	13 1224	15 1370	17 1545	19 1755	
	32 248	35 249	39 250	44 251	49 252	55 254	62 255	71 257	82 259	
160	6 615	7 683	8 756	9 835	9 922	11 1020	12 1131	13 1258	14 1405	
	25 238	28 239	31 240	35 241	38 242	43 243	48 245	53 246	60 248	
140	5 526	6 582	6 642	7 708	8 779	9 857	9 944	10 1043	11 1153	
	20 228	22 229	25 231	27 232	30 233	33 234	37 235	41 236	46 238	
120	4 447	5 493	5 543	6 597	6 655	7 719	8 789	8 867	9 952	
	16 218	18 219	20 221	22 222	24 223	26 224	29 225	32 227	35 228	
100	4 374	4 413	4 454	5 498	5 545	6 596	6 652	7 714	7 780	
	12 207	14 208	15 210	17 211	18 212	20 213	22 215	24 216	27 218	
50	2 212	2 233	2 255	3 278	3 303	3 330	3 358	4 389	4 421	
	6 168	6 170	7 172	7 173	8 175	9 176	10 178	11 180	12 182	
15	1 108	1 118	1 128	1 139	1 151	2 163	2 176	2 189	2 203	
	2 105	2 107	2 109	2 110	3 112	3 113	3 115	3 118	4 120	

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CRUISE - 230KT/M.50 - ALL ENGINES - L/G DOWN											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF						ISA CG=25.0%	N1 (%) KG/H/ENG NM/1000KG		MACH IAS (KT) TAS (KT)		
WEIGHT (1000KG)	FL100		FL200		FL220		FL240		FL270		FL290
44	73.6	.417	83.0	.500	82.7	.500	82.5	.500	82.5	.500	82.5 .500
	1747	230	1780	228	1652	219	1537	210	1386	197	1302 188
	76.1	266	86.3	307	92.2	305	98.3	302	107.7	298	113.7 296
48	74.0	.417	83.3	.500	83.1	.500	83.1	.500	83.1	.500	83.4 .500
	1769	230	1805	228	1681	219	1570	210	1428	197	1352 188
	75.2	266	85.1	307	90.6	305	96.3	302	104.5	298	109.4 296
52	74.4	.417	83.7	.500	83.6	.500	83.7	.500	83.9	.500	84.3 .500
	1795	230	1834	228	1714	219	1608	210	1478	197	1408 188
	74.1	266	83.7	307	88.9	305	94.0	302	101.0	298	105.1 296
56	74.8	.417	84.2	.500	84.2	.500	84.3	.500	84.8	.500	85.5 .500
	1823	230	1867	228	1752	219	1652	210	1533	197	1481 188
	72.9	266	82.3	307	87.0	305	91.4	302	97.3	298	99.9 296
60	75.3	.417	84.7	.500	84.8	.500	85.0	.500	85.8	.500	86.8 .500
	1855	230	1904	228	1795	219	1705	210	1599	197	1570 188
	71.7	266	80.7	307	84.9	305	88.6	302	93.3	298	94.2 296
64	75.9	.417	85.2	.500	85.4	.500	85.8	.500			
	1892	230	1946	228	1846	219	1761	210			
	70.3	266	78.9	307	82.6	305	85.8	302			
68	76.5	.417	85.8	.500	86.1	.500	86.6	.500			
	1933	230	1994	228	1901	219	1825	210			
	68.8	266	77.0	307	80.1	305	82.8	302			
72	77.3	.417									
	1978	230									
	67.2	266									
76	78.0	.417									
	2025	230									
	65.7	266									

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DESCENT - M.50/230KT - ALL ENGINES - L/G DOWN									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=25.0%		MAXIMUM CABIN RATE OF DESCENT 350FT/MIN				
WEIGHT (1000KG)	60				80				IAS (KT)
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	
290	8.1	70	37	IDLE	9.4	81	43	IDLE	188
270	7.5	66	34	IDLE	8.7	77	40	IDLE	197
250	6.9	62	32	IDLE	8.1	73	37	IDLE	205
240	6.7	60	30	IDLE	7.8	70	36	IDLE	210
220	6.1	56	28	IDLE	7.2	66	33	IDLE	219
200	5.6	52	25	IDLE	6.6	62	30	IDLE	228
180	5.1	48	22	IDLE	6.0	57	26	IDLE	230
160	4.5	43	20	IDLE	5.3	51	23	IDLE	230
140	3.9	37	17	IDLE	4.6	43	20	IDLE	230
120	3.3	30	14	IDLE	3.9	36	16	IDLE	230
100	2.7	24	11	IDLE	3.2	28	13	IDLE	230
50	1.1	10	5	IDLE	1.3	12	5	IDLE	230
15	.0	0	0	IDLE	.0	0	0	IDLE	230

11.1-08FOA321-211 CFM56-5B3/P SA23101000C5KG250 0 018590 0 0-1-350.0 15.0 .00 0 02 .500230.000 .000 0 FCOM-N0-02-04-25-009-165

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RACE TRACK HOLDING PATTERN - S SPEED - ALL ENGINES - L/G DOWN								
MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=25.0%		N1 (%) FF (KG/H/ENG)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
58	63.8	66.7	71.2	73.1	75.2	77.2	79.2	81.1
	1627	1614	1602	1599	1594	1591	1591	1594
62	65.7	68.8	73.3	75.3	77.4	79.4	81.2	83.0
	1738	1726	1717	1711	1708	1707	1711	1717
66	67.6	70.8	75.4	77.4	79.4	81.3	83.0	84.6
	1850	1839	1829	1826	1825	1828	1834	1843
70	69.5	72.6	77.4	79.4	81.2	83.0	84.6	86.3
	1964	1957	1944	1943	1945	1951	1960	1975
74	71.2	74.3	79.2	81.2	82.9	84.6	86.2	87.9
	2078	2071	2061	2062	2068	2076	2088	2120
78	72.9	76.0	80.9	82.7	84.5	86.0	87.7	89.5
	2196	2185	2180	2185	2193	2204	2228	2276
82	74.4	77.8	82.5	84.3	85.8	87.4	89.2	
	2311	2301	2303	2310	2321	2338	2379	
86	76.0	79.4	84.0	85.6	87.2	88.8		
	2427	2421	2429	2438	2452	2484		
90	77.6	81.0	85.4	86.9	88.5			
	2546	2543	2559	2571	2594			
94	79.1	82.4	86.6	88.2				
	2668	2668	2691	2706				

R

DESCENT - M.50/230KT - ALL ENGINES - L/G DOWN									
IDLE THRUST			ISA		MAXIMUM CABIN RATE OF DESCENT 350FT/MIN				
NORMAL AIR CONDITIONING			CG=25.0%						
ANTI-ICING OFF									
WEIGHT (1000KG)	45				55				IAS (KT)
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	
290	7.1	67	33	IDLE	8.2	77	38	IDLE	188
270	6.6	63	30	IDLE	7.6	74	35	IDLE	197
250	6.1	60	28	IDLE	7.1	70	32	IDLE	205
240	5.8	58	26	IDLE	6.8	68	31	IDLE	210
220	5.4	55	24	IDLE	6.3	64	28	IDLE	219
200	4.9	51	22	IDLE	5.8	60	26	IDLE	228
180	4.5	47	20	IDLE	5.2	55	23	IDLE	230
160	4.0	41	17	IDLE	4.6	48	20	IDLE	230
140	3.4	34	15	IDLE	4.0	40	17	IDLE	230
120	2.9	28	12	IDLE	3.4	32	14	IDLE	230
100	2.3	21	10	IDLE	2.7	25	11	IDLE	230
50	1.0	9	4	IDLE	1.2	10	5	IDLE	230
15	.0	0	0	IDLE	.0	0	0	IDLE	230

11.0-08FOA320-214 CFM56-5B4/P 23101000C5KG250 0 018590 0 0-1-350.0 15.0 .00 0 02 .500230.000 .000 0 FCOM-NO-02-04-25-009-170

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RACE TRACK HOLDING PATTERN - S SPEED - ALL ENGINES - L/G DOWN								
MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=25.0%		N1 (%) FF (KG/H/ENG)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
46	56.3 1248	59.1 1223	62.9 1206	64.7 1202	66.5 1198	68.3 1194	70.1 1192	71.9 1187
48	57.4 1297	60.3 1274	64.1 1260	66.0 1255	67.8 1251	69.5 1248	71.3 1243	73.2 1239
50	58.6 1347	61.3 1327	65.3 1313	67.2 1308	69.0 1304	70.7 1300	72.5 1296	74.4 1293
52	59.7 1398	62.3 1380	66.6 1366	68.3 1361	70.1 1357	71.8 1353	73.7 1348	75.5 1347
54	60.8 1449	63.3 1434	67.7 1419	69.5 1415	71.1 1410	72.9 1405	74.8 1402	76.7 1402
56	61.7 1501	64.3 1488	68.8 1472	70.5 1467	72.2 1463	74.0 1458	75.9 1457	77.8 1457
58	62.6 1554	65.4 1541	69.8 1525	71.5 1520	73.2 1516	75.1 1512	77.0 1512	78.9 1514
60	63.5 1607	66.4 1594	70.8 1578	72.4 1573	74.2 1569	76.1 1567	78.0 1568	79.8 1571
62	64.4 1659	67.4 1645	71.7 1631	73.4 1626	75.2 1622	77.1 1622	79.0 1624	80.8 1627
64	65.3 1713	68.4 1699	72.6 1684	74.4 1680	76.2 1677	78.1 1678	79.9 1681	81.7 1684
66	66.3 1766	69.3 1753	73.5 1738	75.3 1734	77.1 1733	79.1 1735	80.8 1738	82.6 1743
68	67.2 1819	70.2 1806	74.4 1792	76.2 1789	78.1 1789	80.0 1792	81.7 1796	83.4 1804
70	68.1 1872	71.1 1859	75.3 1847	77.1 1845	79.0 1846	80.8 1850	82.6 1854	84.2 1865
72	69.0 1926	71.9 1913	76.2 1901	78.0 1901	79.9 1904	81.6 1908	83.3 1914	85.0 1928
74	69.8 1981	72.7 1967	77.0 1957	78.9 1958	80.7 1962	82.4 1966	84.1 1975	85.7 1990
76	70.6 2033	73.4 2021	77.8 2013	79.7 2015	81.5 2019	83.2 2024	84.8 2036	
78	71.4 2085	74.2 2075	78.6 2069	80.5 2073	82.2 2077	83.9 2084	85.5 2099	

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DESCENT - M.50/230KT - ALL ENGINES - L/G DOWN									
IDLE THRUST NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG=25.0%		MAXIMUM CABIN RATE OF DESCENT 350FT/MIN				
WEIGHT (1000KG)	45				65				
FL	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	TIME (MIN)	FUEL (KG)	DIST. (NM)	N1	IAS (KT)
290	7.1	67	33	IDLE	9.2	86	42	IDLE	188
270	6.6	63	30	IDLE	8.5	82	39	IDLE	197
250	6.1	60	28	IDLE	7.9	78	36	IDLE	205
240	5.8	58	26	IDLE	7.6	76	35	IDLE	210
220	5.4	55	24	IDLE	7.0	72	32	IDLE	219
200	4.9	51	22	IDLE	6.5	67	29	IDLE	228
180	4.5	47	20	IDLE	5.9	61	26	IDLE	230
160	4.0	41	17	IDLE	5.2	54	23	IDLE	230
140	3.4	34	15	IDLE	4.5	45	19	IDLE	230
120	2.9	28	12	IDLE	3.8	36	16	IDLE	230
100	2.3	21	10	IDLE	3.1	28	13	IDLE	230
50	1.0	9	4	IDLE	1.3	12	5	IDLE	230
15	.0	0	0	IDLE	.0	0	0	IDLE	230

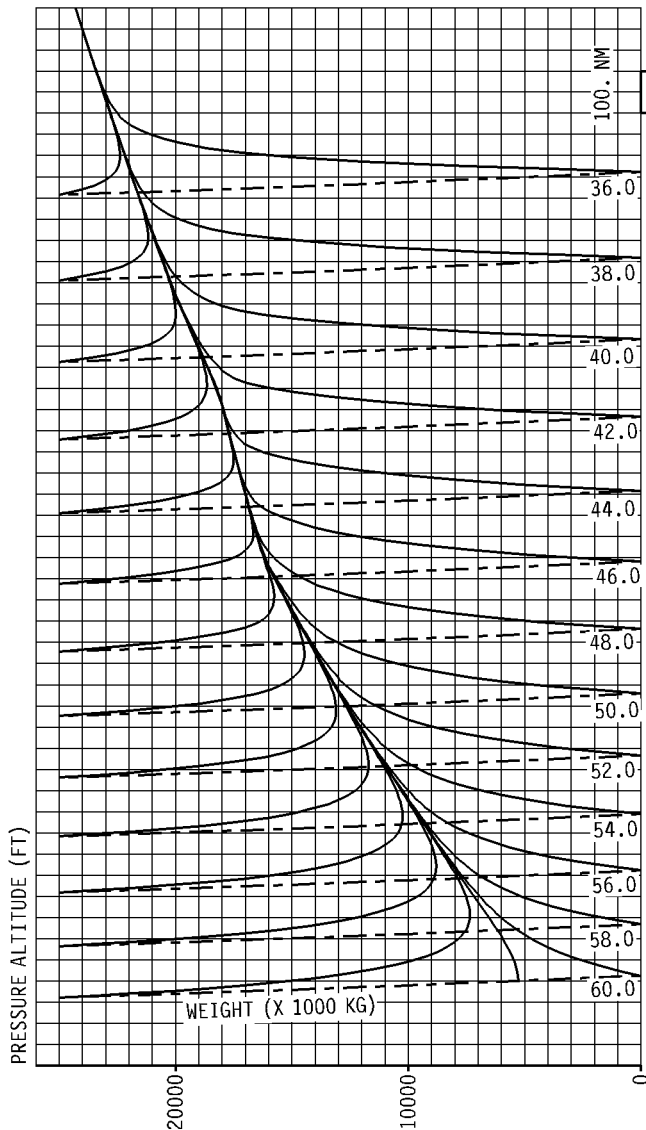
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RACE TRACK HOLDING PATTERN - S SPEED - ALL ENGINES - L/G DOWN								
MAX. CRUISE THRUST LIMITS CONFIGURATION 1 NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG=25.0%		N1 (%) FF (KG/H/ENG)	
WEIGHT (1000KG)	FL 15	FL 50	FL100	FL120	FL140	FL160	FL180	FL200
44	55.3	58.1	61.9	63.5	65.4	67.2	69.0	70.7
	1207	1181	1160	1157	1152	1148	1145	1141
46	56.5	59.3	63.1	64.9	66.7	68.5	70.2	72.0
	1257	1232	1215	1210	1205	1201	1197	1193
48	57.7	60.4	64.3	66.2	68.0	69.7	71.4	73.3
	1307	1283	1269	1262	1258	1254	1249	1245
50	58.9	61.4	65.5	67.4	69.1	70.8	72.6	74.5
	1357	1336	1321	1316	1311	1306	1302	1299
52	59.9	62.5	66.8	68.5	70.2	71.9	73.8	75.7
	1408	1390	1373	1368	1364	1359	1355	1353
54	61.0	63.5	67.9	69.6	71.3	73.0	74.9	76.9
	1459	1444	1427	1422	1417	1412	1409	1408
56	61.9	64.5	69.0	70.6	72.3	74.1	76.0	78.0
	1512	1498	1480	1474	1470	1465	1464	1465
58	62.8	65.6	70.0	71.6	73.3	75.2	77.1	79.0
	1565	1551	1533	1528	1523	1519	1519	1520
60	63.7	66.6	70.9	72.6	74.4	76.2	78.2	79.9
	1618	1603	1586	1581	1577	1575	1576	1577
62	64.6	67.6	71.8	73.5	75.4	77.2	79.2	80.9
	1671	1655	1639	1635	1631	1630	1631	1634
64	65.6	68.6	72.7	74.5	76.3	78.2	80.1	81.8
	1725	1709	1693	1689	1686	1686	1688	1691
66	66.5	69.5	73.6	75.4	77.3	79.2	80.9	82.7
	1777	1763	1747	1743	1742	1744	1745	1751
68	67.4	70.4	74.5	76.4	78.2	80.1	81.8	83.5
	1830	1815	1801	1798	1798	1800	1803	1811
70	68.3	71.3	75.4	77.3	79.1	80.9	82.6	84.3
	1884	1868	1856	1854	1856	1858	1862	1873
72	69.2	72.0	76.3	78.1	80.0	81.7	83.4	85.0
	1937	1922	1911	1911	1913	1916	1922	1935
74	70.0	72.8	77.2	79.0	80.8	82.5	84.2	85.8
	1990	1977	1967	1968	1970	1974	1983	1996
76	70.8	73.6	78.0	79.8	81.6	83.3	84.9	86.6
	2043	2031	2023	2026	2028	2033	2045	2063

EN ROUTE NET FLIGHT PATH - L/G DOWN - ONE ENGINE OUT		
MAX. CONTINUOUS THRUST HIGH AIR CONDITIONING ANTI ICE OFF	ISA CG = 23 %	MINIMUM ENGINE

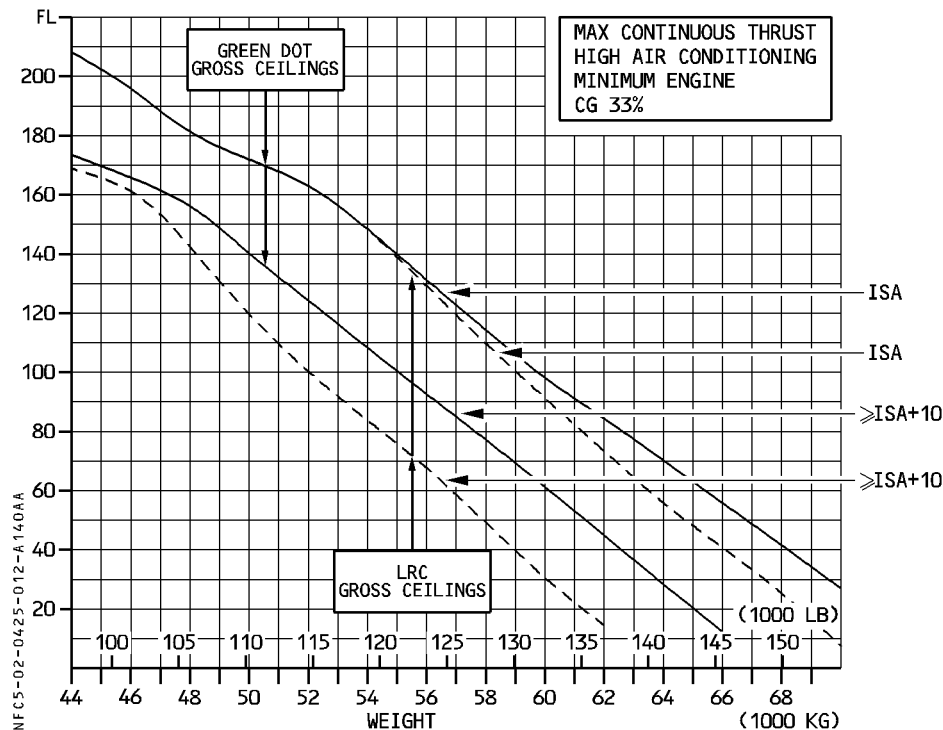
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NFC5-02-0425-011-A140AC



GROSS CEILINGS AT LONG RANGE AND GREEN DOT SPEEDS - ONE ENGINE OUT

R



BLEED CORRECTIONS

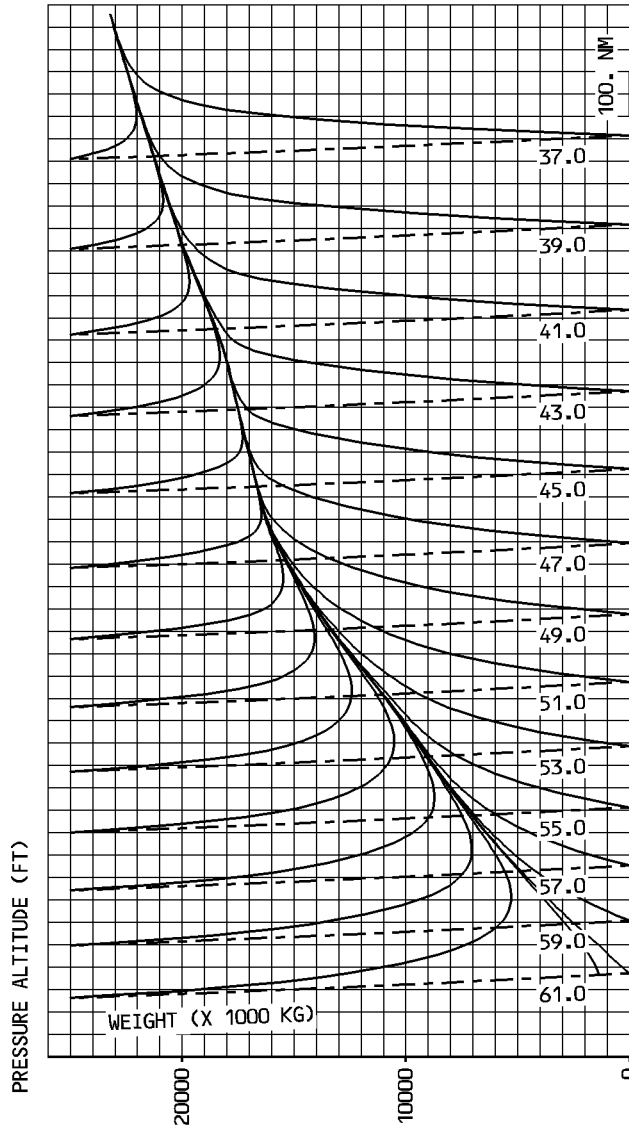
R

		ISA	≥ ISA + 10
LONG RANGE	ENGINE ANTI ICE ON	- 500 FT	- 2800 FT
	TOTAL ANTI ICE ON	- 1300 FT	- 4600 FT
GREEN DOT	ENGINE ANTI ICE ON	- 200 FT	- 1700 FT
	TOTAL ANTI ICE ON	- 1200 FT	- 3500 FT

EN ROUTE NET FLIGHT PATH - L/G DOWN - ONE ENGINE OUT

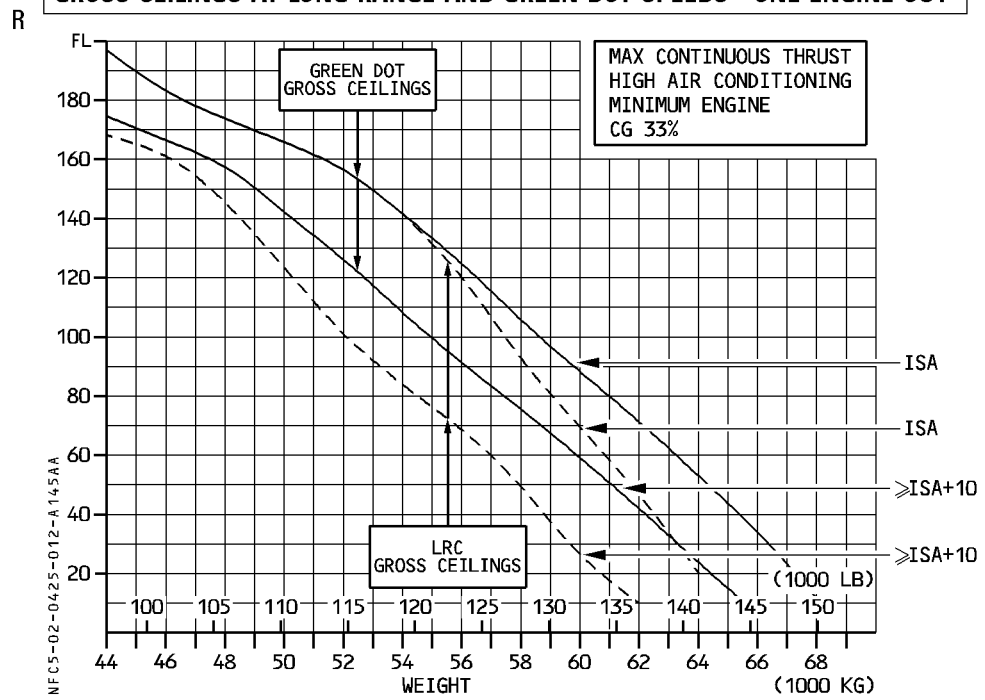
MAX. CONTINUOUS THRUST	ISA	MINIMUM ENGINE
HIGH AIR CONDITIONING		
ANTI ICE OFF	CG = 25 %	

R



NFC5-02-0425-011-A150AB

GROSS CEILINGS AT LONG RANGE AND GREEN DOT SPEEDS - ONE ENGINE OUT



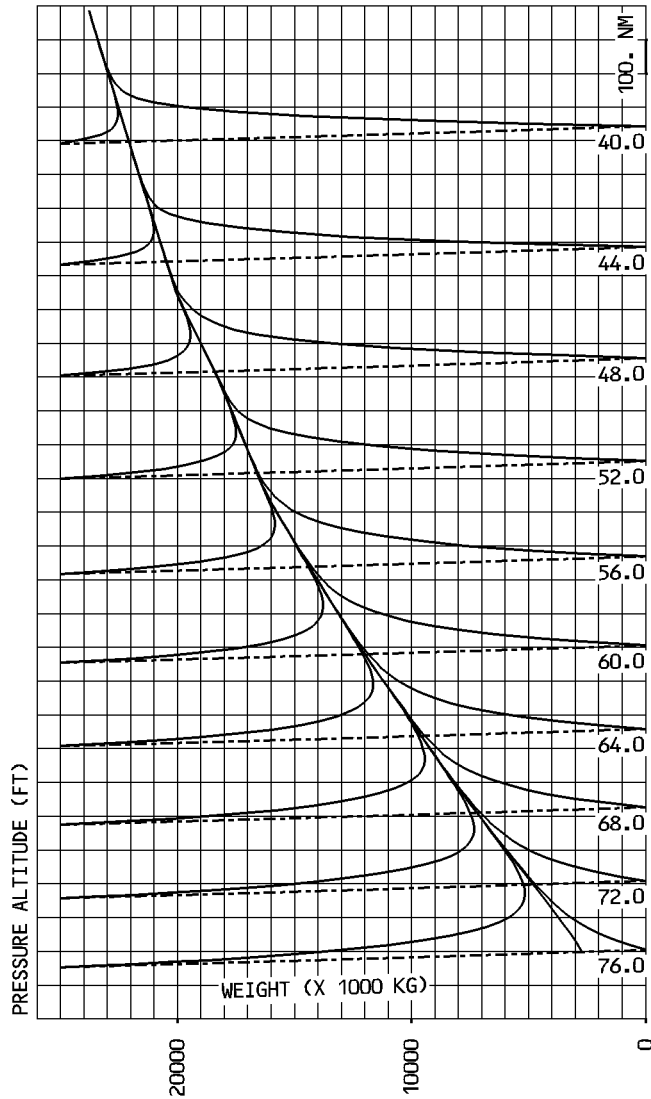
BLEED CORRECTIONS

R

		ISA	≥ ISA + 10
LONG RANGE	ENGINE ANTI ICE ON	- 1200 FT	- 3200 FT
	TOTAL ANTI ICE ON	- 2000 FT	- 6400 FT
GREEN DOT	ENGINE ANTI ICE ON	- 300 FT	- 2000 FT
	TOTAL ANTI ICE ON	- 800 FT	- 4300 FT

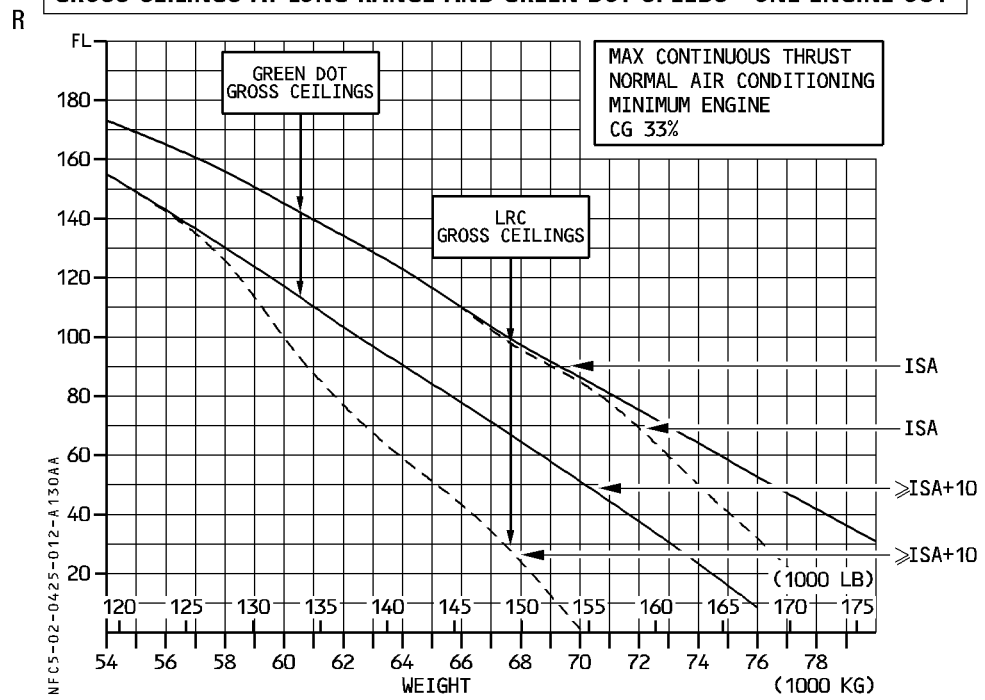
EN ROUTE NET FLIGHT PATH - L/G DOWN - ONE ENGINE OUT		
MAX. CONTINUOUS THRUST	ISA	MINIMUM ENGINE
HIGH AIR CONDITIONING	CG = 25 %	
ANTI ICE OFF		

R



NFCS-02-0425-011-A180AA

GROSS CEILINGS AT LONG RANGE AND GREEN DOT SPEEDS - ONE ENGINE OUT



BLEED CORRECTIONS

R

		ISA	≥ ISA + 10
LONG RANGE	ENGINE ANTI ICE ON	- 600 FT	- 4800 FT
	TOTAL ANTI ICE ON	- 1200 FT	- 8100 FT
GREEN DOT	ENGINE ANTI ICE ON	- 200 FT	- 2800 FT
	TOTAL ANTI ICE ON	- 600 FT	- 4500 FT

INTRODUCTION

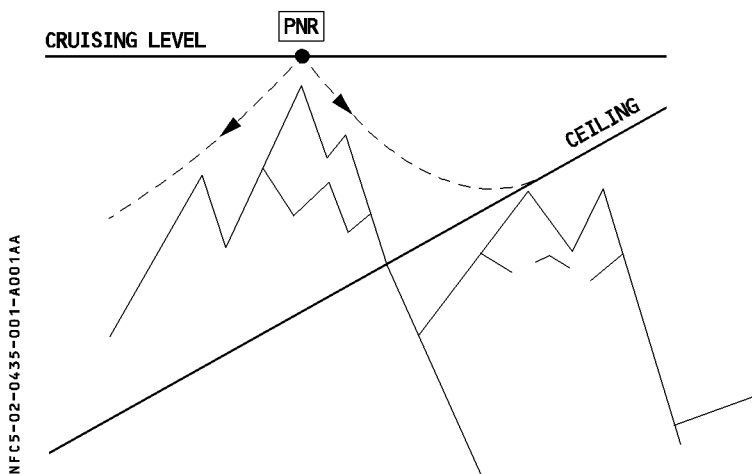
Two failures must be taken into consideration for en route obstacle clearance over mountainous area :

- Engine failure that forces a descent to a lower cruise level
- Depressurization which, due to the passenger oxygen system, requires a descent to 10000 feet before supplementary oxygen is exhausted.

ENGINE FAILURE

If the standard strategy does not allow the aircraft to clear obstacles, the pilot must use a drift down procedure. If an engine failure occurs at any point on the route, the net flight path must clear the obstacles on the drift-down part by 2000 feet and on the climb part by 1000 feet.

If the aircraft cannot clear the en route obstacles, a point of no return (PNR) must be determined.



If an engine failure occurs after the PNR, the aircraft must drift down on course. If the failure occurs before the PNR, the aircraft must turn back.

For en route net flight paths, refer to the Aircraft Flight Manual.

DEPRESSURIZATION

In case of depressurization, the passengers receive oxygen through individual modules. An emergency descent in accordance with a certain profile has to be performed (Refer to 2.04.20) FLIGHT WITHOUT CABIN PRESSURIZATION

CONCLUSION

- R A detailed study of each route over mountainous area must show that single-engine net
- R flight path and passenger oxygen system performance allow the aircraft to clear the obstacles by 1000 feet in climb and by 2000 feet in cruise or descent.
If the aircraft in these circumstances cannot clear the obstacles on the route, a PNR must be determined and diversion procedures must be established.

GENERAL

- R The system design and the reliability of the engine installation of this airplane comply with the criteria for Extended Twin Operations (ETOPS) flights set forth in AMC 20–6 (EASA) or AC 120-42 A (FAA) when the aircraft is configured, maintained and operated in accordance with the provisions of the appropriate Airbus Industrie document « Standard for Extended Range Operations » in the latest approved revision which is the Airbus CMP (Configuration, Maintenance and Procedure) document.

This statement of ability does not constitute an approval to conduct Extended-Range Operations.

The section 6 of the Flight Manual refers to the approved Standard for Extended-Range Operations and the applicable limitations, procedures and performance references.

The operator is responsible for showing that he is complying with the regulation of his nation and for obtaining operational approval from his national authorities. The operator may amend this chapter, as needed.

The airplane must be configured in accordance with the Airbus Industrie Standard for Extended-Range Operations. However, the authorities may under certain conditions allow the operator to conduct ETOPS flights with limited maximum diversion time (for example, 75 minute diversion time in a benign area of operation) without showing full compliance with these standards.

OPERATIONAL LIMITATIONS

DEFINITIONS

- R For the purpose of AC 120–42A and AMC 20–6, Extended-Range Operations are those intended to be conducted over a route that contains a point more than 60 minutes from an adequate airport at the selected one-engine-inoperative speed in still air and ISA (or prevailing delta ISA) conditions.

An adequate airport is an airport which satisfies the aircraft performance requirements applicable at the expected landing weight, and sufficiently equipped to be safely used. In particular, at the anticipated time of use, it should be available and equipped with the necessary services, including ATC, weather information and at least one let down aid for an instrument approach.

A suitable airport is a confirmed adequate airport which satisfies the dispatch weather minima requirements for ceiling and visibility within the required validity period. Airport conditions should also ensure that a safe landing with one engine and/or airframe system inoperative is possible.

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AREA OF OPERATION

The maximum distance from an adequate airport must be determined for ISA (or prevailing delta ISA) and no-wind conditions, taking into account aircraft performance with one engine inoperative and the remaining engine operating at not more than MCT.

To determine the maximum distance from an adequate airport, the operator must define a diversion speed strategy as well as an aircraft reference weight for performance computation.

The same diversion speed strategy (Refer to FCOM 3.06) must be considered for :

- establishing the area of operation ;
- calculating the single-engine fuel planning,
- conducting the diversion in case of engine failure (conditions permitting).

The operator establishes the ETOPS reference gross weight for each route or area of operation. This must be a representative but conservative value of the aircraft gross weight at the critical point of the route or at the various critical points of all the routes included in the area of operation.

The one-engine-inoperative descent and cruise speed law must be chosen so that the associated net flight path clears the enroute obstacles with the regulatory margin.

FCOM section 3.06 gives data for three speed schedules. The associated approved net flight paths are published in the section 6 of the Flight Manual.

When the diversion strategy is chosen, the maximum distance from a diversion airport, can be directly determined for different maximum diversion times, with the help of the tables provided in this section. The area of possible ETOPS operation can then be drawn on plotting charts.

Another way to determine the maximum distance to a diversion airport is to read the one-engine-inoperative cruise TAS (for the reference gross weight and at the FL for best TAS) in the cruise tables in section 3.06 taking into consideration the appropriate speed strategy and the minimum altitude for clearing possible obstacles. The maximum distance the aircraft can travel to a diversion airport is this one-engine-inoperative-TAS multiplied by the maximum allowed diversion time granted to the operator.

Operators whose authorities require that an approved one-engine-inoperative speed be published in the Flight Manual must use this approved speed.

DISPATCH CONSIDERATION

MMEL

The MMEL has been approved taking into consideration the duration of the average ETOPS flight and the maximum diversion time granted to the airframe/engine combination.

The MMEL published by Airbus Industrie and approved by the French DGAC can be used to establish the airline MEL, which must be approved by the operator's national authorities. This MEL will probably be adapted to the airline network, environment and organization.

Other determining parameters will be :

- The maximum and the average diversion times on the route.
- The equipment of the enroute alternates.
- The navigation and communication facilities.
- The average meteorological conditions.

COMMUNICATION AND NAVIGATION FACILITIES

The aircraft communication system has provision to install three VHF transceivers and two HF radios ensuring full compliance with ETOPS requirements on any kind of route.

The aircraft navigation system meets the ETOPS requirements for en route navigation.

The aircraft has three inertial reference systems which, in conjunction with 2 FMS comply with MNPS criteria and this combination of systems is approved as the sole means of navigation for flight up to the maximum aircraft range.

See the MEL for a definition of the authorized dispatch configuration.

Note : For operation within the MNPS area, airlines must obtain approval from their national authorities.

FUEL AND OIL SUPPLY

The aircraft fuel and oil supply must be adequate to allow the aircraft to reach its destination or a planned alternate after the combined failures of an engine and pressurization or the failure of pressurization alone at the critical point on the route. Planners must consider forecast wind and temperature conditions, as well as forecast icing conditions.

The operator must establish a routine for ETOPS critical fuel planning and compare it with the standard (non-ETOPS) fuel planning.

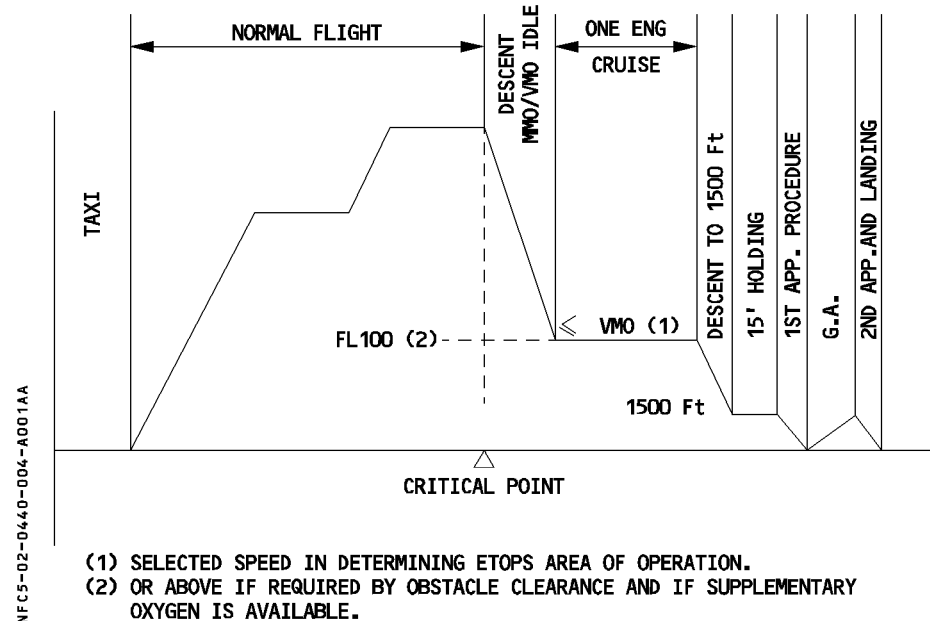
ELECTRICAL GENERATORS

Three generators are required for dispatch.

ETOPS FUEL SCENARIOS

For establishing the ETOPS critical fuel reserves, the planner must consider two diversion scenarios.

Pressurization failure + engine failure



Pressurization failure

Same flight profile, but with 2 engines operating and diversion cruise set at LRC.

Fuel requirements

For each scenario, the required block fuel must be computed in accordance with the operator's ETOPS fuel policy and using the regulatory ETOPS critical fuel reserves described below.

Depending on the strategy and the one-engine-inoperative speed selected for the single-engine diversion scenario, either of these two scenarios may result in the higher fuel requirement.

The scenario resulting in the higher fuel requirement is the ETOPS critical fuel scenario, and the associated minimum block fuel requirement is the ETOPS critical fuel plan.

ETOPS CRITICAL FUEL RESERVES

For the computation of ETOPS critical fuel reserves and of the complete ETOPS critical fuel planning, the diversion fuel must include the following fuel provisions :

- fuel burn-off from the critical point to the end of descent (for example 1500 feet) at the diversion airport,
- 5 % of the above fuel burn-off as contingency fuel,
- fuel for 15 minutes of holding at 1500 feet and green dot speed,
- fuel for first (IFR) approach, a go-around and a second (VFR) approach,
- 5 % fuel mileage penalty or a demonstrated performance factor,
- effect of any Configuration Deviation List (CDL) or MEL item,
- if icing conditions are forecast :
 - * effect of Nacelle Anti Icing (NAI) and Wing Anti Icing (WAI) systems,
 - * effect of ice accretion on the unheated surfaces of the aircraft :

The fuel provisions associated with the effects of NAI and WAI systems and of ice accretion on the unheated surfaces are adjusted to take into account the horizontal extent of the forecast icing areas (exposure time).

The fuel provision factor for ice accretion on the unheated surfaces is a percentage equal to five times the forecast exposure time in hours. For example, assuming a one-hour exposure en route to and (e.g. the 15 minute holding) at the diversion airport, the fuel provision is 5 % of the fuel burned during the considered exposure time. If moderate icing is forecast, the above fuel provision is divided by two.

- If the APU is needed as a power source (MEL), its fuel consumption must be considered: 80 kg/h (APU GEN ON, APU BLEED OFF).

In view of our experience, Airbus Industrie recommends that the operator considers the following non mandatory fuel practices :

- Include the effect of a demonstrated performance factor, in all standard and ETOPS fuel requirement computations,
- Include a contingency fuel provision from departure to the Critical Point (CP), when computing the ETOPS critical fuel planning.

The complete ETOPS critical fuel planning for the ETOPS critical fuel scenario (from the departure to the Critical Point and then from the Critical Point to the diversion airport) must be compared with the standard fuel planning (for example, from the departure to the destination and alternate) computed in accordance with the company fuel policy and applicable operational requirements. The higher of the two fuel requirements must be considered as the minimum required block fuel for the flight.

DISPATCH FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING

ETOPS diversion fuel requirements for dispatch are provided at the end of this section. Data for the engine failure case alone are not provided as this scenario is never critical.

WEATHER MINIMA

R Weather forecasts for en route alternates must meet the operator's applicable weather minimum requirements. If the applicable requirement is AC 120-42A or AMC 20-6 the following applies :

An airplane cannot be dispatched unless the meteorological forecasts at en route alternate airports meet the weather minimums listed here for a period starting one hour before the earliest expected time of landing and ending one hour after the latest expected time of landing.

A. AC 120-42A dispatch weather minima (FAA)

AIRPORT EQUIPMENT	Ceiling (ft)	Visibility (m)
1 ILS/MLS	DH + 400	Greater of (3200, published minima + 1600)
2 ILS/MLS on separate runways *	DH + 200	Greater of (1600, published minima + 800)
Non precision approach	Greater of (800, MDH + 400)	Greater of (3200, published minima + 1600)
CAT II/CAT III capability with engine failure	Lower than above minima, approved on a case-by-case basis considering aircraft performance under failure conditions	

* separate runways are runways that do not touch each other.

DH : decision height

MDH : minimum descent height

- R B. AMC 20–6 dispatch weather minima (EASA)
The operator must use either table 1 or table 2, but not a combination of both.

Table 1

Approach Facility Configuration	Alternate Airfield Ceiling	Weather Minima Visibility
For aerodromes with at least one operational navigation facility, providing a precision or non-precision runway approach procedure or a circling manoeuvre from an instrument approach procedure	A ceiling derived by adding 400 feet to the authorised DH, MDH (DA/MDA) or circling minima	A visibility derived by adding 1500 meters to the authorised landing minima
The weather minima below apply at airports which are equipped with precision or non-precision approaches on at least two separate runways (two separate landing surfaces)		
For airports with at least two operational navigation facilities providing a precision or non-precision runway approach procedure to separate suitable runways	A ceiling derived by adding 200 feet to the higher of the two authorised DH/MDH (DA/MDA) for the approaches	A visibility derived by adding 800 meters to the higher of the two authorised landing minima

Table 2

Type of Approach	Planning Minima (RVR visibility required and ceiling if applicable)			
	Aerodrome with			
	at least 2 separate approach procedures based on 2 separate aids serving 2 separate runways	at least 2 separate approach procedures based on 2 separate aids serving 1 runway	or	at least 1 approach procedure based on 1 aid serving 1 runway
Precision Approach Cat II, III (ILS, MLS)	Precision Approach Cat I Minima	Non-Precision Approach Minima		
Precision Approach Cat I (ILS, MLS)	Non-Precision Approach Minima	Circling minima or, if not available non-precision approach minima plus 200 ft/1000 m		
Non-Precision Approach	The lower of non-precision approach minima plus 200 ft/1000 m or circling minima	The higher of circling minima or non-precision approach minima plus 200 ft/1000 m		
Circling Approach	Circling minima			

DIVERSION DURING EXTENDED RANGE OPERATIONS

DIVERSION DECISION MAKING

The technical criteria governing a re-routing or diversion decision can be classified into four categories, as follows :

- Loss of MNPS capability, before entering the MNPS area (as applicable).
- Weather minima at diversion airport(s) going below the company/crew en-route minima, before reaching the ETOPS Entry Point, or diversion airport(s) becoming unsuitable for any reason.
- Failure cases requiring a diversion to the nearest airport (cases leading to a LAND ASAP message on the ECAM and/or in the QRH).
- Failure cases resulting in increased fuel consumption, exceeding the available fuel reserves.

Comments and Recommendations

· Electrical generation

If one IDG fails, a diversion is required in case of :

- Blue hydraulic circuit low level, low air pressure or overheat, or
- APU no start, or
- APU or APU generator inoperative, or
- Second IDG failure.

· Fuel system

Some failure cases may lead to fuel gravity feeding which implies flight at lower altitude or to some fuel being unusable. The flight crew's evaluation of the actual situation and the fuel remaining may lead to the decision that a diversion is required.

· Hydraulic system :

If low level, low air pressure or overheat on blue hydraulic circuit, a diversion is required in case of :

- One IDG failure, or
- APU no start, or
- APU/APU GEN failure.

· APU :

If APU/APU GEN fails, a diversion is required in case of :

- Blue hydraulic circuit low level, low air pressure or overheat, or
- One IDG failure.

DIVERSION PERFORMANCE DATA

FCOM section 3.06 gives three single engine descent and cruise procedures :

1. The standard strategy.
2. The obstacle strategy.
3. Fixed speed strategies (ETOPS).

For ETOPS operations, any one of the above diversion strategies can be used provided that the selected strategy and speed schedule are used in :

- establishing the area of operation (maximum diversion distance),
- calculating the diversion fuel requirements for the single-engine ETOPS fuel scenario,
- demonstrating the applicable obstacle clearance requirements (net flight path and net ceiling).

During the diversion, the flight crew is expected to use the planned speed schedule. However, based on the evaluation of the actual situation, the pilot in command has the authority to deviate from this planned one-engine-inoperative speed.

GUIDELINES FOR DIVERSION PROCEDURE

- Complete the related failure procedure.
- Inform ATC.
- Initiate the descent.
- Determine which enroute alternate is the most suitable (per company procedure).
- Divert to the chosen enroute alternate.
- Comply with the pre-planned diversion strategy and speed schedule, or adjust the speed schedule, as dictated by the evaluation of the actual situation.

Note : For detailed guidelines and procedures in conducting the diversion (lateral and vertical navigation), see the FMGS Pilot’s Guide (FCOM Volume 4).

PROCEDURES

The SOP (FCOM 3.03) and ABN and EMER procedures (FCOM 3.02) apply. For ETOPS flights, the flight crew must complete them using the procedures given below :

COCKPIT PREPARATION

Fuel

- Before each flight, the flight crew must check that the fuel crossfeed valve is operating correctly :
- **FUEL X FEED ON**
On the ECAM FUEL page check that the fuel crossfeed valve is open (indication is inline green).
 - **FUEL X FEED OFF**
Check that the fuel crossfeed valve is closed.

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ABN AND EMER PROCEDURES

ELECTRICAL EMERGENCY CONFIGURATION :

In case of electrical emergency configuration, it may be better to study the STATUS on the paper checklist, after having applied ECAM actions.

The flight crew must complete the ECAM procedure using the following :

Air conditioning :

As cockpit and cabin temperature control is lost, it is recommended to open the cockpit door.

Fuel :

As all fuel pumps are lost, the engines are fed by gravity. Refer to 3.02.28 (Fuel gravity feed procedure).

Engine anti-ice :

Engine anti-ice valves are permanently open, although the ECAM memo ENG A. ICE is not displayed on the ECAM (except if the ENG A. ICE pushbutton is at ON).

Wing anti-ice :

If only one ENG BLEED is available, PACK 1 must be switched OFF, to avoid having both packs and wing anti-ice supplied by a single bleed source.

BLUE HYDRAULIC LOW LEVEL

Start the APU to ensure availability of the APU generator.

ENGINE OR IDG FAILURE

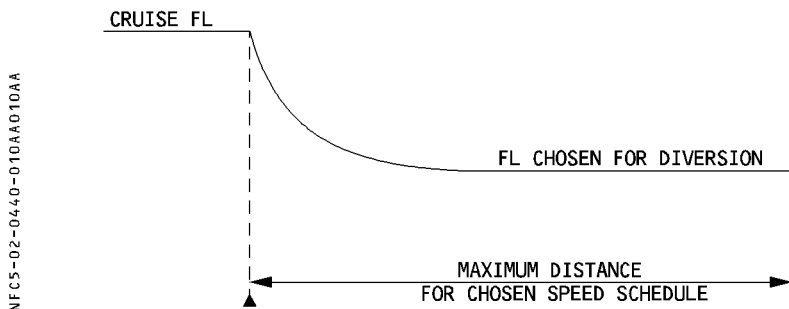
Start the APU and use the APU electrical channel.

PERFORMANCE

The two following cases result in a fuel consumption increase :

- RAT extended (Refer to ELEC EMER proc. 3.02.24).
- in electrical emergency configuration, the engine anti-ice valves are permanently open.

MAXIMUM DISTANCE (Still air) TO DIVERSION AIRPORT IN NAUTICAL MILES



Determination of 60 minutes maximum diversion distance (JAR-OPS 1.245)

Use the distance given within the table below to decide if a route is an ETOPS one according to JAR-OPS 1.245.

The following computation conditions have been used in accordance with the interpretation of the JAR-OPS 1.245 :

- Reference weight : the aircraft gross weight after one hour of flight having taken off at sea level at the maximum structural takeoff weight given by the flight manual
- ISA conditions
- No wind
- Diversion level after engine failure : FL170
- Single engine diversion speed schedule : VMO/MMO

Note : using the JAR-OPS 1.245 method, obstacles have not to be considered to determine if a route is or is not an ETOPS route.

Aircraft	MTOW		Distance (NM)
	(kg)	(lb)	
A320-111 CFM56-5A1	66000	145504	393
	68000	149913	390
A320-211/212 CFM56-5A1/A3	66000 to 67000	145504 to 147708	391
	68000 to 70000	149913 to 154322	388
	71500	157629	385
	73500	162038	382
	75500	166447	379
	77000	169754	376
A320-214 CFM56-5B4	70000	154322	406
	71500	157629	406
	73500 to 77000	162038 to 169754	397
A320-231 IAE V2500-A1	66000 to 68000	149913 to 154322	414
	70000 to 71500	154322 to 157629	411
	73500	162038	408
	75500	166447	405
	77000	169754	403
A320-232/233 IAE V2527-A5/ IAE V2527E-A5	70000	154322	410
	71500	157629	409
	73500	162038	407
	75500 to 78000	166447 to 171959	403

Determination of 60 minutes maximum diversion distance (JAR-OPS 1.245)

Use the distance given within the table below to decide if a route is an ETOPS one according to JAR-OPS 1.245.

The following computation conditions have been used in accordance with the interpretation of the JAR-OPS 1.245 :

- Reference weight : the aircraft gross weight after one hour of flight having taken off at sea level at the maximum structural takeoff weight given by the flight manual
- ISA conditions
- No wind
- Diversion level after engine failure : FL170
- Single engine diversion speed schedule : VMO/MMO

Note : using the JAR-OPS 1.245 method, obstacles have not to be considered to determine if a route is or is not an ETOPS route.

Aircraft	MTOW		Distance (NM)
	(kg)	(lb)	
A319-111/112 CFM56-5B5/B6	64000 to 70000	141094 to 154322	394
	73500	162038	389
	75500	166448	387
A319-113/114 CFM56-5A4/A5	64000	141094	402
	68000	149913	397
	70000	154322	394
	75500	166447	386
A319-115 CFM56-5B7	64000 to 70000	141094 to 154322	410
	75500	166447	407
A319-131/-132 IAE V2524-A5 / IAE V2527M-A5	64000 to 70000	141094 to 149913	394
	73500	154322	389
	75500	166448	405
A319-133 IAE V2527M-A5	64000 to 70000	141094 to 154322	410
	75500	166447	407

Determination of 60 minutes maximum diversion distance (JAR-OPS 1.245)

Use the distance given within the table below to decide if a route is an ETOPS one according to JAR-OPS 1.245.

The following computation conditions have been used in accordance with the interpretation of the JAR-OPS 1.245 :

- Reference weight : the aircraft gross weight after one hour of flight having taken off at sea level at the maximum structural takeoff weight given by the flight manual
- ISA conditions
- No wind
- Diversion level after engine failure : FL170
- Single engine diversion speed schedule : VMO/MMO

Note : using the JAR-OPS 1.245 method, obstacles have not to be considered to determine if a route is or is not an ETOPS route.

Aircraft	MTOW		Distance (NM)
	(kg)	(lb)	
A321-111/-112 CFM56-5B1/B2	78000 to 80000	171959 to 176368	401
	83000 to 85000	182982 to 187391	392
	89000	196210	386
A321-211/-212/-213 CFM56-5B1/B2/B3	78000 to 80000	171959 to 176368	401
	83000 to 85000	182982 to 187391	392
	87000 to 93500	206131	375
A321-131 IAE V2530-A5	78000 to 80000	171959 to 176368	395
	83000 to 85000	182982 to 187391	387
	89000	196210	377
A321-231/-232 IAE V2530-A5 IAE V2533-A5	78000 to 80000	171959 to 176368	395
	83000 to 85000	182982 to 187391	387
	93500	206131	375

MAXIMUM DISTANCE (Still air) TO DIVERSION AIRPORT IN NAUTICAL MILES (cont'd)

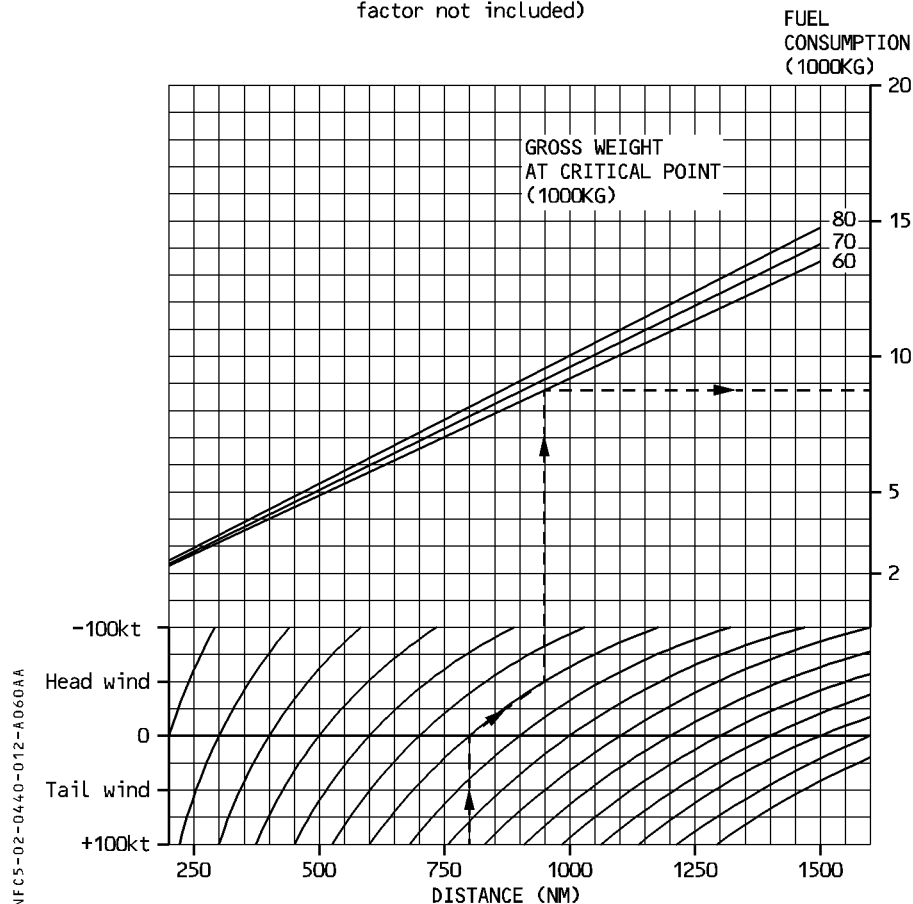
ISA							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	55 000	150	419	623	827	—	—
	60 000	150	418	621	824	1028	1232
	65 000	140	418	619	821	1024	1226
	70 000	130	417	617	818	1019	1221
	75 000	120	416	615	814	1014	1214
	80 000	110	414	612	809	1008	1207
	85 000	100	413	608	804	1001	1198
MCT/320 KT	55 000	170	414	615	817	—	—
	60 000	160	414	615	816	1016	1217
	65 000	160	414	615	816	1016	1217
	70 000	160	412	612	812	1012	1213
	75 000	150	412	610	807	1005	1203
	80 000	140	410	605	799	994	1189
	85 000	130	407	599	791	983	1175

ISA + 10							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	55000	150	427	635	843	—	—
	60000	150	426	633	839	1047	1254
	65000	150	425	630	836	1042	1248
	70000	140	424	628	832	1037	1242
	75000	130	423	625	828	1031	1235
	80000	120	422	622	824	1025	1228
	85000	110	420	619	818	1018	1219
MCT/320KT	55000	170	422	627	833	—	—
	60000	160	423	627	831	1036	1240
	65000	160	422	627	831	1036	1240
	70000	160	420	623	827	1031	1235
	75000	150	419	620	821	1023	1224
	80000	150	415	615	815	1016	1217
	85000	140	413	611	809	1008	1206

R

ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING
ALL ENGINES-LONG RANGE CRUISE

Including: emergency descent-long range cruise at FL100
 final descent 250kt-holding 15 min at FL15
 IFR procedure-Go Around-2nd VFR procedure
 5% allowance for wind errors
 (NAI + WAI + effect of ice accretion + performance
 factor not included)



MAXIMUM DISTANCE (Still air) TO DIVERSION AIRPORT IN NAUTICAL MILES (cont'd)

ISA							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	50 000	160	414	616	818	—	—
	55 000	160	413	614	815	1017	1219
	60 000	160	412	612	812	1012	1213
	65 000	160	410	608	807	1007	1206
	70 000	160	408	605	802	1000	1198
	75 000	160	405	600	795	992	1188
MCT/320 KT	50 000	160	412	613	814	—	—
	55 000	160	412	613	814	1015	1215
	60 000	160	412	612	812	1012	1213
	65 000	160	410	608	807	1007	1206
	70 000	160	408	605	802	1000	1198
	75 000	160	405	600	795	992	1188

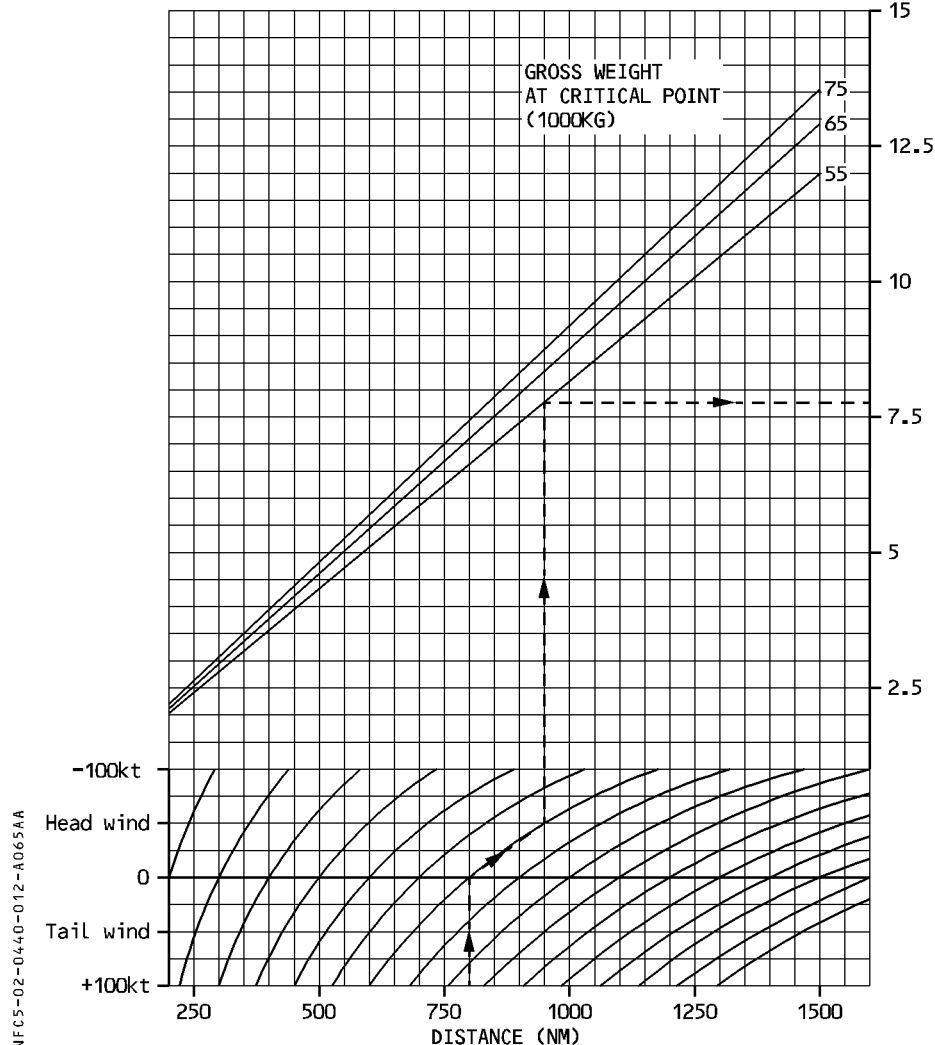
ISA + 10							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	50000	160	422	628	—	—	—
	55000	160	422	626	831	1036	1242
	60000	160	420	624	827	1032	1236
	65000	160	418	620	823	1026	1229
	70000	160	416	616	817	1019	1221
	75000	160	413	611	811	1010	1211
MCT/320KT	50000	170	421	626	831	—	—
	55000	160	421	626	830	1035	1239
	60000	160	420	624	827	1032	1236
	65000	160	418	620	823	1026	1229
	70000	160	416	617	818	1019	1221
	75000	160	413	612	811	1011	1211

R

ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ALL ENGINES—LONG RANGE CRUISE

Including: emergency descent—Long range cruise at FL100
 final descent 250kt—holding 15 min at FL15
 IFR procedure—Go Around—2nd VFR procedure
 5% allowance for wind errors
 (NAI + WAI + effect of ice accretion + performance
 factor not included)

FUEL
 CONSUMPTION
 (1000KG)



MAXIMUM DISTANCE (Still air) TO DIVERSION AIRPORT IN NAUTICAL MILES (cont'd)

ISA							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	50 000	160	409	607	806	1005	1204
	55 000	160	407	604	801	999	1197
	60 000	150	406	601	797	993	1190
	65 000	120	407	601	795	989	1184
	70 000	110	406	598	791	984	1178
	75 000	100	405	595	786	978	1170
MCT/320 KT	50 000	160	409	607	806	1005	1204
	55 000	160	407	604	801	999	1197
	60 000	150	406	601	797	993	1190
	65 000	150	403	597	791	986	1181
	70 000	130	404	596	788	980	1172
	75 000	120	402	592	781	970	1160

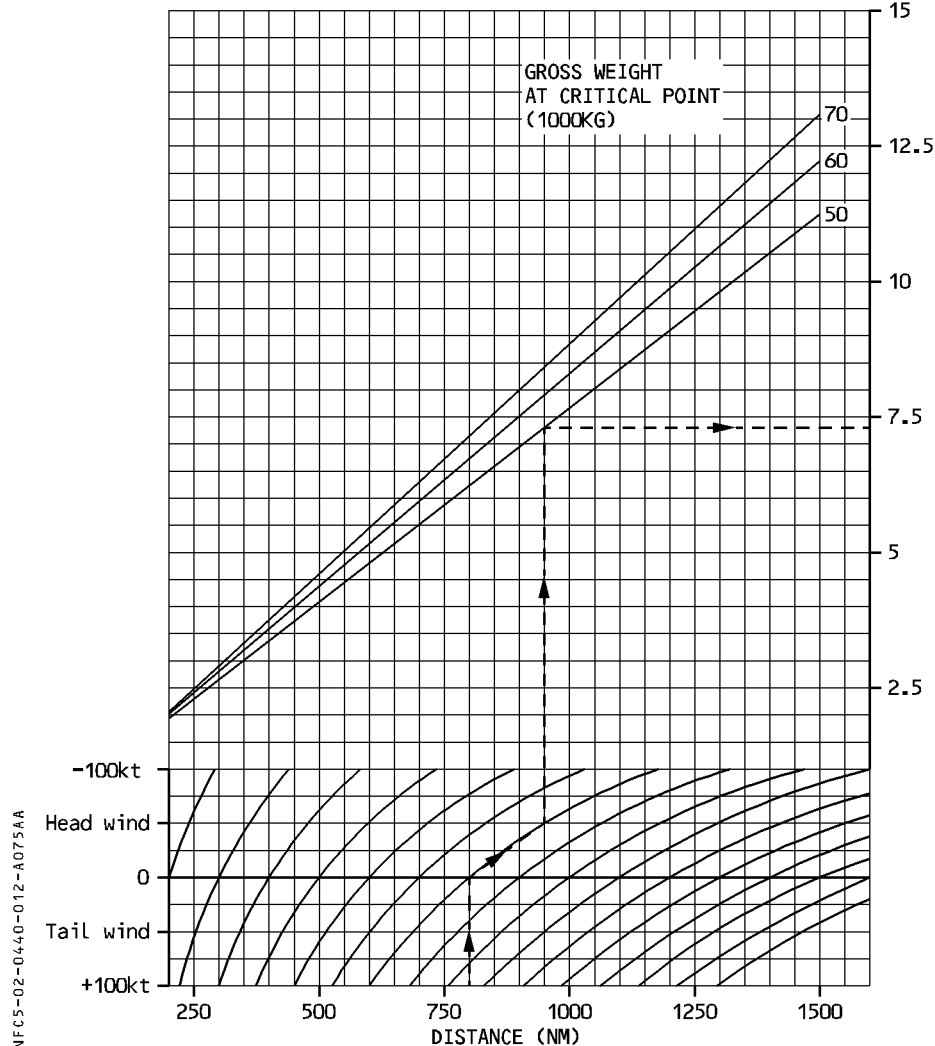
ISA + 10							
SPEED SCHEDULE	A/C WEIGHT AT CRITICAL POINT (KG)	FL FOR DIVERSION	DIVERSION TIME (MIN)				
			60	90	120	150	180
MCT/VM0	50000	160	417	619	821	1024	1227
	55000	160	415	616	817	1018	1220
	60000	150	414	613	812	1012	1212
	65000	130	414	611	808	1006	1205
	70000	110	414	609	805	1001	1198
	75000	110	412	605	799	994	1189
MCT/320KT	50000	160	418	620	822	1025	1228
	55000	160	416	617	818	1019	1221
	60000	150	414	613	812	1012	1212
	65000	140	413	609	807	1005	1203
	70000	130	411	606	801	997	1193
	75000	120	408	601	794	987	1180

R

ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING
ALL ENGINES—LONG RANGE CRUISE

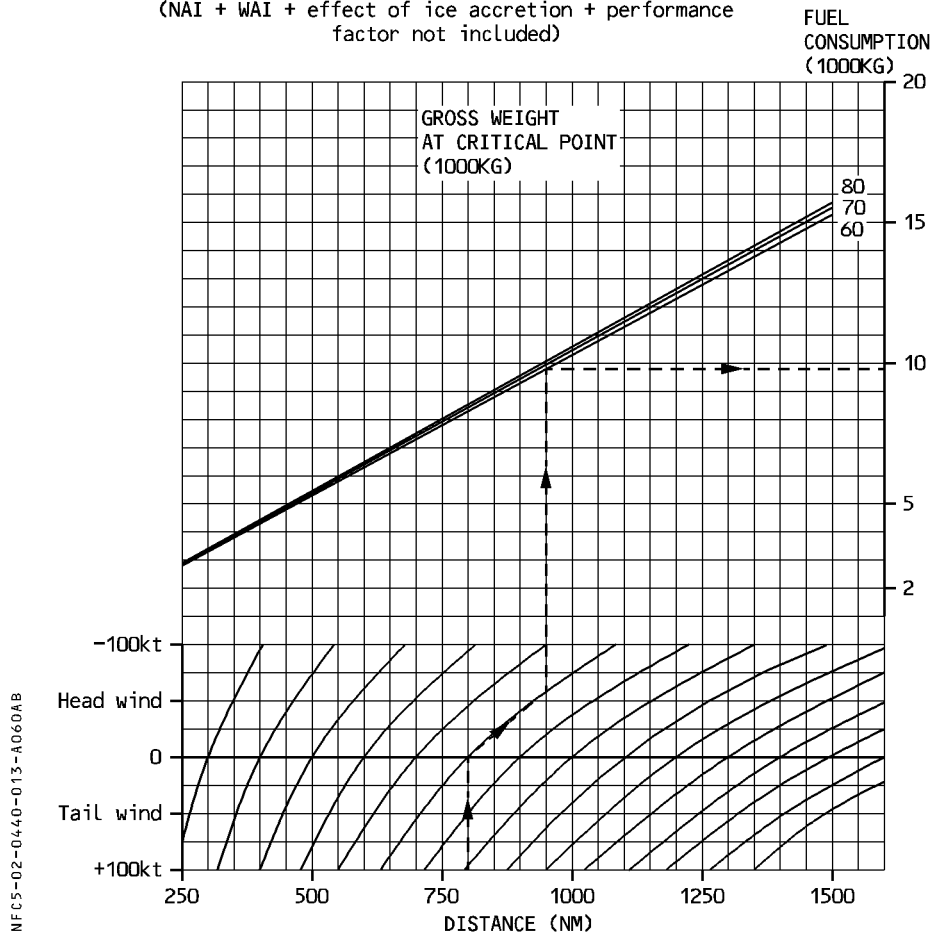
Including: emergency descent—Long range cruise at FL100
 final descent 250kt—holding 15 min at FL15
 IFR procedure—Go Around—2nd VFR procedure
 5% allowance for wind errors
 (NAI + WAI + effect of ice accretion + performance
 factor not included)

FUEL
 CONSUMPTION
 (1000KG)



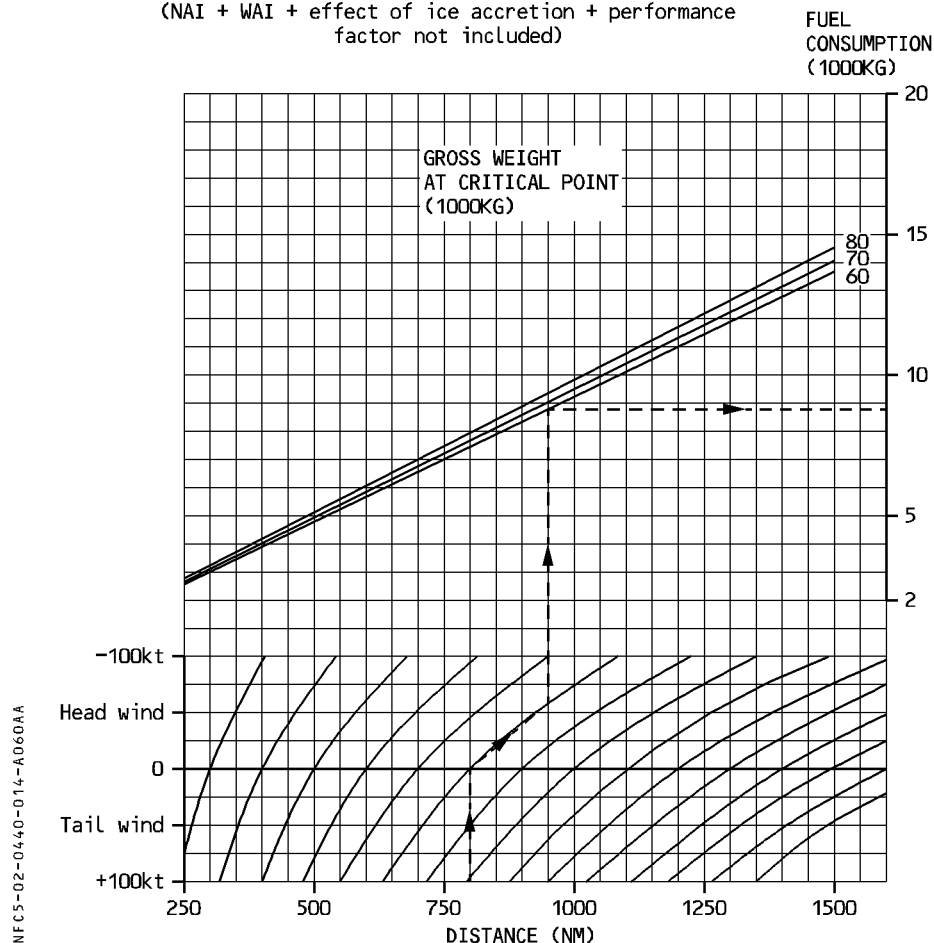
ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING **ONE ENGINE OUT-CRUISE AT 350KT**

Including: emergency descent-cruise 350kt at FL100
 final descent 250kt-holding 15 min at FL15
 IFR procedure-Go Around-2nd VFR procedure
 5% allowance for wind errors-APU fuel burn
 (NAI + WAI + effect of ice accretion + performance
 factor not included)



ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ONE ENGINE OUT-CRUISE AT 320KT

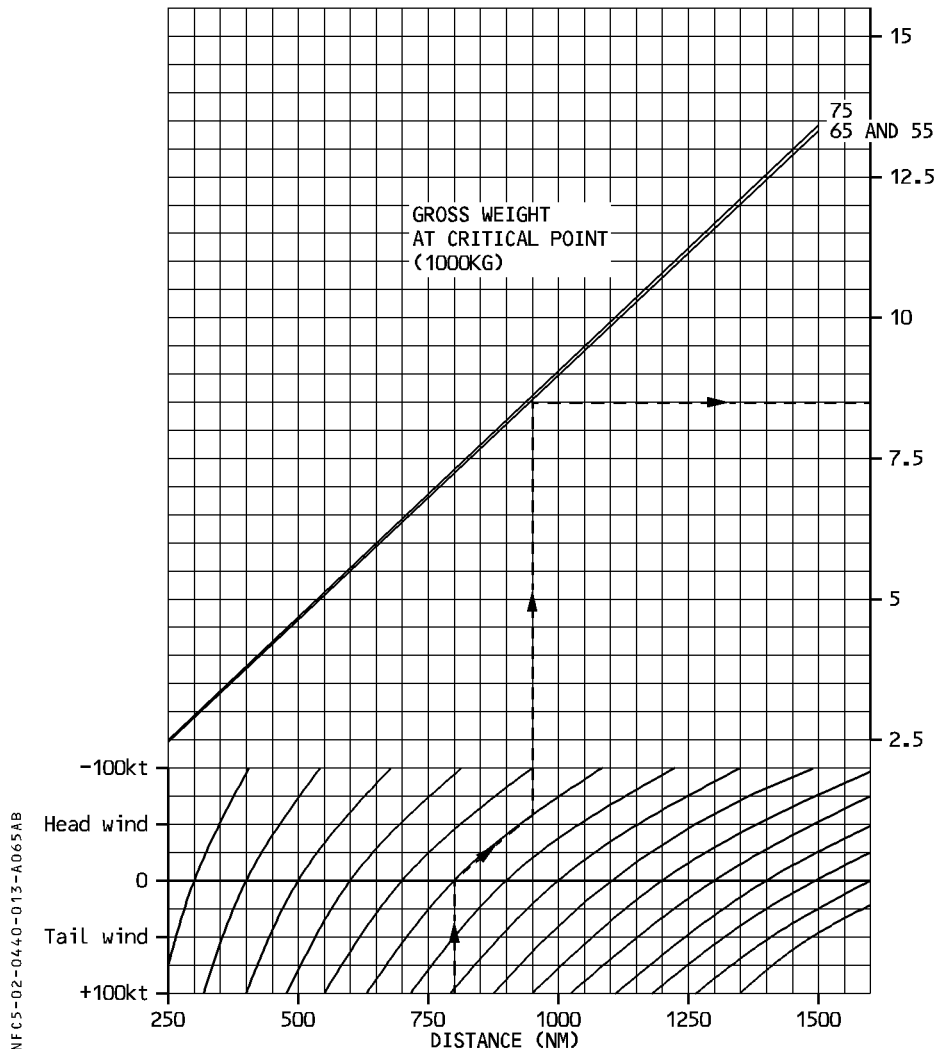
Including: emergency descent-cruise 320kt at FL100
final descent 250kt-holding 15 min at FL15
IFR procedure-Go Around-2nd VFR procedure
5% allowance for wind errors-APU fuel burn
(NAI + WAI + effect of ice accretion + performance
factor not included)



ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ONE ENGINE OUT—CRUISE AT 350KT

Including: emergency descent—cruise 350kt at FL100
final descent 250kt—holding 15 min at FL15
IFR procedure—Go Around—2nd VFR procedure
5% allowance for wind errors—APU fuel burn
(NAI + WAI + effect of ice accretion + performance
factor not included)

**FUEL
CONSUMPTION
(1000KG)**

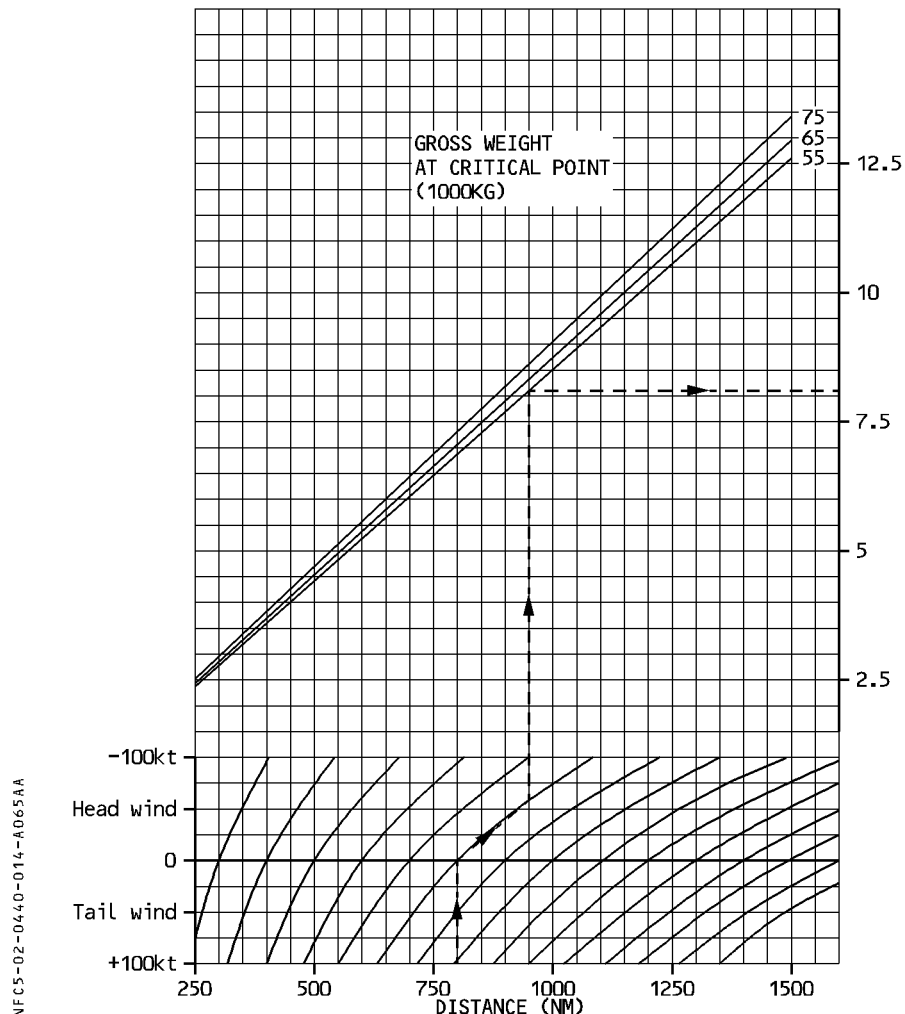


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ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ONE ENGINE OUT-CRUISE AT 320KT

Including: emergency descent-cruise 320kt at FL100
final descent 250kt-holding 15 min at FL15
IFR procedure-Go Around-2nd VFR procedure
5% allowance for wind errors-APU fuel burn
(NAI + WAI + effect of ice accretion + performance
factor not included)

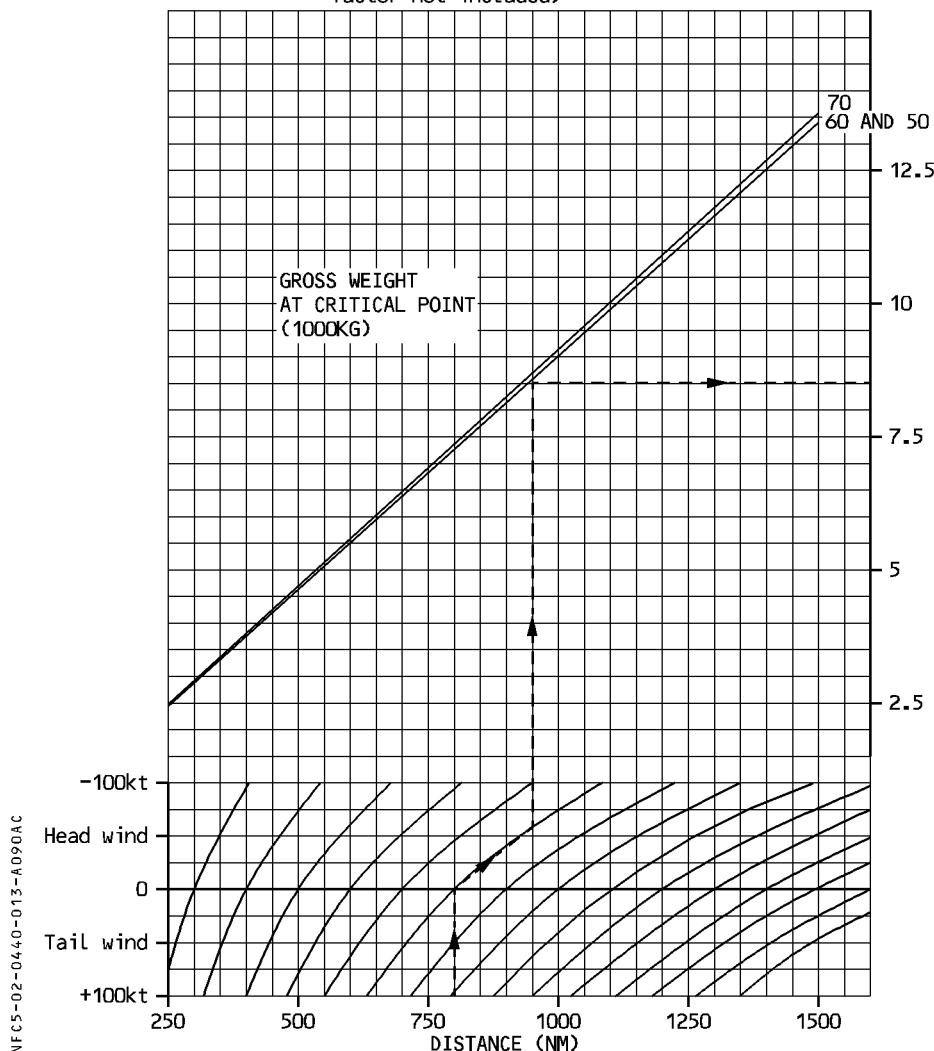
FUEL
CONSUMPTION
(1000KG)



ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ONE ENGINE OUT—CRUISE AT 350KT

Including: emergency descent—cruise 350kt at FL100
 final descent 250kt—holding 15 min at FL15
 IFR procedure—Go Around—2nd VFR procedure
 5% allowance for wind errors—APU fuel burn
 (NAI + WAI + effect of ice accretion + performance
 factor not included)

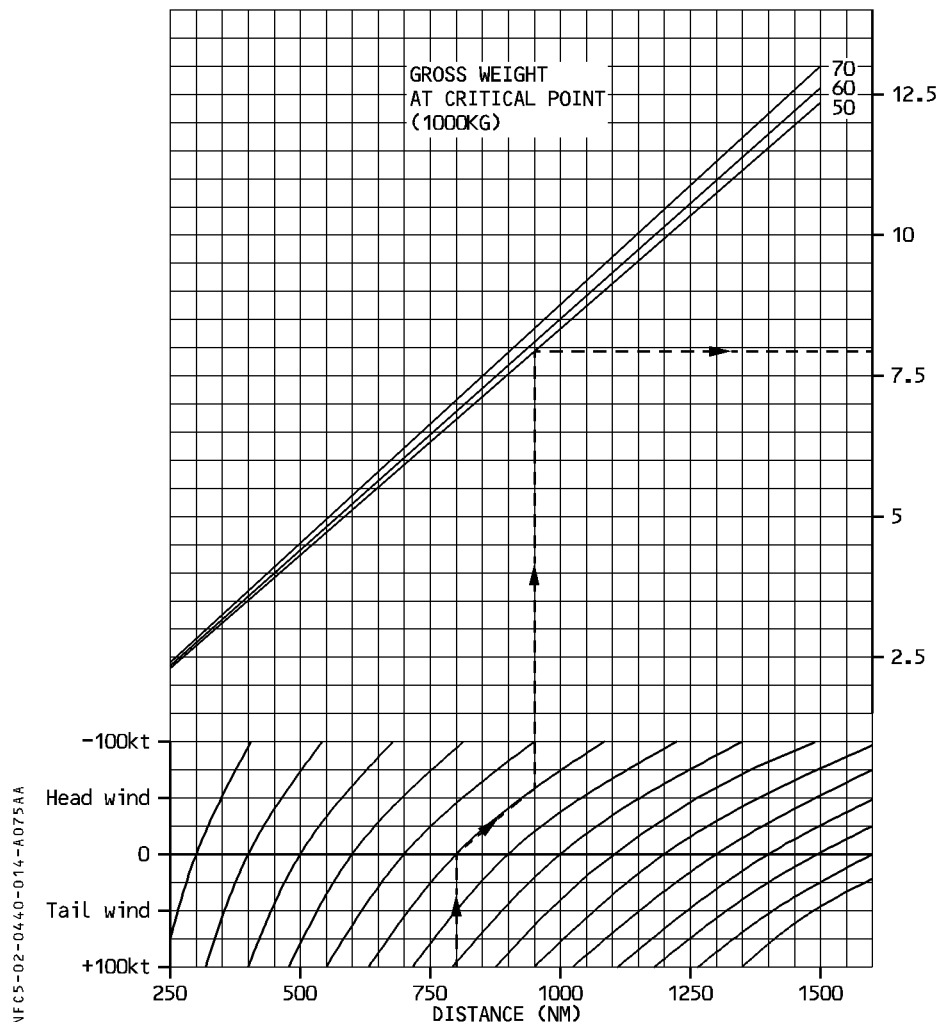
FUEL
 CONSUMPTION
 (1000KG)



ETOPS FUEL REQUIREMENT FROM CRITICAL POINT TO LANDING ONE ENGINE OUT-CRUISE AT 320KT

Including: emergency descent-cruise 320kt at FL100
 final descent 250kt-holding 15 min at FL15
 IFR procedure-Go Around-2nd VFR procedure
 5% allowance for wind errors-APU fuel burn
 (NAI + WAI + effect of ice accretion + performance
 factor not included)

FUEL
 CONSUMPTION
 (1000KG)



GENERAL

This following information is issued to permit the CFM 56-5-B SAC (Single Annular Combustor) and CFM 56-5-B DAC (Double Annular Combustor) engines to be intermixed.

ENGINE PARAMETERS

Engine parameters differ significantly, when the engines are at idle :

EGT : Up to 250° C higher on the DAC

FUEL FLOW : Up to 25 % higher on the DAC

N1 : Higher on the DAC

N2 : Lower on ground on the DAC ; higher in flight on the DAC

CROSSBLEED ENG START

The DAC engine has insufficient acceleration capability to sustain idle speed with a large bleed off take, when it operates with only 20 injectors. Therefore, it is necessary to preset a 30 % N1 on the supplying engine before launching the start sequence.

TAKEOFF PROCEDURE

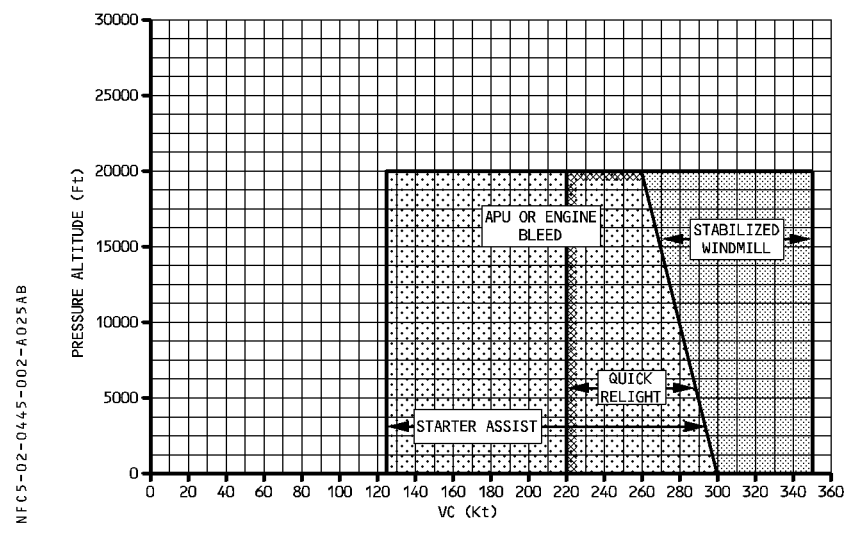
- The PF has to progressively adjust engine thrust in two steps :
 - Step 1 : Idle to 50% N1
Brakes released, when the 50% N1 is stabilized on both engines.
 - Step 2 : Both engines N1 to takeoff thrust.
- This procedure permits a significantly slower acceleration from ground idle to N1 = 50 % for the double annular combustor.
- Other standard operating procedures apply for takeoff.

R ENGINE RESPONSE

R In flight, when the aircraft is in clean configuration, the DAC engine may accelerate from
 R idle more slowly than the SAC engine. This is particularly evident, if the acceleration
 R follows a deceleration. There is not a significant effect on aircraft handling. This difference
 R in engine response disappears when the slats are extended.

ENGINE RELIGHT

DAC engine relight envelope is more restrictive than the SAC engine relight envelope.
 Therefore, in case of engine intermix, the DAC engine relight procedure must be used with
 the corresponding chart (see chart below).



GENERAL

Reduced Vertical Separation Minimum (RVSM) airspace is any airspace or route between FL290 and FL410 (inclusive), where aircraft are vertically separated by 1000 feet, instead of 2000 feet. The aircraft system design complies with the design criteria of the JAA Information Leaflet N° 6, and the FAA 91-RVSM Interim Guidance Material for RVSM operations.

The statement of RVSM capability is also indicated in the AFM.

OPERATIONAL APPROVAL

The above capability statement does not constitute an approval to fly RVSM. Operational approval is to be granted by the Operator's national authorities, after assessment of the airline's capability to meet RVSM requirements. The above-mentioned JAA and FAA documents also cover requirements for obtaining operational approval.

REQUIRED EQUIPMENT/FUNCTIONS FOR RVSM

RVSM regulations require the following equipment/functions in order to be operative :

- 2 ADR + 2 DMC
- 1 transponder
- 1 Autopilot function
- 1 FCU channel (for altitude target selection and OP CLB/OP DES mode engagement)
- 2 PFD functions (for altitude indication)
- 1 FWC (for altitude alert function)

PROCEDURES

The SOPs (FCOM 3.03) and the ABN and EMER (FCOM 3.02) procedures apply. In addition, flights in RVSM airspace must be completed by the following :

FLIGHT PREPARATION

The crew must pay particular attention to conditions that may affect operation in RVSM airspace. These include, but may not be limited to :

- Verifying that the airframe is approved for RVSM operations.
- Reported and forecast weather on the flight route.
- Review of maintenance logs and forms to determine the condition of equipment required for flight in RVSM airspace. Ensure that maintenance action has been taken to correct any defects of required equipment.
- Check that the PFD altitude indication (QNH reference) of ADR1, and also of ADR2, does not differ from the airport elevation by more than 75 feet.
- Check, on ground, that the difference between the two primary altitude indications is less than the tolerance specified in paragraph 3.04.34 "Maximum Differences Between Altitude Indications".

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	RVSM		SEQ 210	REV 37

IN FLIGHT PROCEDURES

PRIOR TO RVSM AIRSPACE ENTRY

The above-listed equipment, required for RVSM, must be operating normally. Should any of this equipment fail prior entering the RVSM airspace, the crew must request new clearance, to avoid flight in this airspace. The two primary altitude indications (PFD indication from the onside ADR or ADR 3) should be in accordance with the instrument tolerance (3.04.34). If only two ADRs are operative, the altimeter indications on the PFD and standby altimeters should be recorded. This information may be useful in case of subsequent PFD altitude discrepancy, or the loss of both remaining ADRs.

WITHIN RVSM AIRSPACE

- Autopilot should be engaged within RVSM airspace for cruise and flight level changes.
- During cleared transitions between flight levels, the aircraft should not overshoot or undershoot the cleared flight levels by more than 150 feet.
- At intervals of approximately one hour, check that PFD altimeter indications agree in accordance with the instrument tolerance (3.04.34). The usual scan of flight deck instruments should be sufficient.
- Use the transponder and the autopilot, associated with one of the ADRs which is within tolerance.

POST FLIGHT

The crew must report any malfunction in the height-keeping systems including the :

- Malfunction, or loss of any required equipment,
 - Altimeter readings outside tolerances specified in 3.04.34,
- and must provide sufficient details to enable maintenance to troubleshoot and repair the system.

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	RVSM		SEQ 102	REV 38

ABN AND EMER PROCEDURES

When in RVSM airspace, the following contingencies which affect the ability to maintain the cleared flight level will be notified to ATC.

- failure of both autopilots,
- loss of altimeter system redundancy (only one PFD indication remaining), or excessive altimeter discrepancy (200 ft).
- failure of any other equipment affecting the ability to maintain the cleared flight level, or
- encountering greater than moderate turbulence.

R *Note: The flight crew can obtain the contingency procedures for flying in Minimum*
R *Navigation Performance Specification (MNPS) airspace by referring to specific*
R *manuals, such as, for example, the North Atlantic (NAT) MNPS Manual.*

If unable to notify ATC and obtain ATC clearance prior to deviating from the assigned cleared flight level, the crew should follow the established contingency procedure and obtain ATC clearance as soon as possible.

GENERAL

The aircraft navigation system, required by regulation to fly within a Required Navigation Performance (RNP) airspace, shall comply with RNAV functionality criteria and with navigation position accuracy and integrity criteria.

When referring to RNP-X, the value of X is the navigation accuracy expressed in NM, which has to be met with a probability of 95 %.

An RNP value can be associated with an airspace, a route, a SID, a STAR, a RNAV approach or a RNAV missed approach procedure.

Depending on the RNP value, and on the airspace environment (ground radio navaid), different navigation equipment may be necessary.

An operational approval from the airline's national authorities may be necessary.

NAVIGATION SYSTEM CAPABILITY (for reference only)

R European BRNAV (RNP-5) and P-RNAV (RNP-1) capability meets the certification requirements of JAA TGL 2 and TGL 10. Terminal and en-route RNAV operations comply with the certification requirements of the FAA Advisory Circular 90-100.

RNP-10 capability in oceanic or remote areas complies with paragraph 12.b (1) of FAA Notice 8400.12a., or with paragraph 12.a. or 12.b (5), if GPS is installed and is operative. Navigation system with the GPS PRIMARY function (if GPS installed) meets the certification requirements of FAA AC 20-130A and TSO C 129A in class C1 (for navigation system with multiple sensor inputs including GPS).

RNP CAPABILITY

In order to match a given RNP value, the FMS-estimated position accuracy (also called Estimated Position Error) must be better than the RNP value. Obviously, this is dependent on the FMS navigation-updating mode (GPS/DME/DME, VORDME, or IRS).

On the MCDU PROG page, the required and the estimated position accuracy are displayed, and determine the HIGH/LOW accuracy indication (refer to FCOM 1.22.20).

The required accuracy can be a default value, which is either a function of the flight phase, or a navigation database procedure value, or a value manually entered by the crew.

When flying in an RNP environment, the crew can insert the appropriate RNP value in the REQUIRED ACCUR field of the PROG page.

- When HIGH is displayed, the RNP requirement is estimated to be fulfilled.
- When LOW is displayed, the RNP requirement is estimated not fulfilled. In this case :
 - The crew crosschecks navigation with raw data, if available,
 - If the crosscheck is negative, or if raw data is unavailable, the crew informs the ATC.

When leaving the RNP environment, the crew will clear the manually-entered required accuracy.

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		SEQ 001	REV 38

Without GPS PRIMARY function

RNP accuracy criteria are met, provided radio navaid coverage supports it for :

- RNP-1 en route and in the terminal area, provided a required accuracy of 1NM(1) is checked, or manually entered in the MCDU.
- RNP-0.3 in approach, provided a required accuracy of 0.3NM(1) is checked, or manually entered in the MCDU.

Note : (1) It is possible to enter the radial equivalent to the specified Crosstrack (XTK) accuracy, that is the RNP multiplied by 1.2, the EPE being an estimated radial position error.

With the GPS PRIMARY function

RNP requirements are met, provided GPS PRIMARY is available, for :

- RNP-1 en route
- RNP-0.5 in the terminal areas, provided the AP or FD in NAV mode is used.
- RNP-0.3 in approach, provided the AP or FD in NAV mode is used.

BRNAV IN EUROPEAN AIRSPACE

In this airspace, radio navaid coverage is assumed to support RNP-5 accuracy.

The minimum required equipment to enter BRNAV airspace is :

- One RNAV system, which means :
 - One FMGC
 - One MCDU
 - R · One VOR or one GPS receiver for FM navigation update
 - R · One DME or one GPS receiver for FM navigation update
 - One IRS
- Flight Plan Data on two NDs.

PROCEDURES

When GPS PRIMARY is not available, periodically crosscheck the FM position with navaid raw data.

Manual selection of a required accuracy on the MCDU is optional.

- If manual entry of a required accuracy is desired, enter 5NM or use the radial equivalent to 5NM XTK accuracy, that is 6.1NM.

When leaving RNP-5 airspace, or when entering the terminal area, revert to the default required accuracy, or enter the appropriate value on the MCDU.

- If one of the following MCDU or ECAM messages is displayed, check navigation accuracy with the navaid raw data, or with the GPS MONITOR page (if GPS installed):
 - NAV ACCUR DOWNGRAD
 - FMS1/FMS2 POS DIFF
 - CHECK IRS 1(2)(3)/FM POSITION
 - ECAM : FM/GPS POS DISAGREE (if GPS installed)
- If the accuracy check confirms that RNP-5 capability is lost, or if both FMGCs have failed : Inform the ATC, and revert to conventional navigation.
- If the accuracy check confirms that only one FMGC position is incorrect, resume navigation with the other FMGC.

In inertial navigation, BRNAV capability is maintained for 2 hours, independently of the estimated accuracy displayed on the MCDU.

RNP-10 IN OCEANIC OR REMOTE AREAS

In this kind of airspace, the aircraft is expected to fly for a long period of time outside radio navaid coverage.

For aircraft without GPS, flight time outside radio navaid coverage is limited. According to FAA Notice 8400.12A, this limitation is :

- 6.2 hours since IRS ground alignment, or
- 5.7 hours since the last the FM radio update.

There is no limitation for aircraft fitted with the GPS.

Minimum required equipment to enter RNP-10 airspace is :

- Two long range navigation systems, which means :
 - Two FMGC
 - Two MCDU
 - One GPS required by flight time outside radio navaid coverage
 - Two IRS

Also refer to the Regional Supplementary Procedures (ICAO Doc 7030) for specific requirements in a particular airspace.

PROCEDURES

Manual selection of a required accuracy on the MCDU is optional.

- If manual entry of a required accuracy is desired, enter 10NM or use the radial equivalent to 10NM XTK accuracy, that is 12.2NM.

When leaving RNP-10 airspace, revert to the default required accuracy or enter the appropriate value.

- R — If one of the following MCDU or ECAM messages is displayed, check navigation with POSITION MONITOR page, ISDU or IRS 1(2)(3) pages, and GPS MONITOR page (if GPS installed) :
 - FMS1/FMS2 POS DIFF
 - CHECK IRS 1(2)(3)/FM POSITION
 - ECAM : FM/GPS POS DISAGREE (if GPS installed)
- Use the AP, with the navigation system checked correct.
- If unable to determine which system is correct, inform the ATC, and look for navaid raw data confirmation as soon as possible.

In inertial navigation, the RNP-10 capability is maintained for 5.7 hours, since the last radio update (according to FAA Notice 8400.12A), independently of the estimated accuracy displayed on the MCDU.

R **P-RNAV/RNP-1 TERMINAL PROCEDURES**

- R For terminal procedures requiring P-RNAV or RNP-1 capability, the flight crew can assume that the radio navaid coverage supports the RNP-1 accuracy. Otherwise, the procedure may specify that GPS equipment is required (refer to the published procedure chart). The minimum equipment required to fly a P-RNAV or RNP-1 procedure is :
- R — One RNAV system, which includes :
 - R · One FMGC
 - R · One MCDU
 - R · One GPS receiver, or one VOR and one DME, for FM navigation update*
 - R · One IRS, and
 - R · One FD in NAV mode.
- R — Flight Plan data displayed on both NDs.
- R *GPS may be required for RNP-1 terminal procedures.
- R For terminal procedures with legs below the MSA, or with legs that may not have sufficient radar coverage, two RNAV systems may be mandated by the procedure chart.

R **PROCEDURES**

- R The terminal procedure (RNAV SID, RNAV STAR, RNAV TRANSITION, ...) must be loaded from the FM navigation database and checked for reasonableness, by comparing the waypoints, tracks, distances and altitude constraints (displayed on the F-PLN page), with the procedure chart.
- R The flight crew must not modify the procedure, that is loaded from the navigation database, unless instructed to do so by the ATC (DIR TO, radar vectoring, insertion of waypoints loaded from the navigation database).

- R ● **If GPS is required for the P-RNAV/RNP-1 procedure :**
- R – Before starting the departure/approach procedure, check that GPS PRIMARY is
- R available (GPS PRIMARY displayed on the MCDU PROG page).
- R – If GPS PRIMARY is not available before starting the procedure, inform the ATC, and
- R request another departure/arrival procedure that does not require GPS.
- R – If GPS PRIMARY is lost while flying the procedure, inform the ATC of this loss of
- R capability, and follow ATC instructions.
- R ● **If GPS is NOT required for the P-RNAV/RNP-1 procedure :**
- R – Check that GPS PRIMARY is available (GPS PRIMARY displayed on the MCDU PROG
- R page).
- R IF GPS PRIMARY is not available :
- R – Crosscheck the FM position with the navaid raw data, before starting the procedure.
- R – Check or enter RNP-1 in the REQUIRED field of the MCDU PROG page, and check that
- R HIGH accuracy is available. When completing the terminal procedure, revert to the
- R default value or enter the appropriate value on the MCDU PROG page.
- R If one of the following messages appears, while flying the procedure :
- R – “NAV ACCUR DOWNGRAD” (on MCDU and ND) on both sides, or
- R – “FMS1/FMS2 POS DIFF” (on MCDU and ND), or
- R – “NAV FM/GPS POS DISAGREE” (on ECAM)
- R Then :
- R – Inform the ATC of the loss of P-RNAV/RNP-1 capability, and follow ATC instructions.
- R *Note : If the “NAV ACCUR DOWNGRAD” message is displayed on one side only,*
- R *navigation may be continued using the other FMGC.*

A318/A319/A320/A321 AEROFLOT Russian Airlines  FLIGHT CREW OPERATING MANUAL	SPECIAL OPERATIONS OPERATION ON NARROW RUNWAYS	2.04.60	P 1
		SEQ. 001	REV 35

GENERAL

A standard runway is 45 meters wide. Operations on runways less than 45 meters wide require authorization from the Airworthiness Authorities.

GENERAL

This chapter gives the limitations, procedures and performance for operations from/to runways with a width below 45 m.
This chapter does not constitute an operational approval to operate on narrow runways.
Such authorization must be obtained by the operator from the appropriate authorities.

LIMITATIONS

- **Minimum runway width** **30 m**
- The dispatch from/to narrow runways is not allowed in case of :
- Nose wheel steering inoperative
 - One brake or more inoperative
- Autoland is not allowed.

PROCEDURES

Diversion to a 45 m wide runway is recommended in case of :

- Rudder jam
- Rudder pedal jam
- Yaw damper fault
- All failures leading to the loss of the nose wheel steering (HYD Green system loss, double hydraulic failure, double BSCU fault, double LGCIU fault)

Maximum demonstrated crosswind for takeoff and landing :

- R — **Dry runway** **38 kt (gust included) for takeoff and landing**
- R — **Wet runway** **33 kt (gust included) for takeoff and landing**
- R — **Contaminated runway** **10 kt (gust included) for takeoff and landing**

Note : These maximum demonstrated crosswind values are based on the assumption that the crew have been trained accordingly.

Operations on icy runways have not been demonstrated.

PERFORMANCE

For runways with a width above or equal to 40 m., the basic takeoff performance remains unchanged.

R For runways with a width below 40 meters, the VMCG must be increased by the values
R indicated in the following table :

R

Runway Width	30 meters	35 meters	40 meters
△ VMCG (kt)	+ 2.5	+ 1.5	+ 0

No correction is required, when takeoff performance is determined by using the applicable approved data.

The minimum V1 values, published in the FCOM 2.02.25, must be increased by 3 kt. When using the takeoff performance for contaminated runways (FCOM 2.04.10), or the quick reference tables (FCOM 2.02.40), the resulting V1 must be crosschecked with the corrected minimum V1.

Further decrease the takeoff weight by 3 tons per knot increase in V1.

GENERAL

This chapter gives the limitations, procedures and performance for operations from/to runways with a width below 45 m.
This chapter does not constitute an operational approval to operate on narrow runways.
Such authorization must be obtained by the operator from the appropriate authorities.

LIMITATIONS

- **Minimum runway width** **30 m**
- The dispatch from/to narrow runways is not allowed in case of :
- Nose wheel steering inoperative
 - One brake or more inoperative
- Autoland is not allowed.

PROCEDURES

Diversion to a 45 m wide runway is recommended in case of :

- Rudder jam
- Rudder pedal jam
- Yaw damper fault
- All failures leading to the loss of the nose wheel steering (HYD Yellow system loss, double hydraulic failure, double BSCU fault, double LGCIU fault)

Maximum demonstrated crosswind for takeoff and landing :

- R — **Dry runway** **38 kt (gust included) for takeoff and landing**
- R — **Wet runway** **33 kt (gust included) for takeoff and landing**
- R — **Contaminated runway** **10 kt (gust included) for takeoff and landing**

Note : These maximum demonstrated crosswind values are based on the assumption that the crew have been trained accordingly.

Operations on icy runways have not been demonstrated.

PERFORMANCE

For runways with a width above or equal to 40 m., the basic takeoff performance remains unchanged.

R For runways with a width below 40 meters, the VMCG must be increased by the values
R indicated in the following table :

R

Runway Width	30 meters	35 meters	40 meters
△ VMCG (kt)	+ 2.5	+ 1.5	+ 0

No correction is required, when takeoff performance is determined by using the applicable approved data.

The minimum V1 values, published in the FCOM 2.02.25, must be increased by 3 kt.
When using the takeoff performance for contaminated runways (FCOM 2.04.10), or the quick reference tables (FCOM 2.02.40), the resulting V1 must be crosschecked with the corrected minimum V1.

Further decrease the takeoff weight by 3 tons per knot increase in V1.

GENERAL

Some airlines may occasionally experience high barometric correction settings above 1050 hPa, or 31.0 InHg on some airfields, due to polar anticyclonic air mass conditions occurring near the polar area during winter.

The FCU, PFD, and CPCS are capable of operating at QNH/QFE up to 1100 hPa, or 32.48 InHg.

R The FMGS is currently limited to 1050 hPa for DEST QNH entry on the MCDU PERF APPR
R page (i.e. as long as the aircraft altitude remains above –1000 feet standard pressure
R altitude).

R When the Standard Pressure altitude becomes less than –1000 feet STD, the FMS is no
R longer capable to compute the aircraft position.

The standby altimeter barometric setting is also limited to 1050 hPa. In addition, the ATC/TCAS operates only up to 1050 hPa (that is as long as the aircraft altitude remains above –1000 feet standard pressure altitude).

Therefore, when using QNH, or QFE for QFE pin-programmed aircraft, for departure and arrival, the crew should be aware of the following consequences, and should apply the following procedures.

It is necessary for the airline to obtain operational approval from its national airworthiness authorities.

CONSEQUENCES

On the ATC-TCAS :

For takeoff, approach and landing, the ATC altitude reporting and the TCAS TA/RA function may generate erroneous altitude information and nuisance TCAS alerts for other aircraft, if the aircraft standard altitude is below –1000 feet standard pressure altitude.

To avoid this, it is recommended to set ALT RPTG to OFF when the QNH exceeds 1050 hPa, and to inform the ATC. As a consequence the TCAS reverts to STBY mode.

On the standby altimeter :

The barometric setting of the standby altimeter is limited to 1050 hPa. When operating with QNH above 1050 hPa, the crew shall use the Standby Altitude Correction table (refer to the table in this chapter) for altitude crosschecks between the PFD and the standby altimeter.

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On cabin pressurization :

The CPCS normally uses the MCDU DEST QNH value to regulate cabin pressure during descent. However, since DEST QNH entries on the MCDU are limited to 1050 hPa, no DEST QNH value should be entered during descent preparation, in order to avoid incorrect cabin pressure regulation. As a backup, the CPCS will use the actual FCU barometric setting (when switching from STD to Baro reference).

In case of QFE use at arrival, the CPCS will erroneously use the FCU-selected QFE as a QNH setting. To ensure correct re-pressurization of the cabin when QFE is used, the Landing Field Elevation must be manually set to 0.

Note : As no DEST QNH is entered, the FMS initially assumes that Standard barometric reference will be kept down to destination for descent flight path calculations. When QNH is set on the FCU, the aircraft and cabin altitude will be higher than expected (the aircraft altitude can be up to 2000 feet higher than expected). This will lead to a higher descent rate, with a possible “CAB PR LO DIFF PR” ECAM caution, and possible opening of the cabin pressure safety valve.

On the FMS :

Descent profile :

In the descent phase, when the crew switches from Standard to Barometric reference, the FMS tries to catch up with an altitude increase induced by the baro reference change. This altitude difference may be up to + 2000 feet, depending on the QNH value. However, the FMS predictions and the VDEV remain unchanged. Consequently, an altitude constraint, just below the Descent Transition Level, may still be predicted as “satisfied”, and actually flown with a positive error. This altitude difference will gradually be zeroed, as the aircraft catches up with the descent profile.

Note : As no DEST QNH value is entered on the MCDU PERF APPR page, the FMS is unable to compute the Descent Transition Level. So, the “STD” baro reference on the PFD will not flash when descending through the Transition Level.

Approach :

R When the Standard Pressure altitude becomes less than –1000 feet STD, the FMS is no
R longer capable to compute the aircraft position. The associated ND display (in ARC or
R NAV mode) will subsequently be invalidated.
R Therefore, non-precision approaches must not be performed using managed guidance.
R The flight crew must perform non-precision approaches using selected lateral and vertical
R guidance, and raw data reference.

STANDBY ALTITUDE CORRECTION

The Standby Altitude Correction table below provides the baro setting that should be used on the standby altimeter, and the correction that should be applied to the altimeter indications, for each QNH between 1050 hPa and 1100 hPa :

Actual QNH (hPa)	Stdby baro setting (hPa)	Correction (feet)		Actual QNH (hPa)	Stdby baro setting (hPa)	Correction (feet)
1050	1050	0		1076	1049	700
1051	1047	100		1077	1046	800
1052	1048	100		1078	1047	800
1053	1049	100		1079	1048	800
1054	1046	200		1080	1049	800
1055	1047	200		1081	1046	900
1056	1048	200		1082	1047	900
1057	1049	200		1083	1048	900
1058	1046	300		1084	1049	900
1059	1047	300		1085	1047	1000
1060	1048	300		1086	1048	1000
1061	1049	300		1087	1049	1000
1062	1047	400		1088	1050	1000
1063	1048	400		1089	1047	1100
1064	1049	400		1090	TBD	TBD
1065	1050	400		1091	TBD	TBD
1066	1047	500		1092	TBD	TBD
1067	1048	500		1093	TBD	TBD
1068	1049	500		1094	TBD	TBD
1069	1050	500		1095	TBD	TBD
1070	1047	600		1096	TBD	TBD
1071	1048	600		1097	TBD	TBD
1072	1049	600		1098	TBD	TBD
1073	1050	600		1099	TBD	TBD
1074	1047	700		1099	TBD	TBD
1075	1048	700		1100	TBD	TBD

How to use :

Set the baro reference of the standby altimeter to the appropriate value. Then :

- To obtain the correct altitude, add the correction to the altimeter indication.
- To fly at a desired altitude, subtract the correction from the desired altitude.

Example :

If the QNH of the day is 1072 hPa, the baro setting on the standby altimeter would be 1049 hPa. When reading an altitude on the standby altimeter, it is necessary to add 600 feet to obtain the actual altitude of the aircraft.

Therefore, in this example, the indicated altitude on the standby altimeter should be 1400 feet, in order to fly at 2000 feet QNH.

PROCEDURES

For Departure :

- Before takeoff :
 - SET the appropriate standby altimeter baro reference (refer to the table in this chapter).
 - SET the ATC "ALT RPTG" to OFF (the TCAS reverts to STBY mode).
 - INFORM the ATC
- After takeoff :
 - SET the "ALT RPTG" to ON above 1000 feet QNH, when time permits.
 - USE the correction value for altitude readings on the standby altimeter.

For Approach/Landing :

- During descent preparation :
 - DO NOT INSERT a DEST QNH value on the MCDU PERF APPR page.
 - For QFE use only, SET the LDG ELEV selector to 0.
- When approaching the transition level :
 - SET the appropriate standby altimeter baro reference (refer to the table in this chapter).
 - USE the correction value for altitude readings on the standby altimeter.
- Before the final approach :
 - SET the ATC "ALT RPTG" to OFF (the TCAS reverts to STBY mode).
 - INFORM the ATC.

R **For non-precision approaches :**

- R — Perform non-precision approaches using selected lateral and vertical guidance, and raw
- R data reference.

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INTRODUCTION

Use this flight planning chapter when no precalculated flight plan is available.

It contains the following general graphs and tables :

- Maximum and optimum cruise altitudes for M.78 and long range speed
- Optimum altitude on short stage
- Ground mile to air mile conversion for M.78 and long range speed

The integrated range method includes the following tables :

- Integrated cruise tables for M.78 for flight levels from FL290 to FL390,
- Integrated cruise tables for long range speed for flight levels from FL100 to FL390,
- Climb, step climb and descent correction tables.

These tables allow the flight planning to be done segment by segment.

Chapter 2.05.15 contains calculation tables and a comprehensive example to show how to use them.

The quick determination method is shown in chapter 2.05.40 for M.78 and long range speed.

MINIMUM RECOMMENDED FUEL REQUIREMENTS

The total fuel quantity required to fly a given sector is the sum of the following quantities:

TAXI FUEL

Quantity required for startup and taxi. Fuel calculation is based on a consumption of

11.5 kg/min or **25 lb/min**

Average quantity (12 minutes) → **140 kg** or **300 lb**

TRIP FUEL

Fuel required from departure to destination includes the following quantities:

- Takeoff and climb at selected speed.
- Cruise at selected speed.
- Descent from cruising level to 1500 feet above destination airport.
- Approach and landing. Fuel calculation is based on a consumption of

20 kg/min or **45 lb/min**.

Average quantity (6 minute IFR) → **120 kg** or **270 lb**

RESERVE FUEL

This quantity includes :

“En Route” reserve fuel (contingency fuel)

- According to national regulations and company policy (generally based on a percentage of trip fuel).

Alternate fuel

- Fuel required to fly from destination to alternate airport.
 It includes go-around **100 kg** or **220 lb** , climb to cruising level, cruise at long range speed, descent and approach procedure.

80 kg or 180 lb for 4 minute VFR

Holding Fuel

Calculation of holding fuel should take into account the altitude of the alternate and the landing weight at the alternate, using holding charts of chapter 3.05.25.

A conservative quantity corresponding to a 30 minute holding at 1500 feet above alternate airport elevation at “green dot” speed in the clean configuration is

1200 kg or **2700 lb** .

APU FUEL

During ground operations, APU fuel consumption is about **130 kg/h** or **290 lb/h** (Packs ON, 90 kVA load on APU GEN).

INTRODUCTION

Use this flight planning chapter when no precalculated flight plan is available.

It contains the following general graphs and tables :

- Maximum and optimum cruise altitudes for M.78 and long range speed
- Optimum altitude on short stage
- Ground mile to air mile conversion for M.78 and long range speed

The integrated range method includes the following tables :

- Integrated cruise tables for M.78 for flight levels from FL290 to FL390,
- Integrated cruise tables for long range speed for flight levels from FL100 to FL390,
- Climb, step climb and descent correction tables.

These tables allow the flight planning to be done segment by segment.

Chapter 2.05.15 contains calculation tables and a comprehensive example to show how to use them.

The quick determination method is shown in chapter 2.05.40 for M.78 and long range speed.

MINIMUM RECOMMENDED FUEL REQUIREMENTS

The total fuel quantity required to fly a given sector is the sum of the following quantities:

TAXI FUEL

Quantity required for startup and taxi. Fuel calculation is based on a consumption of

13.5 kg/min or **30 lb/min**

Average quantity (12 minutes) → **160 kg** or **360 lb**

TRIP FUEL

Fuel required from departure to destination includes the following quantities :

- Takeoff and climb at selected speed.
- Cruise at selected speed.
- Descent from cruising level to 1500 feet above destination airport.
- Approach and landing. Fuel calculation is based on a consumption of

23 kg/min or **50 lb/min** .

Average quantity (6 minute IFR) → **140 kg** or **310 lb**

RESERVE FUEL

This quantity includes :

“En Route” reserve fuel (contingency fuel)

- According to national regulations and company policy (generally based on a percentage of trip fuel).

Alternate fuel

- Fuel required to fly from destination to alternate airport
It includes go-around **120 kg** or **270 lb** , climb to cruising level, cruise at long range speed, descent and approach procedure.

100 kg or 220 lb for 4 minute VFR

Holding Fuel

Calculation of holding fuel should take into account the altitude of the alternate and the landing weight at the alternate, using holding charts of chapter 3.05.25.

A conservative quantity corresponding to a 30 minute holding at 1500 feet above alternate airport elevation at green dot speed in the clean configuration is

1450 kg or **3200 lb** .

APU FUEL

During ground operations, APU fuel consumption is about **130 kg/h** or **290 lb/h** (Packs ON, 90 kVA load on APU GEN).

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INTRODUCTION

Use this flight planning chapter when no precalculated flight plan is available.

It contains the following general graphs and tables :

- Maximum and optimum cruise altitudes for M.78 and long range speed
- Optimum altitude on short stage
- Ground mile to air mile conversion for M.78 and long range speed

The integrated range method includes the following tables :

- Integrated cruise tables for M.78 for flight levels from FL290 to FL390,
- Integrated cruise tables for long range speed for flight levels from FL100 to FL390,
- Climb, step climb and descent correction tables.

These tables allow the flight planning to be done segment by segment.

Chapter 2.05.15 contains calculation tables and a comprehensive example to show how to use them.

The quick determination method is shown in chapter 2.05.40 for M.78 and long range speed.

MINIMUM RECOMMENDED FUEL REQUIREMENTS

The total fuel quantity required to fly a given sector is the sum of the following quantities:

TAXI FUEL

Quantity required for startup and taxi. Fuel calculation is based on a consumption of

10 kg/min or **22 lb/min**

Average quantity (12 minutes) → **120 kg** or **265 lb**

TRIP FUEL

Fuel required from departure to destination includes the following quantities :

- Takeoff and climb at selected speed.
- Cruise at selected speed.
- Descent from cruising level to 1500 feet above destination airport.
- Approach and landing. Fuel calculation is based on a consumption of

17 kg/min or **40 lb/min**.

Average quantity (6 minute IFR) → **110 kg** or **240 lb**

RESERVE FUEL

This quantity includes :

“En Route” reserve fuel (contingency fuel)

- According to national regulations and company policy (generally based on a percentage of trip fuel).

Alternate fuel

- Fuel required to fly from destination to alternate airport.

It includes go-around **80 kg** or **180 lb** , climb to cruising level, cruise at long range speed, descent and approach procedure.

60 kg or 140 lb for 4 minute VFR

Holding Fuel

Calculation of holding fuel should take into account the altitude of the alternate and the landing weight at the alternate, using holding charts of chapter 3.05.25.

A conservative quantity corresponding to a 30 minute holding at 1500 feet above alternate airport elevation and “green dot” speed in the clean configuration is

1150 kg or **2600 lb** .

APU FUEL

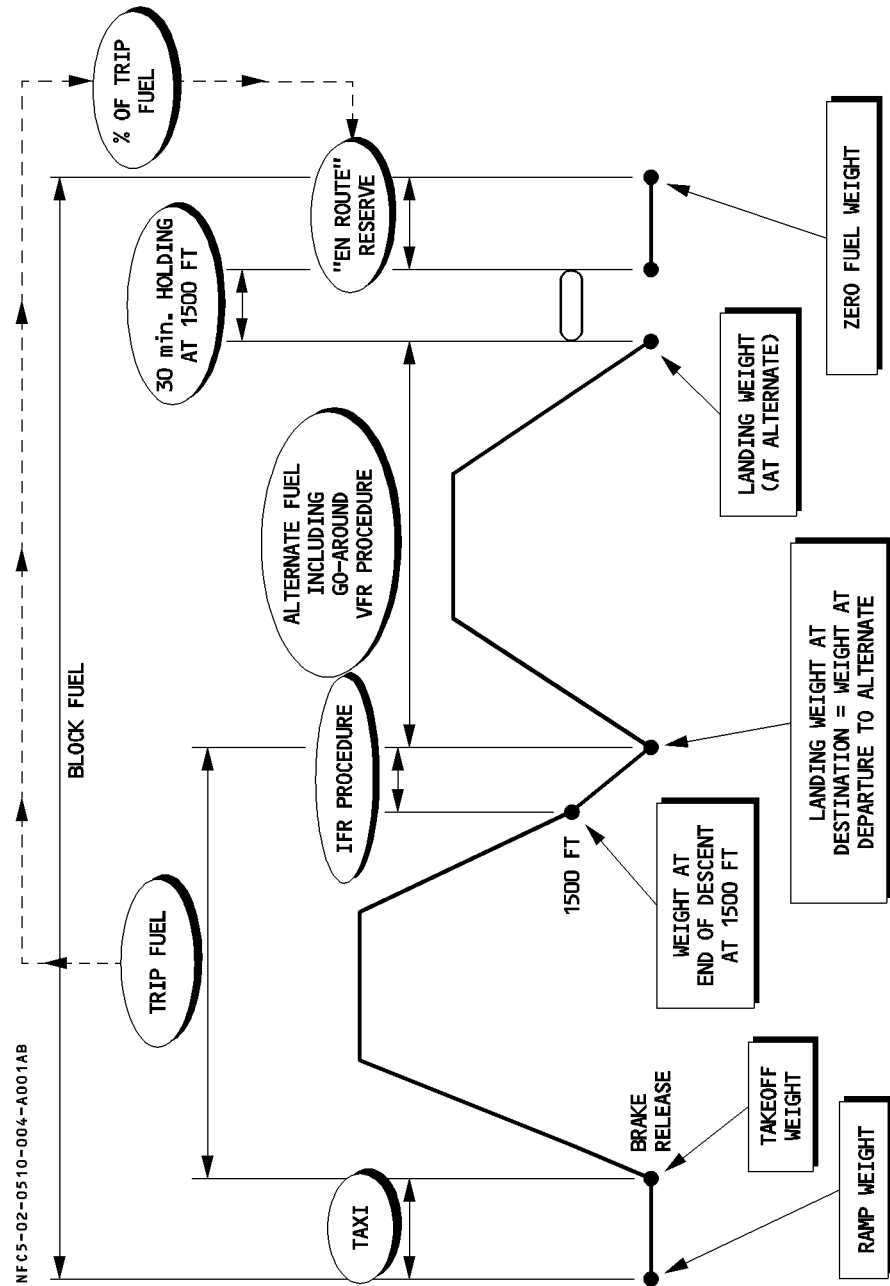
During ground operations, APU fuel consumption is about **130 Kg/h** or **290 lb/h** (Packs on, 90 KVA load on APU GEN).

FLIGHT PLAN

When no precalculated flight plan is available, flight planning can be determined by using the tables given in this chapter.

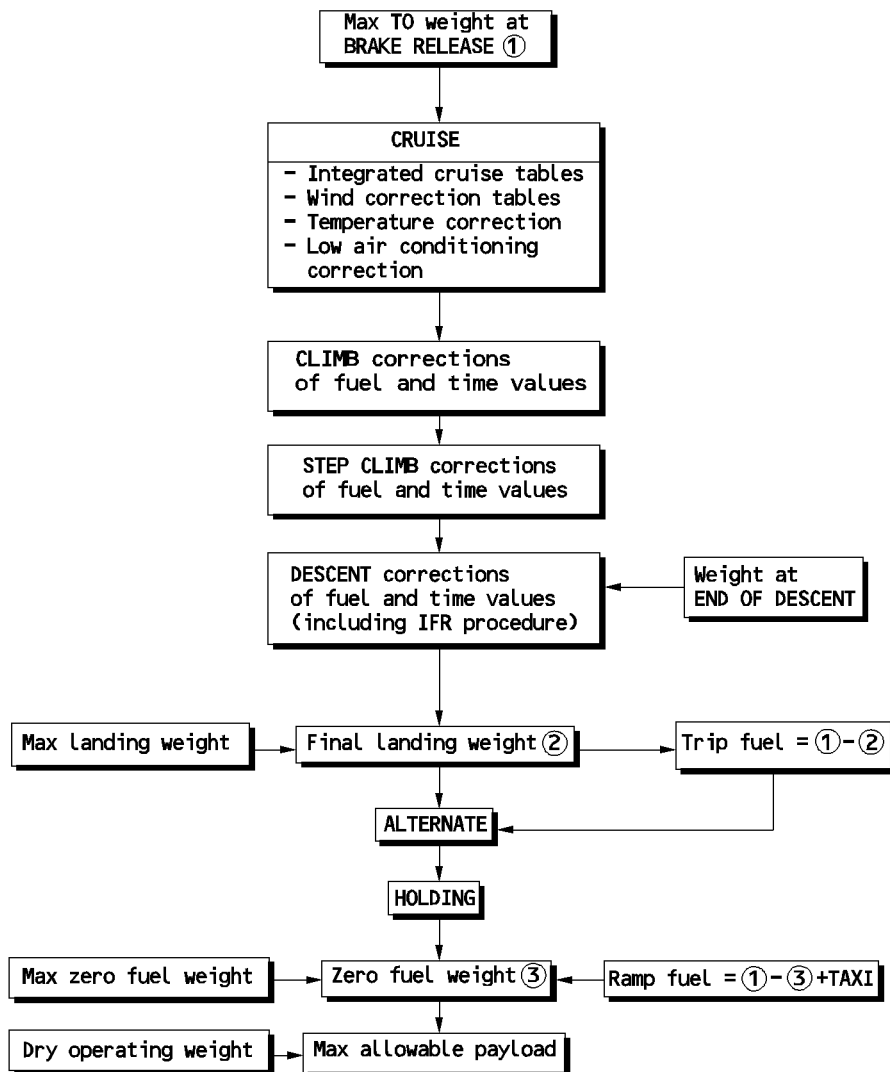
Fuel policy will be the same as for precalculated flight plan.

The graph on the following page defines the different terms used in this chapter.



GENERAL

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	CALCULATION TABLES		SEQ 020	REV 24

The following tables can be used for the flight planning.

The first table allows the planner to calculate fuel and time during cruise, with a possible step climb (see p 3).

The second table shows the fuel and time planning for the whole flight plan (see p 4).

At the end of the section an example shows how to use both tables for a given mission.

Following tables have been calculated using databases for CFM 56–5–B /P SAC. If the engines fitted on the aircraft are not /P, the fuel consumption has to be increased by 3 %.

Note : – Differences in fuel consumption during step climb sections will be taken into account in the calculation table of page 4.

– To find optimum aircraft weight to proceed to next flight level (4000 feet step) (Refer to 2.05.20 p 2).

– Integrated cruise tables are established for ISA conditions only. Corrections due to differences from ISA temperature are included in the calculation table of page 4.

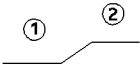
– Overhead departure weight is assumed to be equal to weight at brake release.

– Overhead destination weight must be entered in the calculation table of page 4.

CALCULATION TABLE

MACHNUMBER	
INITIAL FLIGHT LEVEL:	
GROUND DISTANCE:	
WIND ('-' HEAD/'+' TAIL):	
AIR DISTANCE:	

FLIGHT PROFILE



FL:

OVERHEAD DEPARTURE
WEIGHT:
DISTANCE:
TIME:

START OF STEP CLIMB
WEIGHT:
DISTANCE:
TIME:

1

FUEL:
DISTANCE:
TIME:
REMAINING DISTANCE:

FL:

BEGIN OF FINAL CRUISE SEGMENT
WEIGHT:
DISTANCE:
TIME:

OVERHEAD DESTINATION
WEIGHT:
DISTANCE:
TIME:

2

FUEL:
DISTANCE:
TIME:
REMAINING DISTANCE:

REMAINING DISTANCE:

TOTAL VALUES	
WEIGHT OVERHEAD DEPARTURE:	
WEIGHT OVERHEAD DESTINATION:	
FUEL:	
TIME:	

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1	(1) Max TO Weight at BRAKE RELEASE	▼	▶				•	
2	WEIGHT Overhead Destination		▶				•	
3	– Temperature Correction for CRUISE		–				•	
4	+ Correction for Low Air Conditioning		+				•	
5	– CLIMB correction		–				•	
6	+ TO Altitude correction		+				•	
7	– STEP CLIMB correction		–				•	
8	= Corrected Weight Overhead Destination		=				•	
9	+ DESCENT correction (including 6 min IFR)		+				•	
10	(2) Landing Weight at Destination		=				•	
11	– ALTERNATE Fuel		–				•	
12	= ALTERNATE Landing Weight		=				•	
13	– HOLDING		–				•	
14	= Weight at END OF HOLDING		=				•	
15	TRIP FUEL (1) – (2)				•			//////////
16	– “En Route” Reserve		–				•	
17	(3) ZERO FUEL WEIGHT		=				•	
18	– OPERATING WEIGHT EMPTY		–				•	
19	= Max Allowable Payload		=				•	

BLOCK FUEL CALCULATION								
20	Required Fuel (1) – (3)		▶				•	
21	+ Taxi		+				•	
22	= Block Fuel		=				•	

FLIGHT TIME CALCULATION (H. MIN)								
23	Time from integrated Cruise Tables		▶				•	
24	+ CLIMB Correction		+				•	
25	+ DESCENT Correction (including 6 min IFR)		+				•	
26	= Flight Time		=				•	

Note : Line 3 : temperature correction :

$0.015 \text{ (kg/}^{\circ}\text{C/NM)} \times \Delta\text{ISA (}^{\circ}\text{C)} \times \text{air distance (NM)}$ or
 $0.033 \text{ (lb/}^{\circ}\text{C/NM)} \times \Delta\text{ISA (}^{\circ}\text{C)} \times \text{air distance (NM)}$

Line 6 : TO altitude correction :

$0.5 \text{ (kg/1000 kg/1000 ft)} \times \text{TOW (1000 kg)} \times \text{airport elevation (1000 ft)}$ or
 $0.5 \text{ (lb/1000 lb/1000 ft)} \times \text{TOW (1000 lb)} \times \text{airport elevation (1000 ft)}$

Line 10 : Check that landing weight at destination is lower than maximum landing weight.

Line 17 : Check that the zero fuel weight is lower than maximum zero fuel weight.

Line 22 : Check that the block fuel value is lower than maximum tank capacity.

Example

DATA

- TO weight : 80000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (head wind)
- Selected initial FL : 350
- Mach number : M.78
- Temperature : ISA + 10

DETERMINATION OF CRUISE FUEL AND TIME

- A : Enter the chosen flight Mach number, flight level, ground distance to be covered and forecast windspeed in the calculation table of page 7.
 Calculate the air distance (see 2.05.60 P 2)
 here : M.78, 50 kt head wind, 2000 NM ground distance
 → air distance : 2248 NM

CRUISE TABLE FL350

- B : Read from integrated cruise table (M.78, FL350) the values for time and distance for a weight of 80000 kg (see 2.05.30 P 5) :
 → distance : 5787 NM → time : 772 min
- R C : Read from 2.05.20 P 1 the value for the optimum aircraft weight to proceed to FL390 → 68000 kg
- D : Enter integrated cruise table (M.78, FL350) and read the values for a weight of 68000 kg (begin of first step climb)
 → distance : 3811 NM → time : 509 min
- E : Calculate the values for the first cruise segment :
 Fuel : 80000 – 68000 = 12000 kg
 Distance : 5787 – 3811 = 1976 NM
 Time : 772 – 509 = 263 min
 Remaining distance : 2248 – 1976 = 272 NM

CRUISE TABLE FL390

- F

:

Read from integrated cruise table (M.78, FL390) the values for time and distance for the weight of 68000 kg (2.05.30 P 7)
- R

→ distance : 4069 NM → time : 546 min
- R

G : Subtract remaining distance : 4069 – 272 = 3797 NM
- R

H : Interpolate in integrated cruise table (M.78, FL390) the weight and time values corresponding to the distance of 3797 NM
- R

→ weight : 66478 kg → time : 509 min
- I

:

Calculate values for the second cruise segment :
- R

Fuel : 68000 – 66478 = 1522 kg
- R

Distance : 4069 – 3797 = 272 NM
- R

Time : 546 – 509 = 37 min
- Crosscheck that remaining air distance equals zero.
- J

:

Fill in the final table with weight overhead departure (80000 kg) and weight overhead destination (66478 kg).
- R
- K

:

Calculate total values :
- R

Fuel : 80000 – 66478 = 13522 kg
- R

Time : 263 + 37 = 300 min = 5 h 00 min

Example

DATA

- TO weight : 72000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (head wind)
- Selected initial FL : 350
- Mach number : M.78
- Temperature : ISA + 10

DETERMINATION OF CRUISE FUEL AND TIME

- A : Enter the chosen flight Mach number, flight level, ground distance to be covered and forecast windspeed in the calculation table of page 7.
 Calculate the air distance (see 2.05.60 P 2)
 here : M.78, 50 kt head wind, 2000 NM ground distance
 → air distance : 2248 NM

CRUISE TABLE FL350

- B : Read from integrated cruise table (M.78, FL350) the values for time and distance for a weight of 72000 kg (see 2.05.30 P 5) :
 → distance : 5599 NM → time : 747 min
- R C : Read from 2.05.20 P 1 the value for the optimum aircraft weight to proceed to
 R FL390 → 62000 kg
- R D : Enter integrated cruise table (M.78, FL350) and read the values for a weight of
 R 62000 kg (begin of first step climb)
 R → distance : 3759 NM → time : 502 min
- E : Calculate the values for the first cruise segment :
- R Fuel : 72000 – 62000 = 10000 kg
- R Distance : 5599 – 3759 = 1840 NM
- R Time : 747 – 502 = 245 min
- R Remaining distance : 2248 – 1840 = 408 NM

CRUISE TABLE FL390

- F : Read from integrated cruise table (M.78, FL390) the values for time and distance for the weight of 62000 kg (2.05.30 P 7)
- R → distance : 4050 NM → time : 543 min
- R G : Subtract remaining distance : 4050 – 408 = 3642 NM
- H : Interpolate in integrated cruise table (M.78, FL390) the weight and time values corresponding to the distance of 3642 NM
→ weight : 60000 kg → time : 489 min
- I : Calculate values for the second cruise segment :
- R Fuel : 62000 – 60000 = 2000 kg
- R Distance : 4050 – 3642 = 408 NM
- R Time : 543 – 489 = 54 min
- Crosscheck that remaining air distance equals zero.
- J : Fill in the final table with weight overhead departure (72000 kg) and weight overhead destination (60000 kg).
- K : Calculate total values :
- R Fuel : 72000 – 60000 = 12000 kg
- R Time : 245 + 54 = 299 min = 4 h 59 min

Example

DATA

- TO weight : 72000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (head wind)
- Selected initial FL : 350
- Mach number : M.78
- Temperature : ISA + 10

DETERMINATION OF CRUISE FUEL AND TIME

A : Enter the chosen flight Mach number, flight level, ground distance to be covered and forecast windspeed in the calculation table of page 7.
 Calculate the air distance (see 2.05.60 P 2)
 here : M.78, 50 kt head wind, 2000 NM ground distance
 → air distance : 2248 NM

CRUISE TABLE FL350

B : Read from integrated cruise table (M.78, FL350) the values for time and distance for a weight of 72000 kg (see 2.05.30 P 5) :
 → distance : 6601 NM → time : 881 min

R C : Read from 2.05.20 P 1 the value for the optimum aircraft weight to proceed to
 R FL390 → 62000 kg

R D : Enter integrated cruise table (M.78, FL350) and read the values for a weight of
 R 62000 kg (begin of first step climb)
 R → distance : 4734 NM → time : 632 min

E : Calculate the values for the first cruise segment :

R Fuel : 72000 – 62000 = 10000 kg
 R Distance : 6601 – 4734 = 1867 NM
 R Time : 881 – 632 = 249 min
 R Remaining distance : 2248 – 1867 = 381 NM

CRUISE TABLE FL390

F : Read from integrated cruise table (M.78, FL390) the values for time and distance for the weight of 62000 kg (2.05.30 P 7)

→ distance : 5139 NM → time : 689 min

G : Subtract remaining distance : 5139 – 381 = 4758 NM

H : Interpolate in integrated cruise table (M.78, FL390) the weight and time values corresponding to the distance of 4758 NM

→ weight : 60122 kg → time : 638 min

I : Calculate values for the second cruise segment :

Fuel : 62000 – 60122 = 1878 kg

Distance : 5139 – 4758 = 381 NM

Time : 689 – 638 = 51 min

Crosscheck that remaining air distance equals zero.

J : Fill in the final table with weight overhead departure (72000 kg) and weight overhead destination (60122 kg).

K : Calculate total values :

Fuel : 72000 – 60122 = 11878 kg

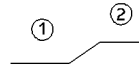
Time : 249 + 51 = 300 min = 5 h 00 min

R

CALCULATION TABLE

MACHNUMBER	0.78
INITIAL FLIGHT LEVEL:	350
GROUND DISTANCE:	2000 NM
WIND ('-' HEAD/'+' TAIL):	- 50 Kt
AIR DISTANCE:	2248 NM

FLIGHT PROFILE



FL: 350

OVERHEAD DEPARTURE	
WEIGHT:	80000 Kg
DISTANCE:	5787 NM
TIME:	772 Min

START OF STEP CLIMB	
WEIGHT:	6800 Kg
DISTANCE:	3811 NM
TIME:	509 Min

1

FUEL:	12000 Kg
DISTANCE:	1976 NM
TIME:	272 Min
REMAINING DISTANCE:	272 NM

FL: 390

BEGIN OF FINAL CRUISE SEGMENT	
WEIGHT:	68000 Kg
DISTANCE:	4069 NM
TIME:	546 Min

OVERHEAD DESTINATION	
WEIGHT:	66478 Kg
DISTANCE:	3797 NM
TIME:	509 Min

2

FUEL:	1522 Kg
DISTANCE:	272 NM
TIME:	37 Min
REMAINING DISTANCE:	0 NM

REMAINING DISTANCE: 272 NM

TOTAL VALUES	
WEIGHT OVERHEAD DEPARTURE:	80000 Kg
WEIGHT OVERHEAD DESTINATION:	66478 Kg
FUEL:	13522 Kg
TIME:	300 Min

NFCS-02-0515-007-A165AA

DATA

- TO weight : 80000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (headwind)
- Selected first flight level : FL350
- M.78
- Temperature : ISA + 10 along the whole flight profile
- Airport elevation : 1500 ft
- Normal air conditioning

STEPS :

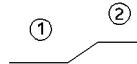
- 1 : Fill in Max TO weight → 80000 kg
- 2 : Enter the integrated cruise table corresponding to the chosen FL with TO weight at brake release point and calculate weight overhead destination. (See 2.05.15 P 7). Fill in → 66478 kg
- 3 : Apply temperature correction for given air distance :
 $2248 \text{ NM} \times 10^{\circ}\text{C} \times 0.015 \text{ kg}/^{\circ}\text{C}/\text{NM} = 337 \text{ kg}$
- 4 : Correction for low air conditioning → here = 0
- 5 : Subtract climb correction for chosen FL (see 2.05.30 P 23) → 1200 kg
- 6 : Add TO altitude correction $0.5 \times 80 \times 1.5 = 60 \text{ kg}$ (enter 100 kg into table)
- 7 : Subtract value for step climb correction : 70 kg (enter 100 kg into table)
- 8 : Calculate corrected weight overhead destination → 64800 kg
- 9 : Enter weight overhead destination and find descent correction (including 6 min IFR) (see 2.05.30 P 24) → 300 kg
- 10 : Calculate landing weight at destination → 65100 kg
- R 11 : Subtract alternate fuel, e.g. : 100 NM at FL100
 (see 2.05.50 P 2) → 1093 kg
- R Landing weight at alternate → $65100 - 1093 = 64007 \text{ kg}$
- R Correction due to deviation from reference landing weight at alternate (see 2.05.50 p 2) → $5 \times (64.0 - 60) = 20 \text{ kg}$
- R Corrected alternate fuel → 1113 kg
- 12 : Calculate alternate landing weight → 64000 kg
- R 13 : Subtract holding fuel (Refer to 3.05.25) → 1241 kg
- R 14 : Calculate weight at end of holding → 62700 kg
- 15 : Calculate trip fuel → 14900 kg
- 16 : Subtract "En Route" reserve (standard amount is 5 % of trip fuel) → 745 kg
- R 17 : Calculate zero fuel weight → 61900 kg
- 18-19 : Subtract dry operating weight to obtain maximum allowable payload.
- R 20-22 : Calculate ramp fue (see 2.05.10 p 2 for taxi fuel).
- R 23-26 : Calculate flight time (see 2.05.15 P 7, 2.05.30 P 23, 2.05.30 P 24).

R

CALCULATION TABLE

MACHNUMBER	0.78
INITIAL FLIGHT LEVEL:	350
GROUND DISTANCE:	2000 NM
WIND ('-' HEAD/'+' TAIL):	-50 KT
AIR DISTANCE:	2248 NM

FLIGHT PROFILE



FL: 350

OVERHEAD DEPARTURE	
WEIGHT:	72000 Kg
DISTANCE:	5599 NM
TIME:	747 Min

START OF STEP CLIMB	
WEIGHT:	62000 Kg
DISTANCE:	3759 NM
TIME:	502 Min

1

FUEL:	10000 Kg
DISTANCE:	1840 NM
TIME:	245 Min
REMAINING DISTANCE:	408 NM

FL: 390

BEGIN OF FINAL CRUISE SEGMENT	
WEIGHT:	62000 Kg
DISTANCE:	4050 NM
TIME:	543 Min

OVERHEAD DESTINATION	
WEIGHT:	60000 Kg
DISTANCE:	3642 NM
TIME:	489 Min

2

FUEL:	2000 Kg
DISTANCE:	408 NM
TIME:	54 Min
REMAINING DISTANCE :	0 NM

REMAINING DISTANCE: 408 NM

TOTAL VALUES	
WEIGHT OVERHEAD DEPARTURE:	72000 Kg
WEIGHT OVERHEAD DESTINATION:	60000 Kg
FUEL:	12000 Kg
TIME:	299 Min

NFC5-02-0515-007-A180AA

DATA

- TO weight : 72000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (headwind)
- Selected first flight level : FL350
- M.78
- Temperature : ISA + 10 along the whole flight profile
- Airport elevation : 1500 ft
- Normal air conditioning

STEPS :

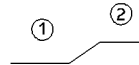
- 1 : Fill in Max TO weight → 72000 kg
- 2 : Enter the integrated cruise table corresponding to the chosen FL with TO weight at brake release point and calculate weight overhead destination. (See 2.05.15 P 7). Fill in → 60000 kg
- 3 : Apply temperature correction for given air distance :
 $2248 \text{ NM} \times 10^{\circ}\text{C} \times 0.015 \text{ kg}/^{\circ}\text{C}/\text{NM} = 337 \text{ kg}$ (enter 400 kg into table)
- 4 : Correction for low air conditioning → here = 0
- 5 : Subtract climb correction for chosen FL (see 2.05.30 P 23) → 1000 kg
- 6 : Add TO altitude correction $0.5 \times 72 \times 1.5 = 54 \text{ kg}$ (enter 0.1 into table)
- 7 : Subtract value for step climb correction : 50 kg (enter 0.1 into table)
- 8 : Calculate corrected weight overhead destination → 58600 kg
- 9 : Enter weight overhead destination and find descent correction (including 6min IFR) (see 2.05.30 P 24) → 200 kg
- 10 : Calculate landing weight at destination → 58800 kg
- R 11 : Subtract alternate fuel, e.g. : 100 NM at FL100
 (see 2.05.50 P 2) → 986 kg
- R Landing weight at alternate → $58800 - 986 = 57814 \text{ kg}$
- R Correction due to deviation from reference landing weight at alternate (see 2.05.50 p 2) → $6 \times (57.8 - 55) = 16.8 \text{ kg}$
- R Corrected alternate fuel → 1003 kg
- 12 : Calculate alternate landing weight → 57800 kg
- R 13 : Subtract holding fuel (Refer to 3.05.25) → 1094 kg
- R 14 : Calculate weight at end of holding → 56700 kg
- 15 : Calculate trip fuel → 13200 kg
- 16 : Subtract "En Route" reserve (standard amount is 5 % of trip fuel) → 660 kg
- R 17 : Calculate zero fuel weight → 56000 kg
- 18-19 : Subtract dry operating weight to obtain maximum allowable payload.
- R 20-22 : Calculate ramp fue (see 2.05.10 P 2 for taxi fuel).
- R 23-26 : Calculate flight time (see 2.05.15 P 7, 2.05.30 P 23, 2.05.30 P 24).

R

CALCULATION TABLE

MACHNUMBER	0.78
INITIAL FLIGHT LEVEL:	350
GROUND DISTANCE:	2000 NM
WIND ('-' HEAD/'+' TAIL):	-50 KT
AIR DISTANCE:	2248 NM

FLIGHT PROFILE



FL: 350

OVERHEAD DEPARTURE	
WEIGHT:	72000 Kg
DISTANCE:	6601 NM
TIME:	881 Min

START OF STEP CLIMB	
WEIGHT:	62000 Kg
DISTANCE:	4734 NM
TIME:	632 Min

1

FUEL:	10000 Kg
DISTANCE:	1867 NM
TIME:	249 Min
REMAINING DISTANCE:	381 NM

FL: 390

BEGIN OF FINAL CRUISE SEGMENT	
WEIGHT:	62000 Kg
DISTANCE:	5139 NM
TIME:	689 Min

OVERHEAD DESTINATION	
WEIGHT:	60122 Kg
DISTANCE:	4758 NM
TIME:	638 Min

2

FUEL:	1878 Kg
DISTANCE:	381 NM
TIME:	51 Min
REMAINING DISTANCE:	0 NM

REMAINING DISTANCE: 381 NM

TOTAL VALUES	
WEIGHT OVERHEAD DEPARTURE:	72000 Kg
WEIGHT OVERHEAD DESTINATION:	60122 Kg
FUEL:	11878 Kg
TIME:	300 Min

NFC5-02-0515-007-A19DAA

DATA

- TO weight 72000 kg
- Ground distance to destination : 2000 NM
- Wind : – 50 kt (headwind)
- Selected first flight level : FL350
- M.78
- Temperature : ISA + 10 along the whole flight profile
- Airport elevation : 1500 ft
- Normal air conditioning

STEPS :

- 1 : Fill in Max TO weight → 72000 kg
- 2 : Enter the integrated cruise table corresponding to the chosen FL with TO weight at brake release point and calculate weight overhead destination. (See 2.05.15 P 7). Fill in → 60122 kg
- 3 : Apply temperature correction for given air distance :
 $2248 \text{ NM} \times 10^{\circ}\text{C} \times 0.015 \text{ kg}/^{\circ}\text{C}/\text{NM} = 337 \text{ kg}$
- 4 : Correction for low air conditioning → here = 0
- 5 : Subtract climb correction for chosen FL (see 2.05.30 P 23) → 1000 kg
- 6 : Add TO altitude correction $0.5 \times 72 \times 1.5 = 54 \text{ kg}$ (enter 100 kg into table)
- 7 : Subtract value for step climb correction : 60 kg (enter 100 kg into table)
- 8 : Calculate corrected weight overhead destination → 58700 kg
- 9 : Enter weight overhead destination and find descent correction (including 6 min IFR) (see 2.05.30 P 24) → 200 kg
- 10 : Calculate landing weight at destination → 58900 kg
- R 11 : Subtract alternate fuel, e.g. : 100 NM at FL100
 (see 2.05.50 P 2) → 913 kg
- R Landing weight at alternate → $58900 - 913 = 57987 \text{ kg}$
- R Correction due to deviation from reference landing weight at alternate (see 2.05.50 p 2) → $6 \times (58.0 - 50) = 48 \text{ kg}$
- R Corrected alternate fuel → 961 kg
- 12 : Calculate alternate landing weight → 57900 kg
- R 13 : Subtract holding fuel (Refer to 3.05.25) → 1093 kg
- 14 : Calculate weight at end of holding → 56800 kg
- 15 : Calculate trip fuel → 13100 kg
- 16 : Subtract "En Route" reserve (standard amount is 5 % of trip fuel) → 655 kg
- 17 : Calculate zero fuel weight → 56100 kg
- 18-19 : Subtract dry operating weight to obtain maximum allowable payload.
- R 20-22 : Calculate ramp fuel (see 2.05.10 P 2 for taxi fuel).
- R 23-26 : Calculate flight time (see 2.05.15 P 7, 2.05.30 P 23, 2.05.30 P 24).

R

1	(1) Max TO Weight at BRAKE RELEASE ▼	►		8	0	•	0
2	WEIGHT Overhead Destination	►		6	6	•	4
3	– Temperature Correction for CRUISE	–			0	•	4
4	+ Correction for Low Air Conditioning	+			0	•	0
5	– CLIMB correction	–			1	•	2
6	+ TO Altitude correction	+			0	•	1
7	– STEP CLIMB correction	–			0	•	1
8	= Corrected Weight Overhead Destination	=		6	4	•	8
9	+ DESCENT correction (including 6 min IFR)	+			0	•	3
10	(2) Landing Weight at Destination	=		6	5	•	1
11	– ALTERNATE Fuel	–			1	•	1
12	= ALTERNATE Landing Weight	=		6	4	•	0
13	– HOLDING	–			1	•	3
14	= Weight at END OF HOLDING	=		6	2	•	7
15	TRIP FUEL (1) – (2)		1	4	•	9	//////////
16	– “En Route” Reserve	–			0	•	8
17	(3) ZERO FUEL WEIGHT	=		6	1	•	9
18	– OPERATING WEIGHT EMPTY	–		4	8	•	5
19	= Max Allowable Payload	=		1	3	•	4

BLOCK FUEL CALCULATION

20	Required Fuel (1) – (3)	►		1	8	•	0
21	+ Taxi	+			0	•	2
22	= Block Fuel	=		1	8	•	2

FLIGHT TIME CALCULATION (H. MIN)

23	Time from integrated Cruise Tables	►		5	•	0	0
24	+ CLIMB Correction	+		0	•	0	4
25	+ DESCENT Correction (including 6 min IFR)	+		0	•	0	9
26	= Flight Time	=		5	•	1	3

Note : Line 3 : temperature correction :

$$0.015(\text{kg}/^{\circ}\text{C}/\text{NM}) \times \Delta\text{ISA } (^{\circ}\text{C}) \times \text{air distance (NM)}$$

Line 6 : TO altitude correction :

$$0.5 (\text{kg}/1000 \text{ kg}/1000 \text{ ft}) \times \text{TOW (1000 kg)} \times \text{airport elevation (1000 ft)}.$$

Line 10 : Check that landing weight at destination is lower than maximum landing weight.

Line 17 : Check that the zero fuel weight is lower than maximum zero fuel weight.

Line 22 : Check that the block fuel value is lower than maximum tank capacity.

R

1	(1) Max TO Weight at BRAKE RELEASE ▼	►		7	2	•	0
2	WEIGHT Overhead Destination	►		6	0	•	0
3	– Temperature Correction for CRUISE	–			0	•	4
4	+ Correction for Low Air Conditioning	+				•	0
5	– CLIMB correction	–			1	•	0
6	+ TO Altitude correction	+			0	•	1
7	– STEP CLIMB correction	–			0	•	1
8	= Corrected Weight Overhead Destination	=		5	8	•	6
9	+ DESCENT correction (including 6 min IFR)	+			0	•	2
10	(2) Landing Weight at Destination	=		5	8	•	8
11	– ALTERNATE Fuel	–			1	•	0
12	= ALTERNATE Landing Weight	=		5	7	•	8
13	– HOLDING	–			1	•	1
14	= Weight at END OF HOLDING	=		5	6	•	7
15	TRIP FUEL (1) – (2)		1	3	•	2	//////////
16	– “En Route” Reserve	–			0	•	7
17	(3) ZERO FUEL WEIGHT	=		5	6	•	0
18	– OPERATING WEIGHT EMPTY	–		4	1	•	3
19	= Max Allowable Payload	=		1	4	•	7

BLOCK FUEL CALCULATION

20	Required Fuel (1) – (3)	►		1	6	•	1
21	+ Taxi	+			0	•	2
22	= Block Fuel	=		1	6	•	3

R

FLIGHT TIME CALCULATION (H. MIN)

23	Time from integrated Cruise Tables	►		4	•	9	9
24	+ CLIMB Correction	+		0	•	0	5
25	+ DESCENT Correction (including 6 min IFR)	+		0	•	1	0
26	= Flight Time	=		5	•	1	4

Note : Line 3 : temperature correction :

$$0.015(\text{kg}/^{\circ}\text{C}/\text{NM}) \times \Delta\text{ISA } (^{\circ}\text{C}) \times \text{air distance (NM)}$$

Line 6 : TO altitude correction :

$$0.5 (\text{kg}/1000 \text{ kg}/1000 \text{ ft}) \times \text{TOW (1000 kg)} \times \text{airport elevation (1000 ft)}.$$

Line 10 : Check that landing weight at destination is lower than maximum landing weight.

Line 17 : Check that the zero fuel weight is lower than maximum zero fuel weight.

Line 22 : Check that the block fuel value is lower than maximum tank capacity.

R

1	(1) Max TO Weight at BRAKE RELEASE ▼	►		7	2	•	0
2	WEIGHT Overhead Destination	►		6	0	•	1
3	– Temperature Correction for CRUISE	–			0	•	4
4	+ Correction for Low Air Conditioning	+			0	•	0
5	– CLIMB correction	–			1	•	0
6	+ TO Altitude correction	+			0	•	1
7	– STEP CLIMB correction	–			0	•	1
8	= Corrected Weight Overhead Destination	=		5	8	•	7
9	+ DESCENT correction (including 6 min IFR)	+			0	•	2
10	(2) Landing Weight at Destination	=		5	8	•	9
11	– ALTERNATE Fuel	–			1	•	0
12	= ALTERNATE Landing Weight	=		5	7	•	9
13	– HOLDING	–			1	•	1
14	= Weight at END OF HOLDING	=		5	6	•	8
15	TRIP FUEL (1) – (2)		1	3	•	1	//////////
16	– “En Route” Reserve	–			0	•	7
17	(3) ZERO FUEL WEIGHT	=		5	6	•	1
18	– OPERATING WEIGHT EMPTY	–		3	9	•	2
19	= Max Allowable Payload	=		1	6	•	9

BLOCK FUEL CALCULATION

20	Required Fuel (1) – (3)	►		1	5	•	9
21	+ Taxi	+			0	•	2
22	= Block Fuel	=		1	6	•	1

R

FLIGHT TIME CALCULATION (H. MIN)

23	Time from integrated Cruise Tables	►		5	•	0	0
24	+ CLIMB Correction	+		0	•	0	4
25	+ DESCENT Correction (including 6 min IFR)	+		0	•	1	0
26	= Flight Time	=		5	•	1	4

Note : Line 3 : temperature correction :

$$0.015(\text{kg}/^{\circ}\text{C}/\text{NM}) \times \Delta\text{ISA } (^{\circ}\text{C}) \times \text{air distance (NM)}$$

Line 6 : TO altitude correction :

$$0.5 (\text{kg}/1000 \text{ kg}/1000 \text{ ft}) \times \text{TOW (1000 kg)} \times \text{airport elevation (1000 ft)}.$$

Line 10 : Check that landing weight at destination is lower than maximum landing weight.

Line 17 : Check that the zero fuel weight is lower than maximum zero fuel weight.

Line 22 : Check that the block fuel value is lower than maximum tank capacity.

OPTIMUM AND MAXIMUM ALTITUDES

DEFINITIONS

- Optimum altitude : The altitude at which the airplane covers the maximum distance per kilogram (pound) of fuel (best specific range). It depends on the actual weight and deviation from ISA.
- Maximum altitude is defined as the lower of :
 - maximum altitude at maximum cruise thrust in level flight and
 - maximum altitude at maximum climb thrust with 300 feet/minute vertical speed.

R

Note : Definition of the maximum altitude in the FMGC is different (Refer to FCOM 4).

CRUISE LEVEL CHARTS

These charts have been established for a center of gravity at 33 % MAC.
 Maximum and optimum altitudes are given for different temperatures at long range speed and M.78.

Note : The $n = 1.3$ g (1.4 g) curve indicates the buffet margin.

OPTIMUM WEIGHT FOR 4000 FEET STEP CLIMB

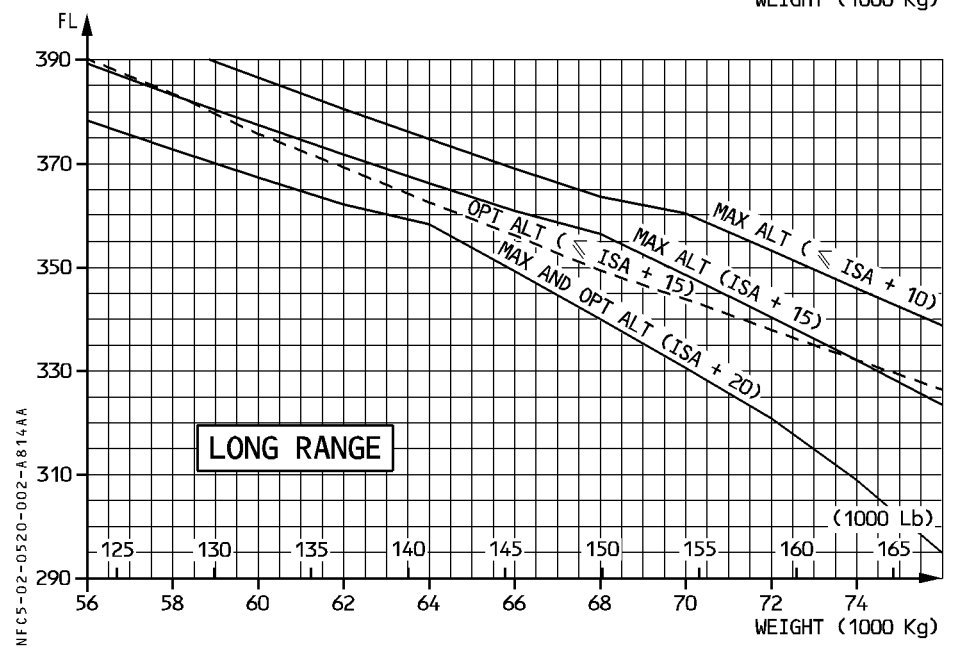
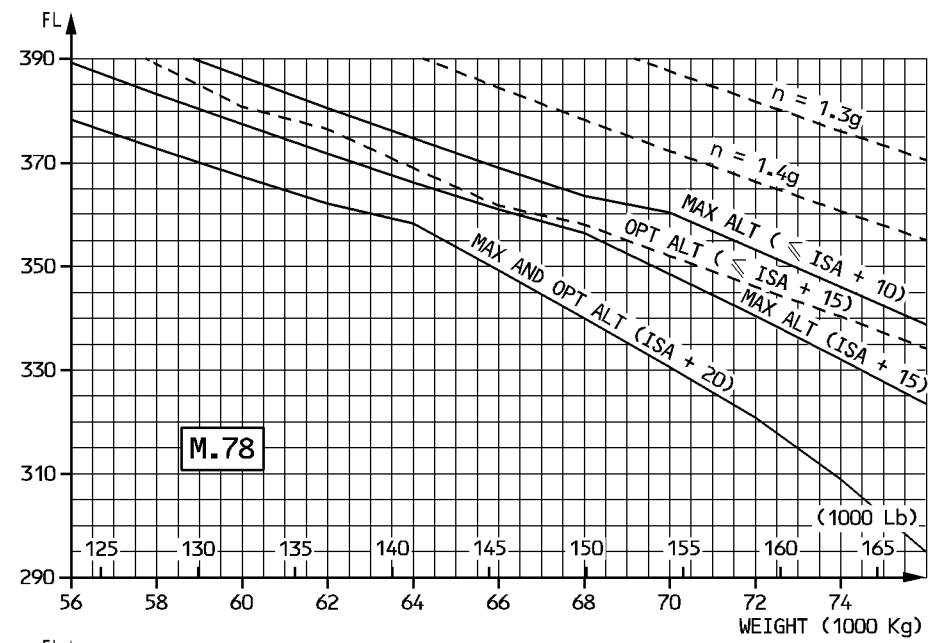
R

STEP CLIMB FROM/TO	WEIGHT (1000 kg/1000 lb)					
	≤ ISA + 10		ISA + 15		ISA + 20	
	LR	M.78	LR	M.78	LR	M.78
310/350	73/160	73/160	70/154	70/154	66/145	66/145
330/370	66/145	66/145	63/138	63/138	59/130	59/130
350/390	59/130	59/130	56/123	56/123	52/114	52/114

BLEED CORRECTIONS

	ENGINE ANTI ICE	TOTAL ANTI ICE
ISA	Max Alt. : – 200 ft Opt Alt. : – 200 ft	Max Alt. : – 500 ft Opt Alt. : – 300 ft
ISA + 10	Max Alt. : – 1500 ft Opt Alt. : – 400 ft	Max Alt. : – 4200 ft Opt Alt. : – 3100 ft
ISA + 15	Max Alt. : – 3500 ft Opt Alt. : – 3500 ft	Max. Alt. : – 4800 ft Opt Alt. : – 4300 ft
ISA + 20	Max Alt. : – 5300 ft Opt Alt. : – 3800 ft	Max Alt. : – 6500 ft Opt Alt. : – 6200 ft

R



OPTIMUM AND MAXIMUM ALTITUDES

DEFINITIONS

- Optimum altitude : The altitude at which the airplane covers the maximum distance per kilogram (pound) of fuel (best specific range). It depends on the actual weight and deviation from ISA.
- Maximum altitude is defined as the lower of :
 - maximum altitude at maximum cruise thrust in level flight and
 - maximum altitude at maximum climb thrust with 300 feet/minute vertical speed.

Note : Definition of the maximum altitude in the FMGC is different (Refer to FCOM 4).

CRUISE LEVEL CHARTS

These charts have been established for a center of gravity at 33 % MAC.
 Maximum and optimum altitudes are given for different temperatures at long range speed and M.78.

Note : The n = 1.3 g (1.4 g) curve indicates the buffet margin.

OPTIMUM WEIGHT FOR 4000 FEET STEP CLIMB

R

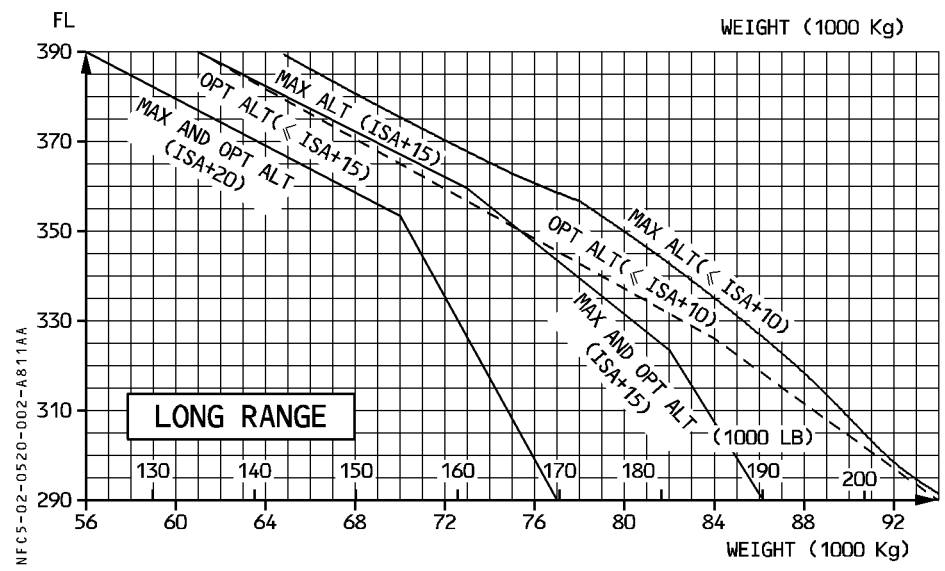
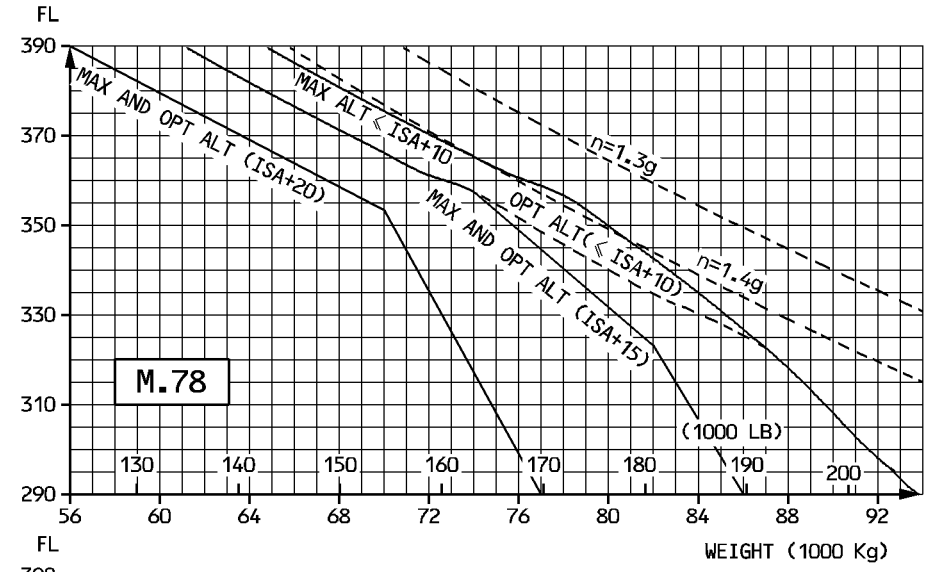
STEP CLIMB FROM/TO	WEIGHT (1000 kg/1000 lb)					
	≤ ISA + 10		ISA + 15		ISA + 20	
	LR	M.78	LR	M.78	LR	M.78
310/350	76/167	80/176	72/158	76/167	65/143	70/154
330/370	69/152	72/158	65/143	69/152	59/130	64/141
350/390	62/136	65/143	58/127	61/134	52/114	56/123

BLEED CORRECTIONS

R

	ENGINE ANTI ICE	TOTAL ANTI ICE
ISA	Max Alt. : – 400 ft Opt Alt. : – 400 ft	Max Alt. : – 900 ft Opt Alt. : – 400 ft
ISA + 10	Max Alt. : – 3200 ft Opt Alt. : – 1200 ft	Max Alt. : – 5000 ft Opt Alt. : – 2800 ft
ISA + 15	Max Alt. : – 5900 ft Opt Alt. : – 5900 ft	Max. Alt. : – 9900 ft Opt Alt. : – 9400 ft
ISA + 20	Max Alt. : – 8200 ft Opt Alt. : – 8200 ft	Max Alt. : – 11000 ft Opt Alt. : – 11000 ft

R



NFC5-02-0520-002-A811AA

OPTIMUM AND MAXIMUM ALTITUDES

DEFINITIONS

- Optimum altitude : The altitude at which the airplane covers the maximum distance per kilogram (pound) of fuel (best specific range). It depends on the actual weight and deviation from ISA.
- Maximum altitude is defined as the lower of :
 - maximum altitude at maximum cruise thrust in level flight and
 - maximum altitude at maximum climb thrust with 300 feet/minute vertical speed.

R

Note : Definition of the maximum altitude in the FMGC is different (Refer to FCOM 4).

CRUISE LEVEL CHARTS

These charts have been established for a center of gravity at 33 % MAC.
 Maximum and optimum altitudes are given for different temperatures at long range speed and M.78.

Note : The n = 1.3 g (1.4 g) curve indicates the buffet margin.

OPTIMUM WEIGHT FOR 4000 FEET STEP CLIMB

R

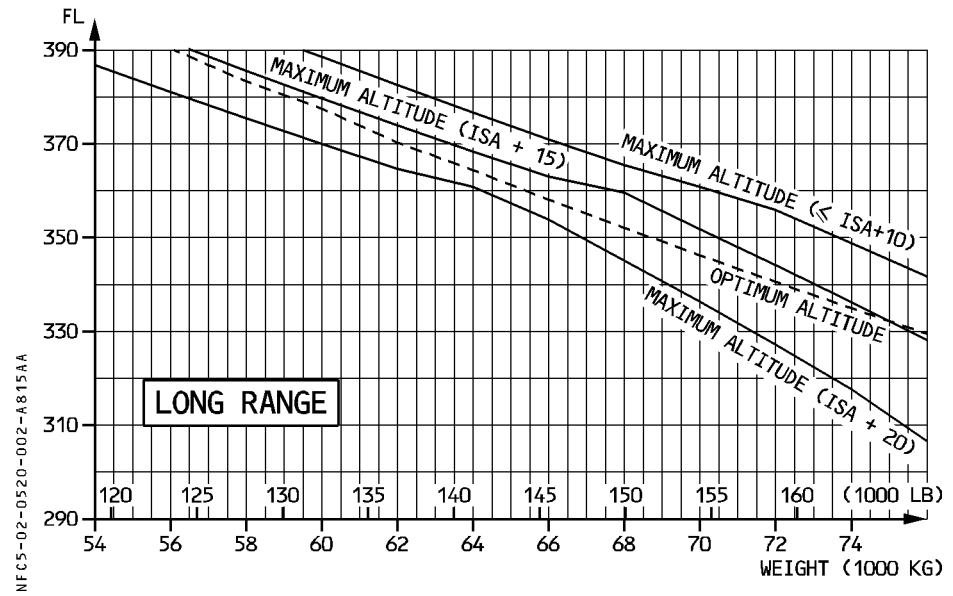
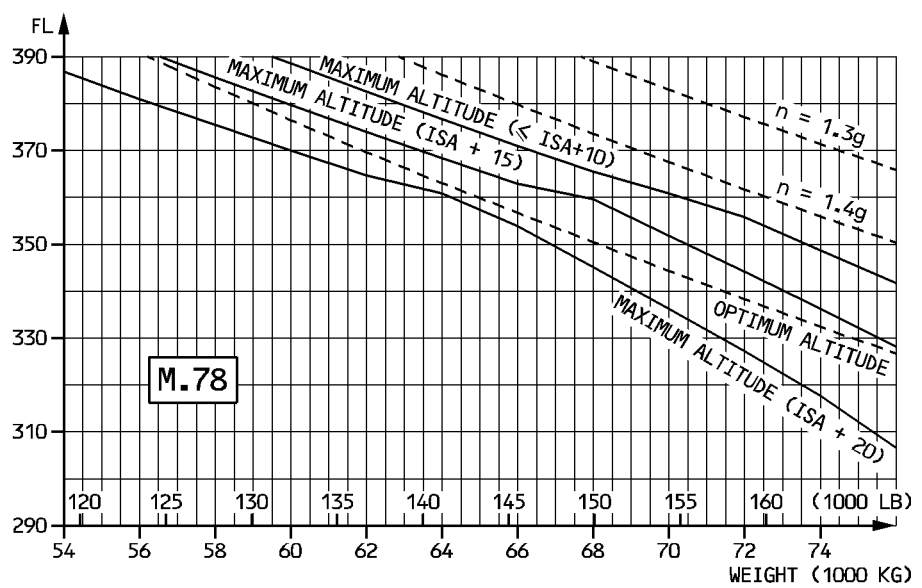
STEP CLIMB FROM/TO	WEIGHT (1000 kg/1000 lb)					
	≤ ISA + 10		ISA + 15		ISA + 20	
	LR	M.78	LR	M.78	LR	M.78
310/350	74/163	74/163	70/154	70/154	67/147	67/147
330/370	66/145	66/145	63/138	63/138	60/132	60/132
350/390	60/132	60/132	57/125	57/125	53/116	53/116

BLEED CORRECTIONS

R

	ENGINE ANTI ICE	TOTAL ANTI ICE
ISA	Max Alt. : – 200 ft Opt Alt. : – 200 ft	Max Alt. : – 500 ft Opt Alt. : – 200 ft
ISA + 10	Max Alt. : – 1400 ft Opt Alt. : – 200 ft	Max Alt. : – 2600 ft Opt Alt. : – 300 ft
ISA + 15	Max Alt. : – 1500 ft Opt Alt. : – 200 ft	Max. Alt. : – 4000 ft Opt Alt. : – 1800 ft
ISA + 20	Max Alt. : – 3600 ft Opt Alt. : – 3200 ft	Max Alt. : – 6800 ft Opt Alt. : – 5700 ft

R



OPTIMUM ALTITUDE ON SHORT STAGE

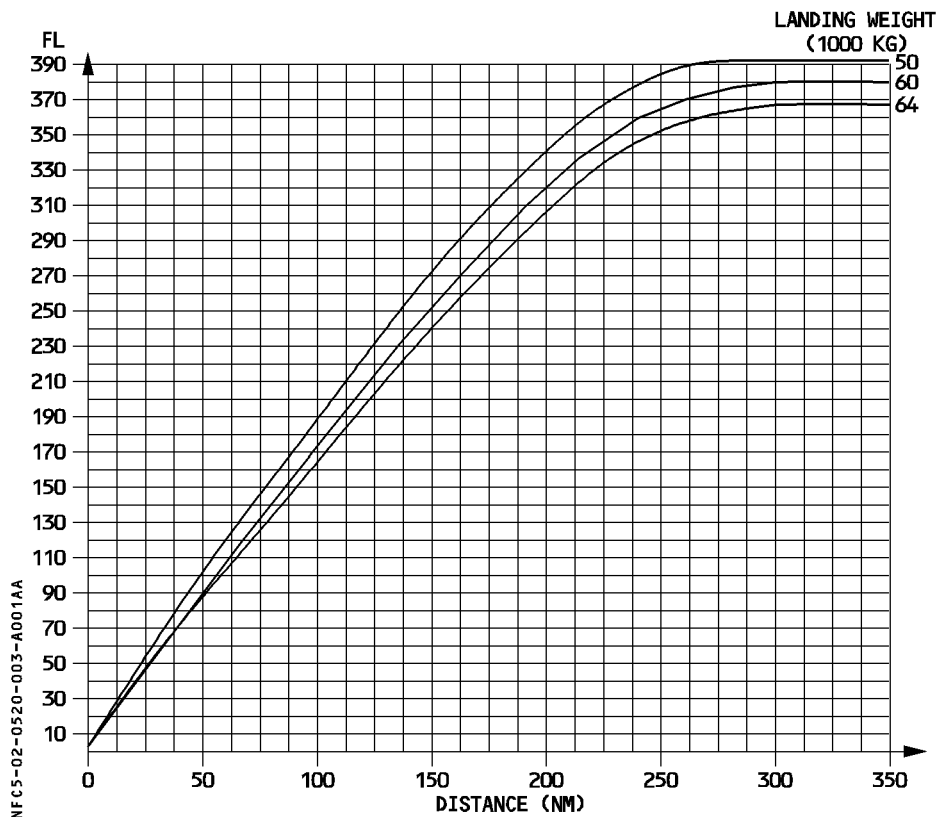
According to the air distance (from brake release point to landing), the cruise flight level is limited by the distance required to perform climb and descent. The graph determines the optimum altitude.

It includes the following profiles:

- Takeoff
- Climb: 250kt/300kt/M.78
- Long range cruise (during at least 5 minutes)
- Descent: M.78/300kt/250kt
- Approach and landing

and it is established for:

- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF



OPTIMUM ALTITUDE ON SHORT STAGE

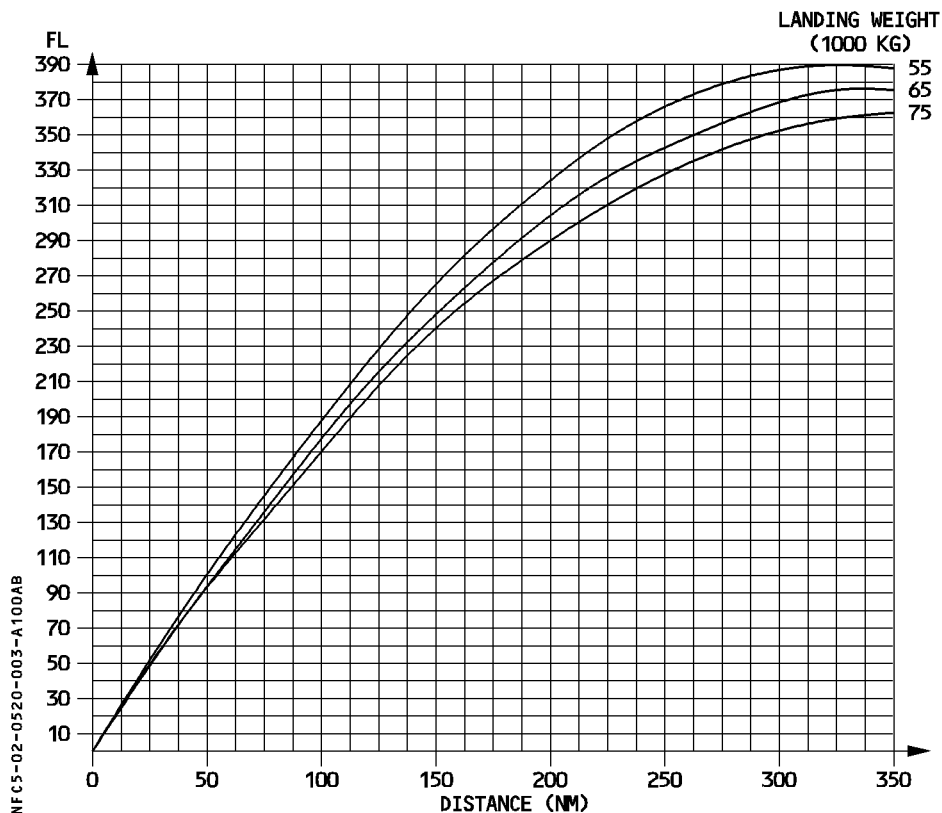
According to the air distance (from brake release point to landing), the cruise flight level is limited by the distance required to perform climb and descent. The graph determines the optimum altitude.

It includes the following profiles:

- Takeoff
- Climb: 250KT/300KT/M.78
- Long range cruise (during at least 5 minutes)
- Descent: M.78/300KT/250KT
- Approach and landing

and it is established for:

- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF



OPTIMUM ALTITUDE ON SHORT STAGE

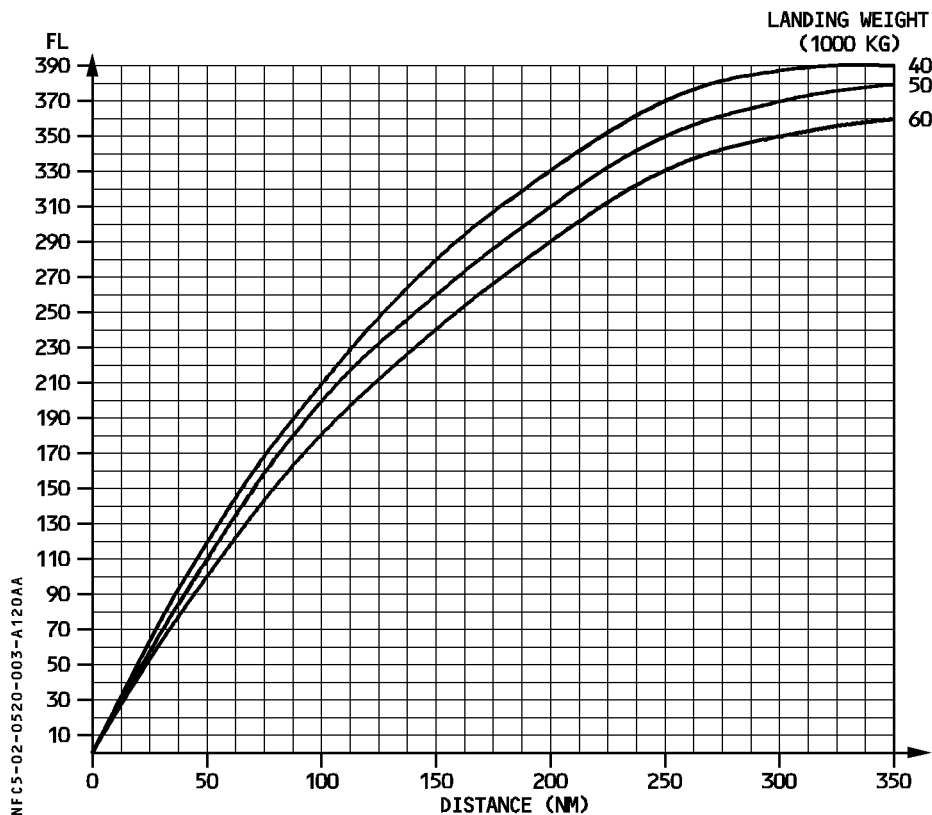
According to the air distance (from brake release point to landing), the cruise flight level is limited by the distance required to perform climb and descent. The graph determines the optimum altitude.

It includes the following profiles:

- Takeoff
- Climb: 250KT/300KT/M.78
- Long range cruise (during at least 5 minutes)
- Descent: M.78/300KT/250kt
- Approach and landing

and it is established for:

- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF



GENERAL

Integrated cruise tables allow the planner to calculate the cruise fuel consumption and the cruise time required to cover a given air distance.

In the tables, the difference between two gross weights represents the fuel consumption. The difference between the corresponding distances and times respectively represents the cruise distance covered and the cruise time for this fuel consumption.

Integrated cruise tables are established for M.78 at fixed levels from FL290 to FL390 and for long range speed at fixed levels from FL100 to FL390.

Corrections are given on separate tables to allow for step climbs and to take into account the climb and the descent phases.

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 462KT		DISTANCE (NM) TIME (MIN)		M.78 FL290		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
64	2602 338	2634 342	2665 346	2697 350	2728 355	2760 359	2791 363	2822 367	2853 371	2885 375
66	2916 379	2947 383	2978 387	3009 391	3040 395	3072 399	3102 403	3133 407	3164 411	3195 415
68	3226 419	3257 423	3288 427	3319 431	3350 435	3381 439	3411 443	3442 447	3473 451	3503 455
70	3534 459	3564 463	3595 467	3625 471	3656 475	3687 479	3717 483	3747 487	3778 491	3808 495
72	3838 499	3869 503	3899 507	3929 511	3959 515	3989 518	4019 522	4050 526	4080 530	4110 534
74	4140 538	4170 542	4199 546	4229 550	4259 554	4289 557	4319 561	4349 565	4378 569	4408 573
76	4438 577	4467 581	4497 584	4527 588	4556 592	4586 596	4615 600	4644 604	4674 607	4703 611
78	4733 615	4762 619	4791 623	4820 626	4850 630	4879 634	4908 638	4937 642	4966 645	4995 649
80	5024 653	5053 657	5082 660	5111 664	5140 668	5168 672	5197 675	5226 679	5254 683	5283 687
82	5312 690	5340 694	5369 698	5397 701	5426 705	5454 709	5482 713	5511 716	5539 720	5567 724
84	5595 727	5624 731	5652 735	5680 738	5708 742	5736 745	5764 749	5792 753	5820 756	5847 760
86	5875 764	5903 767	5931 771	5958 774	5986 778	6014 782	6041 785	6069 789	6096 792	6124 796
88	6151 799	6179 803	6206 807	6233 810	6261 814	6288 817	6315 821	6342 824	6369 828	6396 831
90	6423 835	6450 838	6477 842	6504 845	6531 849	6558 852	6585 856	6612 859	6638 863	6665 866
92	6692 870	6718 873	6745 877	6771 880	6798 883	6824 887	6851 890	6877 894	6903 897	6930 901
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %			TOTAL ANTI ICE ON ΔFUEL = + 5 %			

GENERAL

Integrated cruise tables allow the planner to calculate the cruise fuel consumption and the cruise time required to cover a given air distance.
In the tables, the difference between two gross weights represents the fuel consumption. The difference between the corresponding distances and times respectively represents the cruise distance covered and the cruise time for this fuel consumption.
Integrated cruise tables are established for M.78 at fixed levels from FL290 to FL390 and for long range speed at fixed levels from FL100 to FL390.
Corrections are given on separate tables to allow for step climbs and to take into account the climb and the descent phases.

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 462KT		DISTANCE (NM) TIME (MIN)		M.78 FL290		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	36 5	72 9	108 14	144 19	180 23	216 28	252 33	288 37	323 42
46	359 47	395 51	431 56	467 61	502 65	538 70	574 75	610 79	645 84	681 88
48	717 93	752 98	788 102	823 107	859 112	894 116	930 121	965 125	1001 130	1036 135
50	1072 139	1107 144	1142 148	1178 153	1213 158	1248 162	1283 167	1319 171	1354 176	1389 181
52	1424 185	1459 190	1494 194	1529 199	1564 203	1599 208	1634 212	1669 217	1704 221	1739 226
54	1774 231	1809 235	1844 240	1878 244	1913 249	1948 253	1983 258	2017 262	2052 267	2087 271
56	2121 276	2156 280	2190 285	2225 289	2259 294	2294 298	2328 303	2363 307	2397 312	2432 316
58	2466 320	2500 325	2534 329	2569 334	2603 338	2637 343	2671 347	2705 352	2740 356	2774 360
60	2808 365	2842 369	2876 374	2910 378	2944 383	2978 387	3011 391	3045 396	3079 400	3113 405
62	3147 409	3180 413	3214 418	3248 422	3281 426	3315 431	3348 435	3382 440	3415 444	3449 448
64	3482 453	3516 457	3549 461	3582 466	3616 470	3649 474	3682 479	3715 483	3749 487	3782 491
66	3815 496	3848 500	3881 504	3914 509	3947 513	3980 517	4013 522	4046 526	4078 530	4111 534
68	4144 539	4177 543	4209 547	4242 551	4275 556	4307 560	4340 564	4372 568	4405 573	4438 577
70	4470 581	4502 585	4535 589	4567 594	4599 598	4632 602	4664 606	4696 610	4728 614	4760 619
72	4792 623	4824 627	4856 631	4888 635	4920 639	4952 644	4984 648	5016 652	5047 656	5079 660
74	5111 664	5143 668	5174 672	5206 677	5237 681	5269 685	5300 689	5332 693	5363 697	5394 701
76	5426 705	5457 709	5488 713	5519 717	5551 721	5582 725	5613 729	5644 733	5675 738	5706 742
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22100000C5KG330 0 018590 0 0 1 1.0 .0 .00 02901 . 780 .000 .000 0 FCOM-NO-02-05-30-002-180

GENERAL

Integrated cruise tables allow the planner to calculate the cruise fuel consumption and the cruise time required to cover a given air distance.
In the tables, the difference between two gross weights represents the fuel consumption. The difference between the corresponding distances and times respectively represents the cruise distance covered and the cruise time for this fuel consumption.
Integrated cruise tables are established for M.78 at fixed levels from FL290 to FL390 and for long range speed at fixed levels from FL100 to FL390.
Corrections are given on separate tables to allow for step climbs and to take into account the climb and the descent phases.

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 462KT		DISTANCE (NM) TIME (MIN)		M.78 FL290		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
40	0 0	37 5	74 10	111 14	148 19	185 24	222 29	259 34	296 39	333 43
42	370 48	407 53	444 58	481 63	518 67	555 72	592 77	628 82	665 86	702 91
44	739 96	775 101	812 106	849 110	885 115	922 120	959 125	995 129	1032 134	1068 139
46	1105 144	1141 148	1178 153	1214 158	1251 163	1287 167	1323 172	1360 177	1396 181	1433 186
48	1469 191	1505 196	1541 200	1578 205	1614 210	1650 214	1686 219	1722 224	1758 229	1795 233
50	1831 238	1867 243	1903 247	1939 252	1975 257	2011 261	2047 266	2082 271	2118 275	2154 280
52	2190 285	2226 289	2261 294	2297 299	2333 303	2369 308	2404 312	2440 317	2475 322	2511 326
54	2547 331	2582 336	2618 340	2653 345	2689 349	2724 354	2759 359	2795 363	2830 368	2865 372
56	2901 377	2936 382	2971 386	3006 391	3042 395	3077 400	3112 404	3147 409	3182 414	3217 418
58	3252 423	3287 427	3322 432	3357 436	3392 441	3427 445	3461 450	3496 454	3531 459	3566 463
60	3600 468	3635 472	3670 477	3704 481	3739 486	3773 490	3808 495	3842 499	3877 504	3911 508
62	3946 513	3980 517	4014 522	4048 526	4083 531	4117 535	4151 539	4185 544	4219 548	4253 553
64	4287 557	4321 562	4355 566	4389 570	4423 575	4457 579	4491 584	4525 588	4558 592	4592 597
66	4626 601	4659 606	4693 610	4727 614	4760 619	4794 623	4827 627	4861 632	4894 636	4927 640
68	4961 645	4994 649	5027 653	5061 658	5094 662	5127 666	5160 671	5193 675	5226 679	5259 684
70	5292 688	5325 692	5358 696	5391 701	5424 705	5457 709	5490 713	5522 718	5555 722	5588 726
72	5620 730	5653 735	5685 739	5718 743	5750 747	5783 752	5815 756	5847 760	5880 764	5912 768
74	5944 773	5977 777	6009 781	6041 785	6073 789	6105 793	6137 798	6169 802	6201 806	6233 810
76	6265 814	6296 818	6328 822	6360 827	6391 831	6423 835	6455 839	6486 843	6518 847	6549 851
LOW AIR CONDITIONING ΔFUEL = − 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2210000C5KG330 0 018590 0 0 1 1.0 .0 .00 02901 .780 .000 .000 0 FCOM-N0-02-05-30-002-190

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 458KT		DISTANCE (NM) TIME (MIN)		M.78 FL310		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
64	2770 363	2803 368	2837 372	2870 376	2903 381	2936 385	2969 389	3002 394	3035 398	3068 402
66	3101 407	3134 411	3167 415	3200 419	3232 424	3265 428	3298 432	3330 437	3363 441	3396 445
68	3428 449	3461 454	3493 458	3526 462	3558 466	3591 471	3623 475	3655 479	3687 483	3720 488
70	3752 492	3784 496	3816 500	3848 504	3880 509	3912 513	3944 517	3976 521	4008 525	4039 530
72	4071 534	4103 538	4134 542	4166 546	4198 550	4229 554	4261 559	4292 563	4324 567	4355 571
74	4386 575	4418 579	4449 583	4480 587	4511 591	4542 595	4573 600	4604 604	4635 608	4666 612
76	4697 616	4728 620	4758 624	4789 628	4820 632	4851 636	4881 640	4911 644	4942 648	4972 652
78	5003 656	5033 660	5063 664	5094 668	5124 672	5154 676	5184 680	5214 684	5244 688	5274 691
80	5304 695	5334 699	5364 703	5394 707	5423 711	5453 715	5483 719	5512 723	5542 727	5572 730
82	5601 734	5630 738	5660 742	5689 746	5718 750	5748 754	5777 757	5806 761	5835 765	5864 769
84	5893 773	5922 776	5951 780	5980 784	6009 788	6038 792	6066 795	6095 799	6124 803	6152 807
86	6181 810	6209 814	6238 818	6266 821	6294 825	6323 829	6351 833	6379 836	6407 840	6435 844
88	6464 847	6492 851	6519 855	6547 858	6575 862	6603 866	6631 869	6658 873	6686 877	6714 880
90	6741 884	6769 887	6796 891	6823 895	6851 898	6878 902	6905 905	6932 909	6960 912	6987 916
92	7014 919	7041 923	7068 927	7094 930	7121 934	7148 937	7175 941	7201 944	7228 948	7254 951
ECON AIR CONDITIONING ΔFUEL = - 0.6 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 458KT		DISTANCE (NM) TIME (MIN)		M.78 FL310		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	39 5	77 10	116 15	155 20	193 25	232 30	270 35	309 40	347 46
46	386 51	424 56	462 61	501 66	539 71	577 76	615 81	654 86	692 91	730 96
48	768 101	806 106	844 111	882 116	920 121	958 126	996 131	1034 136	1072 140	1110 145
50	1147 150	1185 155	1223 160	1260 165	1298 170	1336 175	1373 180	1411 185	1449 190	1486 195
52	1524 200	1561 205	1598 210	1636 214	1673 219	1711 224	1748 229	1785 234	1822 239	1859 244
54	1897 249	1934 254	1971 258	2008 263	2045 268	2082 273	2119 278	2156 283	2193 287	2230 292
56	2266 297	2303 302	2340 307	2377 312	2413 316	2450 321	2486 326	2523 331	2559 336	2596 340
58	2632 345	2669 350	2705 355	2741 359	2778 364	2814 369	2850 374	2886 378	2922 383	2958 388
60	2995 393	3031 397	3066 402	3102 407	3138 411	3174 416	3210 421	3246 426	3281 430	3317 435
62	3353 440	3388 444	3424 449	3460 454	3495 458	3531 463	3566 467	3601 472	3637 477	3672 481
64	3707 486	3742 491	3778 495	3813 500	3848 504	3883 509	3918 514	3953 518	3988 523	4023 527
66	4058 532	4092 536	4127 541	4162 546	4196 550	4231 555	4265 559	4300 564	4334 568	4369 573
68	4403 577	4438 582	4472 586	4506 591	4540 595	4574 600	4608 604	4642 609	4677 613	4711 618
70	4745 622	4778 626	4812 631	4846 635	4880 640	4913 644	4947 649	4980 653	5014 657	5048 662
72	5081 666	5114 670	5148 675	5181 679	5214 684	5248 688	5281 692	5314 697	5347 701	5380 705
74	5413 710	5445 714	5478 718	5511 722	5544 727	5576 731	5609 735	5641 740	5674 744	5706 748
76	5739 752	5771 757	5803 761	5836 765	5868 769	5900 773	5932 778	5964 782	5996 786	6028 790
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22100000C5KG330 0 018590 0 0 1 1.0 .0 .00 03101 . 780 .000 .000 0 FCOM-NO-02-05-30-003-180

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 454KT		DISTANCE (NM) TIME (MIN)		M.78 FL330		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	41 5	83 11	124 16	165 22	207 27	248 33	289 38	330 44	371 49
46	412 55	453 60	494 65	535 71	576 76	617 82	658 87	698 92	739 98	780 103
48	821 109	861 114	902 119	942 125	983 130	1024 135	1064 141	1104 146	1145 151	1185 157
50	1225 162	1266 167	1306 173	1346 178	1386 183	1426 189	1466 194	1506 199	1546 204	1586 210
52	1626 215	1666 220	1705 226	1745 231	1785 236	1824 241	1864 247	1903 252	1943 257	1982 262
54	2022 267	2061 273	2100 278	2140 283	2179 288	2218 293	2257 299	2296 304	2335 309	2374 314
56	2413 319	2452 324	2491 329	2530 335	2569 340	2607 345	2646 350	2685 355	2723 360	2762 365
58	2800 370	2839 375	2877 380	2915 386	2953 391	2992 396	3030 401	3068 406	3106 411	3144 416
60	3182 421	3220 426	3258 431	3295 436	3333 441	3371 446	3409 451	3446 456	3484 461	3521 466
62	3559 471	3596 476	3633 481	3671 485	3708 490	3745 495	3782 500	3819 505	3856 510	3893 515
64	3930 520	3967 525	4004 529	4040 534	4077 539	4114 544	4150 549	4187 554	4223 559	4259 563
66	4296 568	4332 573	4368 578	4404 582	4440 587	4476 592	4512 597	4548 602	4584 606	4620 611
68	4656 616	4691 620	4727 625	4762 630	4798 635	4833 639	4868 644	4903 649	4939 653	4974 658
70	5009 662	5044 667	5079 672	5114 676	5148 681	5183 686	5218 690	5252 695	5287 699	5321 704
72	5356 708	5390 713	5424 717	5458 722	5492 726	5527 731	5560 735	5594 740	5628 744	5662 749
74	5696 753	5729 758	5763 762	5796 767	5830 771	5863 775	5896 780	5929 784	5962 789	5995 793
76	6028 797	6061 802	6094 806	6126 810	6159 815	6192 819	6224 823	6256 827	6289 832	6321 836
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22100000C5KG330 0 018590 0 0 1 1.0 .0 .00 03301 .780 .000 .000 0 FCOM-NO-02-05-30-004-180

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 458KT		DISTANCE (NM) TIME (MIN)		M.78 FL310		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
40	0 0	40 5	80 10	120 16	159 21	199 26	239 31	279 37	319 42	358 47
42	398 52	438 57	477 63	517 68	556 73	596 78	636 83	675 89	715 94	754 99
44	794 104	833 109	872 114	912 120	951 125	990 130	1030 135	1069 140	1108 145	1147 150
46	1186 156	1226 161	1265 166	1304 171	1343 176	1382 181	1421 186	1460 191	1499 196	1537 202
48	1576 207	1615 212	1654 217	1693 222	1731 227	1770 232	1809 237	1847 242	1886 247	1925 252
50	1963 257	2002 262	2040 267	2078 272	2117 278	2155 283	2194 288	2232 293	2270 298	2308 303
52	2347 308	2385 313	2423 318	2461 323	2499 328	2537 333	2575 338	2613 343	2651 348	2689 353
54	2727 357	2765 362	2802 367	2840 372	2878 377	2916 382	2953 387	2991 392	3028 397	3066 402
56	3103 407	3141 412	3178 417	3216 422	3253 426	3290 431	3327 436	3365 441	3402 446	3439 451
58	3476 456	3513 461	3550 465	3587 470	3624 475	3661 480	3698 485	3735 490	3771 494	3808 499
60	3845 504	3881 509	3918 514	3954 518	3991 523	4028 528	4064 533	4100 538	4137 542	4173 547
62	4209 552	4246 557	4282 561	4318 566	4354 571	4390 576	4426 580	4462 585	4498 590	4534 594
64	4570 599	4606 604	4641 608	4677 613	4713 618	4749 623	4784 627	4820 632	4855 636	4891 641
66	4926 646	4961 650	4997 655	5032 660	5067 664	5103 669	5138 674	5173 678	5208 683	5243 687
68	5278 692	5313 696	5347 701	5382 706	5417 710	5452 715	5486 719	5521 724	5556 728	5590 733
70	5625 737	5659 742	5693 746	5728 751	5762 755	5796 760	5831 764	5865 769	5899 773	5933 778
72	5967 782	6001 787	6035 791	6068 796	6102 800	6136 804	6170 809	6203 813	6237 818	6270 822
74	6304 826	6337 831	6370 835	6404 840	6437 844	6470 848	6503 853	6536 857	6569 861	6602 866
76	6635 870	6668 874	6701 878	6734 883	6766 887	6799 891	6831 896	6864 900	6896 904	6929 908
LOW AIR CONDITIONING ΔFUEL = − 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2210000C5KG330 0 018590 0 0 1 1.0 .0 .00 03101 .780 .000 .000 0 FCOM-NO-02-05-30-003-190

R

INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 454KT		DISTANCE (NM) TIME (MIN)		M.78 FL330		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
40	0 0	43 6	86 11	129 17	171 23	214 28	257 34	300 40	342 45	385 51
42	428 57	470 62	513 68	555 73	597 79	640 85	682 90	725 96	767 101	809 107
44	852 113	894 118	936 124	978 129	1020 135	1062 140	1104 146	1146 152	1188 157	1230 163
46	1272 168	1313 174	1355 179	1397 185	1439 190	1480 196	1522 201	1563 207	1605 212	1646 218
48	1688 223	1729 229	1771 234	1812 240	1853 245	1895 251	1936 256	1977 261	2018 267	2059 272
50	2100 278	2141 283	2182 289	2223 294	2264 299	2305 305	2345 310	2386 316	2427 321	2467 326
52	2508 332	2548 337	2589 342	2629 348	2670 353	2710 358	2750 364	2791 369	2831 374	2871 380
54	2911 385	2951 390	2991 396	3031 401	3071 406	3111 411	3151 417	3190 422	3230 427	3270 432
56	3309 438	3349 443	3388 448	3428 453	3467 459	3507 464	3546 469	3585 474	3625 479	3664 485
58	3703 490	3742 495	3781 500	3820 505	3859 510	3898 516	3937 521	3975 526	4014 531	4053 536
60	4091 541	4130 546	4168 551	4207 556	4245 561	4284 567	4322 572	4360 577	4398 582	4436 587
62	4474 592	4512 597	4550 602	4588 607	4626 612	4664 617	4701 622	4739 627	4777 632	4814 637
64	4852 642	4889 647	4927 652	4964 657	5001 661	5039 666	5076 671	5113 676	5150 681	5187 686
66	5224 691	5260 696	5297 701	5334 705	5371 710	5407 715	5444 720	5480 725	5516 730	5553 734
68	5589 739	5625 744	5661 749	5697 754	5734 758	5770 763	5805 768	5841 773	5877 777	5912 782
70	5948 787	5984 791	6019 796	6054 801	6090 805	6125 810	6160 815	6195 819	6230 824	6265 829
72	6300 833	6335 838	6370 842	6404 847	6439 852	6474 856	6508 861	6542 865	6577 870	6611 874
74	6645 879	6679 883	6713 888	6747 892	6781 897	6815 901	6848 906	6882 910	6916 915	6949 919
76	6983 924	7016 928	7049 932	7082 937	7115 941	7148 945	7181 950	7214 954	7247 958	7279 963
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2210000C5KG330 0 018590 0 0 1 1.0 .0 .00 03301 .780 .000 .000 0 FCOM-N0-02-05-30-004-190

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 450KT		DISTANCE (NM) TIME (MIN)		M.78 FL350		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
64	3097 413	3133 418	3169 423	3206 428	3242 433	3278 437	3314 442	3350 447	3386 452	3421 457
66	3457 461	3493 466	3528 471	3564 476	3599 480	3635 485	3670 490	3705 494	3741 499	3776 504
68	3811 509	3846 513	3881 518	3916 523	3950 527	3985 532	4020 536	4054 541	4089 546	4123 550
70	4158 555	4192 559	4226 564	4261 569	4295 573	4329 578	4363 582	4397 587	4431 591	4465 596
72	4499 600	4532 605	4566 609	4599 614	4633 618	4666 623	4699 627	4733 632	4766 636	4799 640
74	4832 645	4865 649	4898 654	4930 658	4963 662	4996 667	5029 671	5061 675	5093 680	5126 684
76	5158 688	5190 693	5222 697	5254 701	5286 705	5318 710	5350 714	5382 718	5413 722	5445 727
78	5477 731	5508 735	5539 739	5570 743	5602 748	5633 752	5664 756	5694 760	5725 764	5756 768
80	5787 772	5817 776	5847 780	5878 784	5908 788	5938 792	5968 796	5998 800	6028 804	6058 808
82	6088 812	6117 816	6147 820	6176 824	6206 828	6235 832	6264 836	6293 840	6322 844	6351 848
84	6380 851	6408 855	6437 859	6465 863	6493 866	6521 870	6549 874	6578 878	6606 882	6634 885
86										
88										
90										
92										
ECON AIR CONDITIONING ΔFUEL = - 0.6 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL370		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
64	3236 434	3273 439	3310 444	3347 449	3384 454	3421 459	3458 464	3495 469	3532 474	3569 479
66	3605 484	3642 488	3678 493	3714 498	3751 503	3787 508	3823 513	3859 518	3895 522	3931 527
68	3967 532	4002 537	4038 541	4073 546	4109 551	4144 556	4179 560	4214 565	4249 570	4284 575
70	4319 579	4354 584	4388 588	4423 593	4457 598	4492 602	4526 607	4560 612	4594 616	4628 621
72	4662 625	4695 630	4729 634	4762 639	4796 643	4829 648	4862 652	4895 656	4928 661	4961 665
74	4994 670	5026 674	5059 678	5091 683	5123 687	5156 691	5188 696	5220 700	5251 704	5283 709
76	5315 713	5346 717	5378 721	5409 725	5440 730	5471 734	5502 738	5533 742	5563 746	5594 750
78	5624 754	5655 758								
80										
82										
84										
86										
88										
90										
92										
ECON AIR CONDITIONING ΔFUEL = - 0.6 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 450KT		DISTANCE (NM) TIME (MIN)		M.78 FL350		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	44 6	88 12	132 18	177 24	221 29	265 35	308 41	352 47	396 53
46	440 59	484 65	527 70	571 76	615 82	658 88	702 94	745 99	789 105	832 111
48	875 117	918 123	962 128	1005 134	1048 140	1091 146	1134 151	1177 157	1219 163	1262 168
50	1305 174	1348 180	1390 186	1433 191	1475 197	1518 203	1560 208	1602 214	1645 219	1687 225
52	1729 231	1771 236	1813 242	1855 248	1897 253	1939 259	1981 264	2023 270	2065 276	2106 281
54	2148 287	2189 292	2231 298	2272 303	2314 309	2355 314	2396 320	2437 325	2478 331	2519 336
56	2560 342	2601 347	2642 353	2683 358	2724 363	2764 369	2805 374	2845 380	2886 385	2926 390
58	2967 396	3007 401	3047 407	3087 412	3127 417	3167 423	3207 428	3247 433	3287 439	3326 444
60	3366 449	3406 454	3445 460	3484 465	3524 470	3563 476	3602 481	3641 486	3680 491	3719 496
62	3759 502	3797 507	3836 512	3875 517	3913 522	3952 527	3990 532	4029 538	4067 543	4105 548
64	4143 553	4181 558	4219 563	4257 568	4295 573	4333 578	4370 583	4408 588	4445 593	4483 598
66	4520 603	4557 608	4595 613	4632 618	4669 623	4706 628	4742 633	4779 638	4816 643	4852 648
68	4889 652	4925 657	4961 662	4998 667	5034 672	5070 677	5106 681	5141 686	5177 691	5213 696
70	5248 700	5284 705	5319 710	5354 715	5389 719	5425 724	5459 729	5494 733	5529 738	5564 742
72	5599 747	5633 752	5667 756	5702 761	5736 765	5770 770	5804 775	5838 779	5872 784	5906 788
74	5940 793	5973 797	6006 802	6040 806	6073 810	6107 815	6139 819	6172 824	6205 828	6238 832
76	6271 837	6304 841	6336 846	6369 850	6401 854	6434 859	6466 863	6498 867	6530 871	6562 876
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL370		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	47 6	94 13	141 19	188 25	234 31	281 38	327 44	374 50	421 56
46	467 63	513 69	560 75	606 81	652 87	698 94	744 100	790 106	836 112	882 118
48	928 124	973 131	1019 137	1065 143	1110 149	1156 155	1201 161	1246 167	1291 173	1336 179
50	1382 185	1426 191	1471 197	1516 203	1561 209	1606 215	1650 221	1694 227	1739 233	1783 239
52	1828 245	1872 251	1916 257	1960 263	2004 269	2048 275	2092 281	2135 286	2179 292	2223 298
54	2266 304	2309 310	2353 316	2396 321	2439 327	2482 333	2525 339	2568 344	2611 350	2653 356
56	2696 362	2739 367	2781 373	2823 379	2866 384	2908 390	2950 396	2992 401	3034 407	3076 412
58	3118 418	3159 424	3200 429	3242 435	3283 440	3325 446	3366 451	3407 457	3448 462	3489 468
60	3530 473	3570 479	3610 484	3651 490	3691 495	3732 500	3772 506	3811 511	3851 517	3891 522
62	3931 527	3971 532	4010 538	4049 543	4089 548	4128 554	4167 559	4205 564	4244 569	4283 574
64	4322 580	4360 585	4398 590	4436 595	4475 600	4513 605	4551 610	4588 615	4626 620	4664 625
66	4701 631	4739 635	4776 640	4813 645	4850 650	4887 655	4924 660	4960 665	4997 670	5033 675
68	5070 680	5106 685	5142 690	5177 694	5213 699	5249 704	5285 709	5321 714	5356 718	5392 723
70	5428 728	5463 733	5498 737	5532 742	5567 747	5602 751	5637 756	5672 761		
72										
74										
76										
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %				

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL370		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
40	0 0	49 7	98 13	147 20	196 26	245 33	294 39	342 46	391 52	440 59
42	488 66	537 72	585 78	634 85	682 91	730 98	778 104	826 111	874 117	922 124
44	970 130	1018 137	1066 143	1114 149	1161 156	1209 162	1256 168	1304 175	1351 181	1398 188
46	1446 194	1493 200	1540 207	1587 213	1634 219	1681 225	1728 232	1774 238	1821 244	1868 250
48	1914 257	1961 263	2007 269	2053 275	2100 282	2146 288	2192 294	2238 300	2284 306	2330 312
50	2376 319	2421 325	2467 331	2512 337	2558 343	2603 349	2648 355	2694 361	2739 367	2784 373
52	2829 379	2874 385	2919 391	2963 397	3008 403	3053 409	3097 415	3142 421	3186 427	3230 433
54	3275 439	3319 445	3363 451	3407 457	3450 463	3494 469	3538 474	3581 480	3625 486	3668 492
56	3712 498	3755 504	3798 509	3841 515	3884 521	3927 527	3969 532	4012 538	4055 544	4097 549
58	4140 555	4182 561	4224 566	4266 572	4308 578	4350 583	4391 589	4433 595	4474 600	4516 606
60	4558 611	4599 617	4640 622	4681 628	4722 633	4763 639	4803 644	4844 650	4884 655	4925 660
62	4965 666	5005 671	5045 677	5085 682	5125 687	5165 693	5204 698	5243 703	5283 708	5322 714
64	5361 719	5400 724	5439 729	5478 735	5516 740	5555 745	5593 750	5631 755	5670 760	5708 765
66	5746 771	5783 776	5821 781	5859 786	5896 791	5934 796	5971 801	6008 806	6045 811	6082 816
68	6119 821	6155 826	6192 830	6228 835	6265 840	6301 845	6337 850	6373 855	6409 860	6445 864
70	6481 869	6516 874	6552 879	6587 883	6623 888	6658 893	6693 898	6728 902	6762 907	6797 912
72	6832 916									
74										
76										
LOW AIR CONDITIONING ΔFUEL = − 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %				

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL390		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
64	3340 448	3377 453	3414 458	3452 463	3489 468	3527 473	3563 478	3600 483	3637 488	3674 493
66	3710 498	3746 502	3783 507	3819 512	3855 517	3891 522	3927 527	3962 531	3998 536	4033 541
68	4069 546	4103 550	4137 555	4172 560	4206 564	4241 569	4275 573	4310 578	4344 583	4379 587
70										
72										
74										
76										
78										
80										
82										
84										
86										
88										
90										
92										
ECON AIR CONDITIONING ΔFUEL = - 0.6 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

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INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL100			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	1928 366	1951 370	1974 374	1997 378	2020 382	2043 386	2066 390	2089 394	2112 398	2135 402	340
66	2158 406	2180 410	2203 414	2226 418	2249 422	2272 426	2295 430	2317 434	2340 438	2363 442	341
68	2386 446	2408 450	2431 454	2453 458	2476 462	2499 466	2521 470	2544 474	2566 478	2589 482	343
70	2611 486	2634 489	2656 493	2679 497	2701 501	2724 505	2746 509	2768 513	2791 517	2813 521	344
72	2835 525	2858 528	2880 532	2902 536	2924 540	2946 544	2969 548	2991 552	3013 555	3035 559	345
74	3057 563	3079 567	3101 571	3123 574	3145 578	3167 582	3189 586	3211 590	3233 593	3255 597	346
76	3277 601	3299 605	3320 609	3342 612	3364 616	3386 620	3408 624	3429 627	3451 631	3473 635	348
78	3494 639	3516 642	3538 646	3559 650	3581 653	3602 657	3624 661	3645 664	3667 668	3688 672	350
80	3710 675	3731 679	3752 682	3774 686	3795 690	3816 693	3838 697	3859 700	3880 704	3901 707	354
82	3923 711	3944 715	3965 718	3986 722	4007 725	4028 729	4049 732	4070 735	4091 739	4112 742	360
84	4133 746	4154 749	4175 753	4196 756	4216 759	4237 763	4258 766	4279 770	4300 773	4320 776	365
86	4341 780	4362 783	4382 786	4403 790	4424 793	4444 796	4465 800	4485 803	4506 806	4526 810	371
88	4547 813	4567 816	4588 819	4608 823	4629 826	4649 829	4670 832	4690 836	4710 839	4731 842	376
90	4751 845	4771 848	4791 852	4812 855	4832 858	4852 861	4872 864	4892 868	4913 871	4933 874	378
92	4953 877	4973 880	4993 883	5013 887	5033 890	5053 893	5073 896	5093 899	5113 902	5133 906	380
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL390		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
44	0 0	49 7	99 13	148 20	198 27	247 33	296 40	345 46	394 53	444 59
46	493 66	541 73	590 79	638 86	687 92	735 99	784 105	832 112	880 118	928 124
48	976 131	1024 137	1071 144	1119 150	1167 156	1214 163	1262 169	1309 176	1356 182	1403 188
50	1450 194	1497 201	1544 207	1590 213	1637 220	1683 226	1730 232	1776 238	1822 244	1868 251
52	1914 257	1960 263	2005 269	2051 275	2096 281	2142 287	2187 293	2232 299	2277 305	2322 311
54	2367 317	2411 323	2456 329	2500 335	2545 341	2589 347	2633 353	2676 359	2720 365	2764 371
56	2808 377	2851 382	2894 388	2937 394	2980 400	3023 405	3066 411	3108 417	3150 423	3193 428
58	3235 434	3277 440	3319 445	3361 451	3402 456	3444 462	3485 467	3526 473	3568 478	3609 484
60	3650 489	3690 495	3731 500	3771 506	3812 511	3852 517	3892 522	3931 527	3971 533	4010 538
62	4050 543	4090 548	4129 554	4169 559	4207 564	4245 569	4284 575	4323 580	4362 585	4401 590
64										
66										
68										
70										
72										
74										
76										
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

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INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL100			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	29 6	57 13	86 19	115 26	143 32	172 38	200 45	229 51	257 57	268
46	285 64	314 70	342 76	370 82	398 89	426 95	454 101	482 107	510 113	538 119	271
48	566 125	593 131	621 137	649 143	676 149	704 155	731 161	759 167	786 173	813 179	275
50	841 185	868 191	895 196	922 202	949 208	976 214	1003 219	1030 225	1057 231	1084 236	280
52	1111 242	1137 247	1164 253	1190 258	1217 264	1244 269	1270 274	1296 280	1323 285	1349 290	287
54	1376 295	1402 300	1428 305	1454 310	1480 315	1506 320	1532 325	1558 330	1584 335	1610 340	308
56	1636 345	1662 350	1687 355	1713 359	1739 364	1765 369	1790 374	1816 378	1841 383	1867 388	320
58	1893 392	1918 397	1943 402	1969 406	1994 411	2020 416	2045 420	2070 425	2095 429	2121 434	327
60	2146 439	2171 443	2196 448	2221 452	2247 457	2272 461	2297 466	2322 470	2347 474	2372 479	333
62	2397 483	2421 488	2446 492	2471 497	2496 501	2521 505	2546 510	2570 514	2595 518	2620 523	338
64	2644 527	2669 531	2694 536	2718 540	2743 544	2767 548	2792 553	2816 557	2841 561	2865 565	343
66	2889 570	2914 574	2938 578	2962 582	2987 586	3011 590	3035 595	3059 599	3084 603	3108 607	348
68	3132 611	3156 615	3180 619	3204 624	3228 628	3253 632	3276 636	3300 640	3324 644	3348 648	351
70	3372 652	3396 656	3420 660	3444 664	3468 668	3492 672	3515 676	3539 680	3563 684	3587 688	354
72	3610 692	3634 696	3658 700	3681 704	3705 708	3729 712	3752 716	3776 720	3799 724	3823 728	355
74	3846 732	3870 736	3893 740	3916 744	3940 748	3963 752	3987 756	4010 760	4033 764	4056 768	356
76	4080 771	4103 775	4126 779	4149 783	4173 787	4196 791	4219 795	4242 799	4265 803	4288 806	357
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 01001 . 990.000 .000 0 FCDM-NO-02-05-30-008-180

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INTEGRATED CRUISE										
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0% TAS= 447KT		DISTANCE (NM) TIME (MIN)		M.78 FL390		
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8
40	0 0	52 7	104 14	156 21	208 28	260 35	311 42	363 49	415 56	466 63
42	518 69	569 76	620 83	671 90	722 97	773 104	824 111	875 117	926 124	977 131
44	1027 138	1078 145	1128 151	1178 158	1228 165	1279 171	1329 178	1378 185	1428 192	1478 198
46	1528 205	1577 212	1627 218	1676 225	1726 231	1775 238	1824 245	1873 251	1922 258	1971 264
48	2019 271	2068 277	2116 284	2165 290	2213 297	2262 303	2310 310	2357 316	2405 323	2453 329
50	2501 335	2549 342	2596 348	2643 355	2691 361	2738 367	2785 373	2832 380	2879 386	2925 392
52	2972 399	3019 405	3065 411	3111 417	3157 423	3204 430	3249 436	3295 442	3341 448	3386 454
54	3432 460	3477 466	3522 472	3567 478	3612 484	3657 490	3702 496	3746 502	3790 508	3835 514
56	3879 520	3923 526	3967 532	4010 538	4054 544	4098 550	4141 555	4184 561	4227 567	4270 573
58	4313 578	4355 584	4398 590	4440 595	4482 601	4525 607	4566 612	4608 618	4650 624	4691 629
60	4733 635	4774 640	4815 646	4856 651	4897 657	4938 662	4978 668	5018 673	5058 678	5099 684
62	5139 689	5179 695	5218 700	5258 705	5297 710	5337 716	5376 721	5415 726	5453 731	5492 737
64	5531 742	5570 747	5608 752	5647 757						
66										
68										
70										
72										
74										
76										
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %				TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL100			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	30 7	59 14	89 20	118 27	148 34	177 41	207 47	236 54	265 61	261
42	295 67	324 74	353 81	382 87	411 94	440 100	469 107	498 113	527 120	556 126	264
44	585 133	613 139	642 146	670 152	699 159	728 165	756 172	784 178	813 184	841 191	266
46	869 197	898 203	926 210	954 216	982 222	1010 228	1038 235	1066 241	1094 247	1122 253	268
48	1150 259	1177 265	1205 272	1233 278	1260 284	1288 290	1315 296	1343 302	1370 308	1398 314	271
50	1425 320	1452 326	1479 332	1506 338	1534 343	1561 349	1588 355	1615 361	1641 367	1668 373	275
52	1695 378	1722 384	1749 390	1775 395	1802 401	1829 407	1855 412	1881 417	1908 423	1934 428	280
54	1961 434	1987 439	2013 444	2039 449	2065 454	2092 459	2118 464	2143 469	2169 474	2195 479	302
56	2221 484	2247 489	2273 493	2299 498	2324 503	2350 508	2376 512	2401 517	2427 522	2452 526	320
58	2478 531	2503 536	2529 540	2554 545	2579 549	2605 554	2630 558	2655 563	2681 567	2706 572	333
60	2731 576	2756 581	2781 585	2807 590	2832 594	2857 598	2882 603	2907 607	2932 612	2957 616	339
62	2982 620	3007 625	3031 629	3056 633	3081 638	3106 642	3131 646	3156 650	3180 655	3205 659	345
64	3230 663	3254 667	3279 672	3304 676	3328 680	3353 684	3377 688	3402 693	3426 697	3451 701	350
66	3475 705	3500 709	3524 713	3548 717	3573 722	3597 726	3622 730	3646 734	3670 738	3694 742	353
68	3719 746	3743 750	3767 754	3791 758	3815 762	3840 766	3864 771	3888 775	3912 779	3936 783	356
70	3960 787	3984 791	4008 795	4032 799	4056 803	4080 807	4103 811	4127 815	4151 819	4175 823	359
72	4199 827	4223 831	4246 834	4270 838	4294 842	4318 846	4341 850	4365 854	4388 858	4412 862	360
74	4436 866	4459 870	4483 874	4506 878	4530 882	4553 886	4577 889	4600 893	4624 897	4647 901	361
76	4671 905	4694 909	4717 913	4741 917	4764 920	4787 924	4810 928	4834 932	4857 936	4880 940	362
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 0.00 01001 .990 .000 .000 0 FCOM-NO-02-05-30-008-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL120			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2022 370	2046 374	2070 378	2094 383	2118 387	2142 391	2167 395	2191 400	2215 404	2239 408	341
66	2263 412	2287 416	2311 421	2335 425	2359 429	2382 433	2406 437	2430 442	2454 446	2478 450	342
68	2502 454	2525 458	2549 462	2573 466	2596 471	2620 475	2644 479	2667 483	2691 487	2714 491	343
70	2738 495	2762 499	2785 503	2808 507	2832 512	2855 516	2879 520	2902 524	2925 528	2949 532	345
72	2972 536	2995 540	3019 544	3042 548	3065 552	3088 556	3111 560	3134 564	3157 568	3180 572	347
74	3204 576	3226 579	3249 583	3272 587	3295 591	3318 595	3341 599	3364 603	3386 607	3409 610	352
76	3432 614	3455 618	3477 622	3500 625	3523 629	3545 633	3568 637	3590 640	3613 644	3635 648	358
78	3658 652	3680 655	3702 659	3725 663	3747 666	3770 670	3792 674	3814 677	3836 681	3858 684	364
80	3881 688	3903 692	3925 695	3947 699	3969 702	3991 706	4013 710	4035 713	4057 717	4079 720	370
82	4101 724	4123 727	4145 731	4167 734	4189 738	4211 741	4233 745	4254 748	4276 752	4298 755	374
84	4320 759	4341 762	4363 766	4385 769	4406 772	4428 776	4450 779	4471 783	4493 786	4514 790	376
86	4536 793	4557 796	4579 800	4600 803	4622 807	4643 810	4664 813	4686 817	4707 820	4729 823	379
88	4750 827	4771 830	4792 834	4814 837	4835 840	4856 844	4877 847	4898 850	4920 853	4941 857	380
90	4962 860	4983 863	5004 867	5025 870	5046 873	5067 877	5088 880	5109 883	5130 886	5151 889	384
92	5172 893	5192 896	5213 899	5234 902	5255 905	5276 909	5296 912	5317 915	5338 918	5358 921	389
ECON AIR CONDITIONING ΔFUEL = − 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL150			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2174 390	2200 395	2226 399	2252 404	2278 408	2304 413	2329 417	2355 422	2381 426	2406 430	344
66	2432 435	2458 439	2483 444	2509 448	2534 452	2560 457	2585 461	2610 465	2635 469	2661 474	350
68	2686 478	2711 482	2736 486	2762 491	2787 495	2812 499	2837 503	2862 507	2887 511	2912 516	357
70	2937 520	2962 524	2986 528	3011 532	3036 536	3061 540	3086 544	3110 548	3135 552	3160 556	363
72	3184 560	3209 564	3233 568	3258 572	3282 576	3307 580	3331 584	3356 588	3380 592	3405 596	369
74	3429 600	3453 604	3477 608	3502 612	3526 616	3550 620	3574 623	3598 627	3623 631	3647 635	371
76	3671 639	3695 643	3719 647	3743 650	3767 654	3791 658	3815 662	3838 666	3862 670	3886 673	374
78	3910 677	3934 681	3957 685	3981 689	4005 692	4029 696	4052 700	4076 704	4099 707	4123 711	376
80	4146 715	4170 718	4193 722	4217 726	4240 730	4264 733	4287 737	4310 740	4334 744	4357 748	380
82	4380 751	4403 755	4427 759	4450 762	4473 766	4496 769	4519 773	4542 776	4565 780	4588 783	386
84	4611 787	4634 790	4657 794	4680 797	4703 801	4726 804	4748 808	4771 811	4794 815	4817 818	392
86	4839 822	4862 825	4885 828	4907 832	4930 835	4953 839	4975 842	4998 845	5020 849	5043 852	399
88	5065 855	5087 859	5110 862	5132 865	5154 869	5177 872	5199 875	5221 879	5244 882	5266 885	403
90	5288 888	5310 892	5332 895	5354 898	5377 901	5399 905	5421 908	5443 911	5465 914	5487 918	406
92	5509 921	5531 924	5553 927	5574 930	5596 934	5618 937	5640 940	5662 943	5684 946	5705 950	409
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL120			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	30 7	60 13	90 20	119 26	149 33	179 39	208 46	238 52	267 58	272
46	297 65	326 71	356 78	385 84	414 90	443 96	472 103	501 109	530 115	559 121	277
48	588 127	617 133	645 139	674 145	703 151	731 157	760 162	788 168	817 174	845 179	284
50	873 185	902 190	930 196	958 201	986 207	1014 212	1042 218	1070 223	1098 228	1126 234	305
52	1153 239	1181 244	1209 249	1236 255	1264 260	1292 265	1319 270	1347 275	1374 280	1402 286	316
54	1429 291	1456 296	1484 301	1511 306	1538 311	1566 316	1593 321	1620 326	1647 331	1674 336	323
56	1701 341	1728 346	1755 351	1782 356	1809 360	1836 365	1863 370	1889 375	1916 380	1943 385	328
58	1970 389	1996 394	2023 399	2050 404	2076 408	2103 413	2129 418	2156 422	2182 427	2209 432	335
60	2235 437	2261 441	2288 446	2314 450	2340 455	2366 460	2393 464	2419 469	2445 473	2471 478	341
62	2497 482	2523 487	2549 491	2575 496	2601 500	2627 505	2653 509	2679 514	2705 518	2730 522	347
64	2756 527	2782 531	2808 536	2833 540	2859 544	2885 549	2910 553	2936 558	2962 562	2987 566	350
66	3013 571	3038 575	3064 579	3089 584	3114 588	3140 592	3165 597	3191 601	3216 605	3241 609	352
68	3267 614	3292 618	3317 622	3342 627	3367 631	3393 635	3418 639	3443 644	3468 648	3493 652	353
70	3518 656	3543 661	3568 665	3593 669	3618 673	3643 678	3667 682	3692 686	3717 690	3742 694	354
72	3767 699	3791 703	3816 707	3841 711	3866 715	3890 719	3915 724	3939 728	3964 732	3989 736	354
74	4013 740	4038 744	4062 749	4087 753	4111 757	4135 761	4160 765	4184 769	4208 773	4233 777	355
76	4257 781	4281 785	4305 789	4329 794	4354 798	4378 802	4402 806	4426 810	4450 814	4474 818	357
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 01201 . 990 .000 .000 0 FCOM-NO-02-05-30-009-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL150			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	32 6	63 13	95 19	126 25	158 31	189 37	221 44	252 50	283 56	299
46	314 62	345 68	376 74	407 80	438 86	469 92	500 98	531 103	562 109	593 115	310
48	623 121	654 127	684 133	715 139	746 144	776 150	806 156	837 161	867 167	897 173	315
50	928 179	958 184	988 190	1018 195	1048 201	1078 207	1108 212	1138 218	1168 223	1198 229	321
52	1227 234	1257 239	1287 245	1316 250	1346 256	1376 261	1405 266	1434 272	1464 277	1493 282	327
54	1523 287	1552 293	1581 298	1610 303	1640 308	1669 313	1698 319	1727 324	1756 329	1785 334	336
56	1814 339	1843 344	1871 349	1900 354	1929 359	1958 364	1986 369	2015 374	2044 379	2072 384	344
58	2101 389	2129 394	2158 398	2186 403	2215 408	2243 413	2272 418	2300 423	2328 428	2356 433	348
60	2385 438	2413 442	2441 447	2469 452	2497 457	2525 462	2553 467	2581 471	2609 476	2637 481	349
62	2665 486	2693 491	2721 495	2749 500	2777 505	2805 510	2832 514	2860 519	2888 524	2915 529	349
64	2943 533	2970 538	2998 543	3026 548	3053 552	3081 557	3108 562	3135 566	3163 571	3190 576	350
66	3217 580	3245 585	3272 590	3299 594	3326 599	3353 604	3380 608	3407 613	3434 617	3461 622	351
68	3488 627	3515 631	3542 636	3569 640	3596 645	3623 649	3649 654	3676 658	3702 663	3729 667	354
70	3756 672	3782 676	3809 680	3835 685	3862 689	3888 694	3914 698	3940 702	3967 707	3993 711	358
72	4019 716	4045 720	4071 724	4098 729	4124 733	4150 737	4176 741	4201 746	4227 750	4253 754	361
74	4279 759	4305 763	4331 767	4356 771	4382 775	4408 780	4433 784	4459 788	4485 792	4510 796	365
76	4536 800	4561 805	4587 809	4612 813	4637 817	4663 821	4688 825	4713 829	4738 833	4764 837	369
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 01501 . 990 .000 .000 0 FCOM-N0-02-05-30-0010-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL120			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	31 7	62 14	93 21	124 28	155 35	186 42	216 49	247 56	278 63	263
42	309 70	339 77	369 84	400 91	430 98	461 104	491 111	521 118	551 125	581 131	265
44	611 138	641 145	671 151	701 158	731 165	761 171	790 178	820 184	850 191	879 198	269
46	909 204	938 211	967 217	997 223	1026 230	1055 236	1084 243	1113 249	1142 255	1171 261	273
48	1200 268	1229 274	1258 280	1286 286	1315 292	1344 298	1372 304	1401 310	1429 316	1458 322	278
50	1486 328	1514 333	1542 339	1571 344	1599 350	1627 356	1655 361	1683 366	1711 372	1738 377	300
52	1766 382	1794 388	1822 393	1849 398	1877 403	1905 408	1932 413	1960 418	1987 423	2014 429	316
54	2042 434	2069 439	2096 444	2124 448	2151 453	2178 458	2205 463	2232 468	2260 473	2287 478	328
56	2314 483	2341 488	2368 492	2395 497	2422 502	2448 507	2475 512	2502 516	2529 521	2556 526	335
58	2582 530	2609 535	2636 540	2662 544	2689 549	2716 554	2742 558	2768 563	2795 567	2821 572	342
60	2848 577	2874 581	2901 586	2927 590	2953 595	2980 599	3006 604	3032 608	3058 613	3084 617	348
62	3110 621	3136 626	3163 630	3189 635	3215 639	3241 644	3267 648	3293 652	3319 657	3344 661	352
64	3370 666	3396 670	3422 674	3448 679	3474 683	3499 687	3525 692	3551 696	3577 700	3602 705	356
66	3628 709	3653 713	3679 718	3705 722	3730 726	3756 730	3781 735	3807 739	3832 743	3857 748	357
68	3883 752	3908 756	3934 760	3959 765	3984 769	4010 773	4035 777	4060 781	4085 786	4110 790	358
70	4136 794	4161 798	4186 802	4211 807	4236 811	4261 815	4286 819	4311 823	4336 828	4361 832	359
72	4386 836	4411 840	4435 844	4460 848	4485 853	4510 857	4535 861	4559 865	4584 869	4609 873	359
74	4634 877	4658 881	4683 885	4707 890	4732 894	4757 898	4781 902	4806 906	4830 910	4854 914	360
76	4879 918	4903 922	4928 926	4952 930	4976 934	5000 938	5025 942	5049 946	5073 950	5097 954	362
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA222000C5KG330 0 018590 0 0 1 1.0 .00 01201 .990 .000 .000 0 FCOM-NO-02-05-30-009-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL150			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	33 7	66 15	99 22	132 30	165 37	198 44	231 52	264 59	296 66	267
42	329 73	361 80	394 87	426 94	458 102	491 109	523 115	555 122	587 129	619 136	272
44	651 142	682 149	714 155	746 161	777 168	809 174	840 180	872 186	903 192	934 199	294
46	965 205	996 211	1027 217	1058 223	1089 229	1120 234	1151 240	1182 246	1213 252	1243 258	310
48	1274 264	1305 269	1335 275	1366 281	1396 286	1427 292	1457 298	1487 303	1518 309	1548 314	319
50	1578 320	1608 325	1638 331	1668 336	1698 342	1728 348	1758 353	1788 358	1818 364	1848 369	326
52	1878 374	1907 380	1937 385	1967 390	1996 396	2026 401	2056 406	2085 411	2115 416	2144 422	335
54	2173 427	2203 432	2232 437	2261 442	2290 447	2320 452	2349 457	2378 462	2407 467	2436 472	343
56	2465 477	2494 482	2523 487	2552 492	2581 497	2609 502	2638 507	2667 512	2696 517	2724 522	350
58	2753 526	2782 531	2810 536	2839 541	2867 546	2896 551	2924 556	2953 560	2981 565	3010 570	352
60	3038 575	3067 580	3095 585	3123 589	3151 594	3180 599	3208 604	3236 609	3264 613	3292 618	353
62	3320 623	3348 628	3376 632	3404 637	3432 642	3460 647	3488 651	3516 656	3544 661	3571 665	354
64	3599 670	3627 675	3655 679	3682 684	3710 689	3738 693	3765 698	3793 703	3820 707	3848 712	355
66	3875 717	3903 721	3930 726	3957 731	3985 735	4012 740	4039 744	4067 749	4094 753	4121 758	356
68	4148 762	4175 767	4202 771	4229 776	4256 780	4283 785	4310 789	4337 794	4363 798	4390 803	360
70	4417 807	4444 811	4470 816	4497 820	4524 825	4550 829	4577 833	4603 838	4630 842	4656 846	364
72	4683 851	4709 855	4735 859	4761 864	4788 868	4814 872	4840 876	4866 881	4892 885	4919 889	368
74	4945 893	4971 897	4997 902	5022 906	5048 910	5074 914	5100 918	5126 922	5152 926	5177 931	372
76	5203 935	5229 939	5254 943	5280 947	5306 951	5331 955	5357 959	5382 963	5408 967	5433 971	376
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 01501 .990 .000 .000 0 FCOM-NO-02-05-30-0010-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL170			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2277 403	2304 407	2330 412	2357 416	2384 421	2411 425	2438 430	2464 434	2491 438	2518 443	359
66	2544 447	2571 452	2597 456	2624 460	2650 465	2677 469	2703 473	2729 477	2756 482	2782 486	365
68	2808 490	2834 495	2861 499	2887 503	2913 507	2939 512	2965 516	2991 520	3017 524	3043 529	368
70	3069 533	3095 537	3121 541	3147 545	3172 549	3198 554	3224 558	3250 562	3275 566	3301 570	371
72	3327 574	3352 578	3378 583	3403 587	3429 591	3455 595	3480 599	3505 603	3531 607	3556 611	373
74	3582 615	3607 619	3632 623	3657 627	3682 631	3708 635	3733 639	3758 643	3783 647	3808 651	378
76	3833 655	3858 659	3883 662	3908 666	3933 670	3957 674	3982 678	4007 682	4032 685	4056 689	385
78	4081 693	4106 697	4130 701	4155 704	4179 708	4204 712	4228 716	4253 719	4277 723	4302 727	391
80	4326 730	4350 734	4375 738	4399 741	4423 745	4448 749	4472 752	4496 756	4520 759	4544 763	398
82	4568 767	4592 770	4616 774	4640 777	4664 781	4688 785	4712 788	4736 792	4760 795	4783 799	402
84	4807 802	4831 806	4855 809	4878 813	4902 816	4926 820	4949 823	4973 827	4997 830	5020 834	405
86	5044 837	5067 841	5091 844	5114 848	5138 851	5161 854	5184 858	5208 861	5231 865	5254 868	407
88	5278 872	5301 875	5324 878	5347 882	5371 885	5394 889	5417 892	5440 895	5463 899	5486 902	410
90	5509 905	5532 909	5555 912	5578 915	5601 919	5624 922	5647 925	5669 929	5692 932	5715 935	413
92	5738 938	5760 942	5783 945	5806 948	5829 951	5851 955	5874 958	5896 961	5919 964	5941 968	416
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL190			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2378 412	2406 417	2434 421	2462 426	2490 430	2518 435	2545 440	2573 444	2601 449	2629 453	367
66	2657 458	2684 462	2712 467	2739 471	2767 475	2795 480	2822 484	2849 489	2877 493	2904 498	369
68	2932 502	2959 506	2986 511	3013 515	3041 519	3068 524	3095 528	3122 532	3149 536	3176 541	375
70	3203 545	3230 549	3257 553	3283 558	3310 562	3337 566	3364 570	3390 574	3417 578	3444 582	382
72	3470 587	3497 591	3523 595	3550 599	3576 603	3603 607	3629 611	3655 615	3682 619	3708 623	390
74	3734 627	3760 631	3787 635	3813 639	3839 643	3865 647	3891 651	3917 654	3943 658	3969 662	395
76	3995 666	4020 670	4046 674	4072 678	4098 682	4124 686	4149 689	4175 693	4201 697	4226 701	399
78	4252 705	4277 708	4303 712	4328 716	4354 720	4379 724	4405 727	4430 731	4455 735	4481 739	403
80	4506 742	4531 746	4556 750	4582 754	4607 757	4632 761	4657 765	4682 768	4707 772	4732 776	405
82	4757 779	4782 783	4807 787	4832 790	4857 794	4881 798	4906 801	4931 805	4956 809	4980 812	408
84	5005 816	5030 819	5054 823	5079 826	5103 830	5128 834	5152 837	5177 841	5201 844	5226 848	412
86	5250 851	5274 855	5299 858	5323 862	5347 865	5372 869	5396 872	5420 876	5444 879	5468 883	416
88	5492 886	5516 890	5540 893	5564 896	5588 900	5612 903	5636 907	5660 910	5684 913	5708 917	419
90	5732 920	5755 924	5779 927	5803 930	5827 934	5850 937	5874 940	5897 944	5921 947	5945 950	422
92	5968 954	5992 957	6015 960	6038 964	6062 967	6085 970	6109 974	6132 977	6155 980	6179 983	426
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL170			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	33 6	66 13	99 19	132 25	165 32	198 38	231 44	264 51	296 57	311
46	329 63	362 69	394 75	427 81	459 88	492 94	524 100	556 106	588 112	621 118	317
48	653 124	685 130	717 136	749 142	781 148	813 153	845 159	876 165	908 171	940 177	322
50	971 182	1003 188	1034 194	1066 199	1097 205	1129 211	1160 216	1191 222	1222 227	1254 233	330
52	1285 239	1316 244	1347 249	1378 255	1409 260	1440 266	1470 271	1501 277	1532 282	1563 287	339
54	1593 293	1624 298	1655 303	1685 309	1716 314	1746 319	1776 324	1807 330	1837 335	1868 340	345
56	1898 345	1928 351	1958 356	1988 361	2019 366	2049 372	2079 377	2109 382	2139 387	2169 392	346
58	2199 397	2228 403	2258 408	2288 413	2318 418	2348 423	2377 428	2407 434	2437 439	2466 444	347
60	2496 449	2525 454	2555 459	2584 464	2614 469	2643 474	2672 479	2702 484	2731 489	2760 494	348
62	2789 499	2818 504	2847 509	2876 514	2905 519	2934 524	2963 529	2992 534	3021 539	3050 544	350
64	3078 549	3107 553	3136 558	3164 563	3193 568	3221 573	3250 578	3278 582	3306 587	3335 592	354
66	3363 597	3391 601	3419 606	3448 611	3476 615	3504 620	3532 625	3560 629	3588 634	3616 639	358
68	3644 643	3671 648	3699 653	3727 657	3755 662	3783 666	3810 671	3838 675	3865 680	3893 684	362
70	3920 689	3948 693	3975 698	4002 702	4030 707	4057 711	4084 716	4111 720	4139 725	4166 729	366
72	4193 733	4220 738	4247 742	4274 747	4301 751	4328 755	4355 760	4381 764	4408 768	4435 772	370
74	4462 777	4488 781	4515 785	4542 789	4568 794	4595 798	4621 802	4648 806	4674 810	4700 814	376
76	4727 819	4753 823	4779 827	4806 831	4832 835	4858 839	4884 843	4910 847	4936 851	4962 855	383
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 01701 . 990 .000 .000 0 FCOM-NO-02-05-30-0011-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL190			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	35 7	69 13	104 20	139 26	173 33	207 39	242 45	276 52	310 58	317
46	345 65	379 71	413 77	447 83	481 90	515 96	548 102	582 108	616 114	650 120	324
48	683 126	717 132	750 138	784 144	817 150	850 156	884 162	917 168	950 174	983 180	334
50	1016 185	1049 191	1082 197	1115 203	1148 208	1180 214	1213 220	1246 226	1278 231	1311 237	341
52	1344 243	1376 248	1408 254	1441 260	1473 265	1506 271	1538 277	1570 282	1602 288	1635 294	343
54	1667 299	1699 305	1731 310	1763 316	1795 321	1827 327	1859 333	1890 338	1922 344	1954 349	344
56	1986 355	2017 360	2049 366	2080 371	2112 377	2144 382	2175 387	2206 393	2237 398	2269 404	345
58	2300 409	2331 414	2362 420	2393 425	2424 430	2455 436	2486 441	2517 446	2547 451	2578 457	349
60	2609 462	2640 467	2670 472	2701 477	2731 482	2762 488	2792 493	2822 498	2853 503	2883 508	354
62	2913 513	2943 518	2973 523	3003 528	3033 533	3063 538	3093 543	3123 548	3153 553	3183 558	358
64	3213 563	3242 568	3272 573	3301 578	3331 583	3361 587	3390 592	3419 597	3449 602	3478 607	362
66	3507 611	3536 616	3566 621	3595 626	3624 630	3653 635	3682 640	3711 645	3740 649	3769 654	367
68	3798 659	3826 663	3855 668	3884 672	3912 677	3941 682	3970 686	3998 691	4027 695	4055 700	373
70	4084 704	4112 709	4140 713	4169 717	4197 722	4225 726	4253 731	4281 735	4309 739	4337 744	380
72	4365 748	4393 752	4421 757	4449 761	4477 765	4505 770	4533 774	4560 778	4588 782	4616 786	388
74	4643 791	4671 795	4698 799	4726 803	4753 807	4781 811	4808 815	4835 819	4862 824	4890 828	396
76	4917 832	4944 836	4971 840	4998 844	5025 848	5053 852	5079 856	5106 860	5133 864	5160 868	404
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 01901 . 990 .000 .000 0 FCOM-N0-02-05-30-0012-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL170			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	34 7	69 14	103 22	138 29	172 36	206 43	240 50	274 56	308 63	276
42	342 70	375 76	409 83	443 90	476 96	510 103	543 109	577 116	610 122	643 128	304
44	676 135	709 141	742 147	775 154	809 160	842 166	874 172	907 178	940 185	973 191	314
46	1005 197	1038 203	1070 209	1103 215	1135 221	1168 227	1200 233	1232 239	1265 245	1297 251	321
48	1329 257	1361 263	1393 268	1425 274	1457 280	1489 286	1521 292	1552 297	1584 303	1616 309	328
50	1648 314	1679 320	1711 325	1742 331	1774 336	1805 342	1837 347	1868 353	1899 358	1930 364	338
52	1962 369	1993 375	2024 380	2055 385	2086 391	2117 396	2148 401	2179 407	2209 412	2240 417	347
54	2271 423	2302 428	2332 433	2363 438	2394 444	2425 449	2455 454	2485 459	2516 465	2546 470	349
56	2577 475	2607 480	2638 485	2668 491	2698 496	2729 501	2759 506	2789 511	2819 516	2849 522	351
58	2879 527	2909 532	2939 537	2969 542	2999 547	3029 552	3059 557	3089 562	3119 567	3148 573	352
60	3178 578	3208 583	3237 588	3267 593	3297 598	3326 603	3356 608	3385 613	3415 618	3444 623	352
62	3473 628	3503 633	3532 637	3561 642	3590 647	3619 652	3648 657	3677 662	3706 667	3735 672	355
64	3764 676	3793 681	3822 686	3851 691	3879 696	3908 700	3937 705	3965 710	3994 715	4023 719	359
66	4051 724	4079 729	4108 733	4136 738	4165 743	4193 747	4221 752	4249 757	4277 761	4306 766	364
68	4334 770	4362 775	4390 779	4418 784	4446 789	4474 793	4502 798	4529 802	4557 807	4585 811	368
70	4613 816	4640 820	4668 824	4695 829	4723 833	4751 838	4778 842	4805 846	4833 851	4860 855	373
72	4888 859	4915 864	4942 868	4969 872	4997 877	5024 881	5051 885	5078 889	5105 893	5132 898	380
74	5159 902	5186 906	5213 910	5240 914	5266 919	5293 923	5320 927	5347 931	5373 935	5400 939	386
76	5427 943	5453 947	5480 951	5506 955	5533 959	5559 963	5585 967	5612 971	5638 975	5664 979	392
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA222000C5KG330 0 018590 0 0 1 1.0 .00 01701 .990 .000 .000 0 FCOM-NO-02-05-30-011-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL190			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	36 7	72 14	108 21	143 28	179 35	215 41	250 48	286 55	322 62	310
42	357 69	392 75	428 82	463 89	498 95	534 102	568 109	603 115	638 122	673 128	314
44	708 135	743 141	778 148	812 154	847 161	881 167	916 173	950 180	985 186	1019 192	322
46	1053 198	1087 205	1121 211	1155 217	1189 223	1224 229	1257 235	1291 241	1325 247	1359 253	329
48	1392 259	1426 265	1459 271	1493 277	1526 283	1560 288	1593 294	1626 300	1660 306	1693 311	341
50	1726 317	1759 323	1792 329	1825 334	1858 340	1891 346	1924 351	1957 357	1989 363	2022 368	347
52	2055 374	2088 380	2120 385	2153 391	2185 397	2218 402	2250 408	2283 413	2315 419	2347 425	348
54	2380 430	2412 436	2444 441	2476 447	2509 452	2541 458	2573 463	2605 469	2637 474	2669 480	349
56	2701 485	2732 491	2764 496	2796 501	2828 507	2859 512	2891 518	2922 523	2954 528	2985 534	350
58	3017 539	3048 544	3079 550	3110 555	3142 560	3173 565	3204 571	3235 576	3266 581	3297 586	355
60	3328 591	3359 596	3389 602	3420 607	3451 612	3482 617	3512 622	3543 627	3573 632	3604 637	359
62	3634 642	3665 647	3695 652	3725 657	3755 662	3786 667	3816 672	3846 677	3876 682	3906 687	364
64	3936 691	3966 696	3996 701	4026 706	4055 711	4085 716	4115 720	4144 725	4174 730	4204 735	369
66	4233 739	4263 744	4292 749	4322 753	4351 758	4380 763	4410 767	4439 772	4468 777	4497 781	376
68	4526 786	4555 790	4584 795	4613 799	4642 804	4671 808	4700 813	4729 817	4757 822	4786 826	382
70	4815 831	4844 835	4872 839	4901 844	4929 848	4958 853	4986 857	5015 861	5043 866	5071 870	389
72	5100 874	5128 878	5156 883	5184 887	5212 891	5240 895	5268 900	5296 904	5324 908	5352 912	395
74	5380 916	5408 921	5436 925	5464 929	5491 933	5519 937	5547 941	5574 945	5602 949	5630 953	402
76	5657 957	5685 961	5712 965	5740 970	5767 974	5794 978	5822 982	5849 986	5876 990	5903 993	408
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 0.00 01901 .990 .000 .000 0 -FCOM-NO-02-05-30-012-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL210			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2480 419	2509 424	2538 428	2567 433	2596 437	2625 442	2654 446	2682 451	2711 455	2740 460	378
66	2769 464	2798 469	2826 473	2855 478	2884 482	2912 487	2941 491	2969 495	2997 500	3026 504	386
68	3054 508	3083 513	3111 517	3139 521	3167 526	3195 530	3223 534	3251 538	3279 543	3307 547	392
70	3336 551	3363 555	3391 560	3419 564	3447 568	3475 572	3502 576	3530 581	3558 585	3585 589	396
72	3613 593	3640 597	3668 601	3695 605	3723 610	3750 614	3778 618	3805 622	3832 626	3860 630	400
74	3887 634	3914 638	3941 642	3968 646	3995 650	4023 654	4050 658	4076 662	4103 666	4130 670	403
76	4157 674	4184 678	4211 682	4238 686	4264 690	4291 694	4318 698	4344 702	4371 706	4398 709	406
78	4424 713	4451 717	4477 721	4503 725	4530 729	4556 733	4583 736	4609 740	4635 744	4661 748	410
80	4688 752	4714 755	4740 759	4766 763	4792 767	4818 771	4844 774	4870 778	4896 782	4922 785	414
82	4948 789	4973 793	4999 797	5025 800	5051 804	5076 808	5102 811	5128 815	5153 819	5179 822	417
84	5204 826	5230 830	5255 833	5281 837	5306 840	5331 844	5357 848	5382 851	5407 855	5433 858	421
86	5458 862	5483 865	5508 869	5533 873	5558 876	5583 880	5608 883	5633 887	5658 890	5683 894	425
88	5708 897	5733 901	5758 904	5782 908	5807 911	5832 915	5857 918	5881 921	5906 925	5931 928	428
90	5955 932	5980 935	6004 938	6029 942	6053 945	6078 949	6102 952	6126 955	6151 959	6175 962	431
92	6199 965	6223 969	6248 972	6272 975	6296 979	6320 982	6344 985	6368 989	6392 992	6416 995	435
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL230			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2581 422	2611 426	2641 431	2671 435	2702 440	2732 445	2762 449	2792 454	2822 458	2851 463	393
66	2881 467	2911 472	2941 476	2971 481	3000 485	3030 490	3060 494	3089 499	3119 503	3148 508	396
68	3178 512	3207 517	3237 521	3266 525	3295 530	3324 534	3354 538	3383 543	3412 547	3441 551	400
70	3470 556	3499 560	3528 564	3557 569	3586 573	3615 577	3643 581	3672 586	3701 590	3729 594	404
72	3758 598	3787 603	3815 607	3844 611	3872 615	3901 619	3929 623	3957 628	3986 632	4014 636	408
74	4042 640	4070 644	4098 648	4127 652	4155 656	4183 660	4211 664	4239 668	4266 673	4294 677	412
76	4322 681	4350 685	4378 689	4405 693	4433 697	4461 701	4488 705	4516 708	4544 712	4571 716	416
78	4599 720	4626 724	4653 728	4681 732	4708 736	4735 740	4762 744	4790 748	4817 751	4844 755	419
80	4871 759	4898 763	4925 767	4952 771	4979 774	5006 778	5033 782	5060 786	5086 790	5113 793	423
82	5140 797	5167 801	5193 805	5220 808	5246 812	5273 816	5299 820	5326 823	5352 827	5379 831	426
84	5405 834	5431 838	5458 842	5484 845	5510 849	5536 853	5562 856	5588 860	5614 863	5641 867	431
86	5667 871	5692 874	5718 878	5744 881	5770 885	5796 888	5822 892	5847 895	5873 899	5899 902	435
88	5924 906	5950 909	5975 913	6001 916	6027 920	6052 923	6077 927	6103 930	6128 933	6153 937	440
90	6179 940	6204 944	6229 947	6254 950	6279 954	6305 957	6330 961	6355 964	6380 967	6405 971	445
92	6430 974	6455 977	6479 981	6504 984	6529 987	6554 991	6579 994	6603 997	6628 1000	6653 1004	449
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL210			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	36 7	72 13	109 20	145 26	181 33	217 40	253 46	289 52	324 59	325
46	360 65	396 72	431 78	467 84	502 91	538 97	573 103	608 109	644 116	679 122	336
48	714 128	749 134	784 140	819 146	854 153	889 159	923 165	958 171	993 177	1027 183	340
50	1062 189	1097 195	1131 201	1165 207	1200 213	1234 220	1269 225	1303 231	1337 237	1371 243	341
52	1405 249	1439 255	1473 261	1507 267	1541 273	1575 279	1608 285	1642 290	1675 296	1709 302	344
54	1742 308	1776 314	1809 319	1842 325	1875 331	1909 336	1942 342	1975 348	2008 353	2041 359	348
56	2074 365	2106 370	2139 376	2172 381	2204 387	2237 392	2270 398	2302 403	2334 409	2367 414	353
58	2399 420	2431 425	2464 430	2496 436	2528 441	2560 447	2592 452	2624 457	2656 462	2688 468	357
60	2720 473	2751 478	2783 483	2814 489	2846 494	2878 499	2909 504	2940 509	2972 515	3003 520	362
62	3034 525	3066 530	3097 535	3128 540	3159 545	3190 550	3221 555	3252 560	3283 565	3314 570	367
64	3344 575	3375 580	3406 585	3436 589	3467 594	3497 599	3528 604	3558 609	3589 613	3619 618	376
66	3649 623	3679 628	3710 632	3740 637	3770 642	3800 646	3830 651	3860 656	3890 660	3920 665	385
68	3950 669	3979 674	4009 678	4039 683	4068 687	4098 692	4127 696	4157 701	4186 705	4216 709	393
70	4245 714	4274 718	4304 723	4333 727	4362 731	4391 736	4420 740	4449 744	4478 749	4507 753	401
72	4536 757	4565 761	4594 766	4623 770	4652 774	4681 778	4709 783	4738 787	4767 791	4795 795	407
74	4824 799	4853 804	4881 808	4910 812	4938 816	4967 820	4995 824	5023 829	5051 833	5080 837	409
76	5108 841	5136 845	5164 849	5193 853	5221 857	5249 861	5277 866	5305 870	5333 874	5361 878	411
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 02101 . 990 .000 .000 0 FCOM-NO-02-05-30-013-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL230			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	38 7	76 13	113 20	151 27	189 34	226 40	264 47	301 54	339 60	336
46	376 67	414 74	451 80	488 87	525 93	562 100	599 106	636 113	673 119	710 126	338
48	746 132	783 139	819 145	856 152	892 158	929 164	965 171	1001 177	1037 183	1073 189	342
50	1109 196	1145 202	1181 208	1217 214	1253 220	1288 227	1324 233	1359 239	1395 245	1430 251	347
52	1466 257	1501 263	1536 269	1571 275	1606 281	1641 287	1676 293	1711 299	1746 304	1781 310	351
54	1815 316	1850 322	1884 328	1919 334	1953 339	1988 345	2022 351	2056 357	2091 362	2125 368	357
56	2159 374	2193 379	2227 385	2261 390	2294 396	2328 402	2362 407	2396 412	2429 418	2463 423	362
58	2496 429	2530 434	2563 440	2596 445	2630 450	2663 456	2696 461	2729 466	2762 472	2795 477	370
60	2828 482	2861 487	2893 492	2926 498	2959 503	2992 508	3024 513	3057 518	3089 523	3121 528	379
62	3154 533	3186 538	3218 543	3250 548	3283 553	3315 558	3347 563	3379 568	3411 572	3442 577	389
64	3474 582	3506 587	3538 592	3569 596	3601 601	3633 606	3664 611	3696 615	3727 620	3758 625	397
66	3790 629	3821 634	3852 639	3884 643	3915 648	3946 653	3977 657	4008 662	4039 666	4070 671	404
68	4101 675	4132 680	4163 685	4193 689	4224 694	4255 698	4286 703	4316 707	4347 712	4377 716	406
70	4408 721	4438 725	4469 730	4499 734	4529 739	4560 743	4590 747	4620 752	4650 756	4681 761	408
72	4711 765	4741 770	4771 774	4801 778	4831 783	4861 787	4890 791	4920 796	4950 800	4980 804	409
74	5010 809	5039 813	5069 817	5098 822	5128 826	5157 830	5186 834	5216 839	5245 843	5274 847	413
76	5304 851	5333 856	5362 860	5391 864	5420 868	5449 872	5478 876	5507 880	5536 885	5565 889	417
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 02301 . 990 .000 0 FCOM-N0-02-05-30-014-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL210			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	38 7	75 14	113 21	151 29	189 36	226 43	263 50	301 57	338 64	315
42	375 71	412 78	449 84	486 91	523 98	560 105	597 112	634 118	670 125	707 132	322
44	743 138	780 145	816 151	852 158	889 164	925 171	961 177	997 184	1033 190	1069 196	333
46	1105 203	1140 209	1176 215	1212 221	1247 228	1283 234	1318 240	1354 246	1389 252	1424 258	341
48	1460 265	1495 271	1530 277	1565 283	1600 289	1635 295	1670 301	1705 307	1740 313	1775 319	345
50	1810 325	1844 331	1879 337	1913 343	1948 349	1983 355	2017 361	2051 367	2086 373	2120 379	346
52	2155 385	2189 391	2223 397	2257 402	2291 408	2325 414	2359 420	2392 426	2426 431	2460 437	349
54	2494 443	2527 449	2561 454	2594 460	2628 466	2661 471	2695 477	2728 482	2761 488	2794 494	354
56	2827 499	2860 505	2893 510	2926 516	2959 521	2992 527	3025 532	3058 537	3090 543	3123 548	359
58	3156 554	3188 559	3221 564	3253 570	3285 575	3318 580	3350 585	3382 591	3414 596	3446 601	364
60	3479 606	3510 612	3542 617	3574 622	3606 627	3638 632	3670 637	3701 642	3733 647	3765 652	371
62	3796 657	3828 662	3859 667	3891 672	3922 677	3953 682	3984 687	4016 692	4047 697	4078 702	378
64	4109 707	4140 711	4171 716	4202 721	4233 726	4264 731	4294 735	4325 740	4356 745	4386 750	385
66	4417 754	4448 759	4478 764	4508 768	4539 773	4569 777	4600 782	4630 787	4660 791	4690 796	392
68	4720 800	4750 805	4780 809	4810 814	4840 818	4870 823	4900 827	4930 832	4960 836	4990 840	399
70	5019 845	5049 849	5079 854	5108 858	5138 862	5167 867	5197 871	5226 875	5256 880	5285 884	405
72	5314 888	5344 893	5373 897	5402 901	5431 905	5461 910	5490 914	5519 918	5548 922	5577 927	409
74	5606 931	5635 935	5663 939	5692 943	5721 948	5750 952	5779 956	5808 960	5836 964	5865 968	413
76	5894 973	5922 977	5951 981	5979 985	6008 989	6036 993	6065 997	6093 1001	6121 1006	6150 1010	414
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 02101 .990 .000 .000 0 FCOM-NO-02-05-30-013-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL230			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	40 7	79 15	119 22	158 29	198 37	237 44	276 51	315 58	354 65	323
42	393 72	432 79	470 86	509 93	548 100	587 106	625 113	663 120	701 127	740 134	335
44	778 140	816 147	854 154	892 160	930 167	968 174	1006 180	1043 187	1081 194	1119 200	341
46	1156 207	1194 213	1231 220	1268 226	1306 233	1343 239	1380 246	1417 252	1454 259	1491 265	343
48	1528 272	1565 278	1602 284	1639 291	1675 297	1712 303	1748 309	1785 316	1821 322	1857 328	347
50	1894 334	1930 340	1966 347	2002 353	2038 359	2074 365	2110 371	2145 377	2181 383	2217 389	352
52	2253 395	2288 401	2323 407	2359 413	2394 419	2430 425	2465 430	2500 436	2535 442	2570 448	358
54	2605 454	2640 459	2675 465	2709 471	2744 476	2779 482	2814 488	2848 493	2882 499	2917 505	364
56	2951 510	2986 516	3020 521	3054 527	3088 532	3122 538	3156 543	3190 548	3224 554	3258 559	371
58	3292 565	3325 570	3359 575	3393 581	3426 586	3460 591	3493 596	3527 602	3560 607	3593 612	379
60	3627 617	3660 622	3693 627	3726 632	3759 638	3792 643	3825 648	3858 653	3890 658	3923 663	386
62	3956 668	3988 673	4021 678	4054 683	4086 687	4119 692	4151 697	4183 702	4215 707	4248 712	394
64	4280 717	4312 721	4344 726	4376 731	4408 736	4440 741	4472 745	4504 750	4536 755	4568 759	401
66	4599 764	4631 769	4663 773	4694 778	4726 783	4758 787	4789 792	4820 797	4852 801	4883 806	406
68	4915 810	4946 815	4977 820	5008 824	5039 829	5071 833	5102 838	5133 842	5164 847	5195 851	409
70	5226 856	5256 860	5287 865	5318 869	5349 874	5380 878	5410 883	5441 887	5471 892	5502 896	411
72	5533 901	5563 905	5594 910	5624 914	5654 918	5685 923	5715 927	5745 932	5775 936	5806 940	412
74	5836 945	5866 949	5896 953	5926 958	5956 962	5986 966	6015 971	6045 975	6075 979	6105 984	415
76	6134 988	6164 992	6193 996	6223 1000	6252 1005	6282 1009	6311 1013	6341 1017	6370 1021	6399 1026	418
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 02301 .990 .000 .000 0 FCOM-NO-02-05-30-014-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL250			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2687 427	2718 432	2750 436	2781 441	2812 446	2844 450	2875 455	2906 460	2937 464	2968 469	400
66	2999 474	3030 478	3061 483	3092 487	3123 492	3154 496	3184 501	3215 506	3246 510	3276 515	404
68	3307 519	3337 524	3368 528	3398 532	3429 537	3459 541	3489 546	3519 550	3550 555	3580 559	408
70	3610 563	3640 568	3670 572	3700 576	3730 581	3760 585	3789 589	3819 594	3849 598	3879 602	413
72	3908 607	3938 611	3967 615	3997 619	4026 623	4056 628	4085 632	4115 636	4144 640	4173 644	417
74	4202 649	4232 653	4261 657	4290 661	4319 665	4348 669	4377 673	4406 678	4435 682	4463 686	420
76	4492 690	4521 694	4550 698	4578 702	4607 706	4636 710	4664 714	4692 718	4721 722	4749 726	424
78	4778 730	4806 734	4834 738	4862 742	4891 746	4919 750	4947 753	4975 757	5003 761	5031 765	430
80	5059 769	5086 773	5114 777	5142 780	5170 784	5198 788	5225 792	5253 796	5280 799	5308 803	435
82	5336 807	5363 811	5390 814	5418 818	5445 822	5472 826	5500 829	5527 833	5554 837	5581 840	440
84	5608 844	5635 848	5662 851	5689 855	5716 858	5743 862	5770 866	5797 869	5824 873	5850 876	445
86	5877 880	5904 884	5930 887	5957 891	5984 894	6010 898	6037 901	6063 905	6090 908	6116 912	448
88	6142 915	6169 919	6195 922	6221 926	6247 929	6274 933	6300 936	6326 940	6352 943	6378 947	451
90	6404 950	6430 954	6456 957	6482 960	6508 964	6534 967	6559 971	6585 974	6611 978	6637 981	453
92	6662 984	6688 988	6713 991	6739 994	6765 998	6790 1001	6815 1004	6841 1008	6866 1011	6892 1015	455
ECON AIR CONDITIONING ΔFUEL = − 0.6%				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL270			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2794 431	2827 436	2859 441	2892 446	2924 450	2957 455	2989 460	3022 465	3054 469	3086 474	409
66	3118 479	3150 483	3182 488	3214 492	3246 497	3278 502	3310 506	3342 511	3373 515	3405 520	413
68	3437 525	3468 529	3500 534	3531 538	3563 543	3594 547	3626 552	3657 556	3688 561	3719 565	417
70	3750 570	3781 574	3812 578	3843 583	3874 587	3905 591	3936 596	3967 600	3997 604	4028 609	422
72	4059 613	4089 617	4120 622	4150 626	4181 630	4211 634	4241 639	4272 643	4302 647	4332 651	427
74	4362 655	4392 660	4422 664	4452 668	4482 672	4512 676	4542 680	4572 684	4601 688	4631 692	433
76	4661 697	4690 701	4720 705	4749 709	4779 713	4808 717	4838 721	4867 725	4896 729	4925 733	438
78	4955 736	4984 740	5013 744	5042 748	5071 752	5100 756	5129 760	5157 764	5186 768	5215 772	443
80	5244 776	5272 779	5301 783	5330 787	5358 791	5387 795	5415 799	5444 802	5472 806	5500 810	446
82	5529 814	5557 817	5585 821	5613 825	5642 829	5670 833	5698 836	5726 840	5754 844	5782 847	449
84	5810 851	5837 855	5865 859	5893 862	5921 866	5949 870	5976 873	6004 877	6031 881	6059 884	451
86	6087 888	6114 892	6141 895	6169 899	6196 902	6223 906	6251 910	6278 913	6305 917	6332 920	453
88	6359 924	6386 928	6413 931	6440 935	6467 938	6494 942	6521 945	6548 949	6575 952	6601 956	454
90	6628 959	6655 963	6681 966	6708 970	6734 973	6761 977	6787 980	6814 984	6840 987	6866 991	456
92	6893 994	6919 998	6945 1001	6971 1004	6997 1008	7023 1011	7049 1015	7075 1018	7101 1022	7127 1025	457
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL250			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	39 7	79 14	118 21	158 28	197 35	236 42	275 48	314 55	353 62	339
46	392 69	431 76	470 82	508 89	547 96	586 103	624 109	662 116	700 122	739 129	344
48	777 136	815 142	853 149	891 155	928 161	966 168	1004 174	1041 181	1079 187	1116 193	349
50	1154 200	1191 206	1228 212	1265 219	1302 225	1340 231	1376 237	1413 243	1450 249	1487 256	355
52	1523 262	1560 268	1596 274	1633 280	1669 286	1706 292	1742 298	1778 304	1814 309	1850 315	361
54	1886 321	1922 327	1958 333	1993 338	2029 344	2065 350	2100 356	2136 361	2171 367	2207 372	370
56	2242 378	2277 384	2312 389	2347 395	2382 400	2417 406	2452 411	2487 416	2522 422	2556 427	381
58	2591 432	2626 438	2660 443	2695 448	2729 453	2764 459	2798 464	2832 469	2866 474	2900 479	391
60	2935 484	2968 490	3002 495	3036 500	3070 505	3104 510	3138 515	3171 520	3205 525	3239 530	399
62	3272 535	3306 540	3339 545	3373 550	3406 555	3439 560	3473 565	3506 570	3539 575	3572 580	402
64	3605 585	3638 590	3671 594	3704 599	3737 604	3770 609	3803 614	3836 619	3868 624	3901 629	404
66	3934 633	3966 638	3999 643	4031 648	4064 653	4096 657	4128 662	4160 667	4193 672	4225 676	405
68	4257 681	4289 686	4321 690	4353 695	4385 700	4417 704	4448 709	4480 714	4512 718	4543 723	409
70	4575 727	4606 732	4638 737	4669 741	4701 746	4732 750	4763 755	4794 759	4825 764	4857 768	414
72	4888 773	4919 777	4950 781	4980 786	5011 790	5042 795	5073 799	5104 803	5134 808	5165 812	419
74	5196 816	5226 821	5256 825	5287 829	5317 834	5348 838	5378 842	5408 846	5438 851	5468 855	423
76	5498 859	5528 863	5558 867	5588 872	5618 876	5648 880	5678 884	5707 888	5737 892	5767 896	428
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0-08F0A320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 02501 . 990 .000 .000 0 FCOM-N0-02-05-30-015-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL270			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	41 7	82 14	123 21	164 28	205 35	245 42	286 49	327 56	367 63	347
46	408 70	448 77	488 83	528 90	568 97	608 104	648 110	688 117	727 124	767 130	353
48	807 137	846 144	885 150	925 157	964 163	1003 170	1042 176	1081 182	1120 189	1159 195	360
50	1198 201	1236 208	1275 214	1313 220	1352 226	1390 232	1428 238	1467 244	1505 250	1543 256	370
52	1581 262	1619 268	1656 274	1694 280	1732 286	1770 292	1807 298	1844 303	1882 309	1919 315	382
54	1957 321	1994 326	2031 332	2068 338	2105 343	2142 349	2178 354	2215 360	2252 366	2289 371	392
56	2325 377	2362 382	2398 388	2435 393	2471 399	2508 404	2544 410	2580 415	2616 420	2652 426	397
58	2688 431	2724 437	2760 442	2796 447	2832 453	2868 458	2903 464	2939 469	2974 474	3010 480	400
60	3046 485	3081 490	3116 495	3152 501	3187 506	3222 511	3257 516	3292 522	3327 527	3362 532	401
62	3397 537	3432 542	3466 547	3501 553	3536 558	3570 563	3605 568	3639 573	3674 578	3708 583	405
64	3742 588	3776 593	3810 598	3844 603	3879 608	3913 613	3946 618	3980 623	4014 628	4048 632	410
66	4081 637	4115 642	4148 647	4182 652	4215 657	4249 661	4282 666	4315 671	4348 676	4381 680	415
68	4415 685	4447 690	4480 694	4513 699	4546 704	4579 709	4612 713	4644 718	4677 722	4709 727	420
70	4742 732	4774 736	4807 741	4839 745	4871 750	4904 754	4936 759	4968 763	5000 768	5032 772	426
72	5064 777	5096 781	5128 786	5159 790	5191 794	5223 799	5255 803	5286 807	5318 812	5349 816	431
74	5381 821	5412 825	5443 829	5474 833	5506 838	5537 842	5568 846	5599 851	5630 855	5661 859	435
76	5692 863	5723 867	5753 872	5784 876	5815 880	5846 884	5876 888	5907 892	5937 897	5968 901	440
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 02701 . 990 .000 .000 0 FCOM-N0-02-05-30-016-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL250			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	41 7	83 15	124 22	165 30	207 37	247 44	288 51	329 59	370 66	333
42	411 73	451 80	492 88	532 95	573 102	613 109	653 116	693 123	733 130	774 137	339
44	814 144	853 151	893 158	933 165	972 172	1012 179	1051 185	1091 192	1130 199	1169 206	344
46	1209 212	1247 219	1286 226	1325 232	1364 239	1403 246	1442 252	1480 259	1519 265	1557 272	349
48	1596 278	1634 285	1672 291	1710 298	1749 304	1787 310	1825 317	1862 323	1900 329	1938 336	355
50	1976 342	2013 348	2051 354	2088 360	2126 367	2163 373	2200 379	2237 385	2274 391	2311 397	362
52	2349 403	2385 409	2422 415	2459 421	2496 427	2532 432	2569 438	2605 444	2642 450	2678 456	371
54	2714 461	2751 467	2787 473	2823 479	2859 484	2895 490	2931 495	2966 501	3002 507	3038 512	379
56	3074 518	3109 523	3145 529	3180 534	3216 539	3251 545	3286 550	3321 556	3357 561	3392 566	388
58	3427 572	3462 577	3497 582	3531 588	3566 593	3601 598	3636 603	3670 608	3705 614	3740 619	396
60	3774 624	3809 629	3843 634	3877 639	3912 644	3946 650	3980 655	4014 660	4048 665	4082 670	401
62	4116 675	4150 680	4184 685	4218 690	4252 695	4286 700	4319 705	4353 710	4387 715	4420 720	405
64	4454 725	4487 730	4521 735	4554 739	4587 744	4621 749	4654 754	4687 759	4720 764	4753 769	407
66	4787 774	4820 779	4852 783	4885 788	4918 793	4951 798	4984 803	5017 807	5049 812	5082 817	408
68	5115 822	5147 827	5179 831	5212 836	5244 841	5277 845	5309 850	5341 855	5373 859	5405 864	411
70	5437 869	5469 873	5501 878	5533 882	5565 887	5597 892	5628 896	5660 901	5691 905	5723 910	415
72	5755 914	5786 919	5817 923	5849 928	5880 932	5912 937	5943 941	5974 945	6005 950	6036 954	420
74	6067 959	6098 963	6129 967	6160 972	6190 976	6221 980	6252 985	6283 989	6313 993	6344 998	425
76	6374 1002	6405 1006	6435 1010	6466 1014	6496 1019	6526 1023	6556 1027	6587 1031	6617 1035	6647 1040	430
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 0-08FOA319-112 CFM56-5B6/P SA222000C5KG330 0 018590 0 0 1 1.0 .00 02501 .990 .000 .000 0 FCOM-NO-02-05-30-015-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL270			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	43 8	86 15	129 23	172 30	215 38	258 45	301 53	343 60	386 67	340
42	429 75	471 82	513 89	555 97	597 104	639 111	681 118	723 125	765 133	806 140	347
44	848 147	889 154	931 161	972 168	1013 175	1055 182	1095 189	1136 195	1177 202	1218 209	353
46	1259 216	1299 223	1340 229	1380 236	1421 243	1461 249	1501 256	1541 262	1581 269	1621 276	360
48	1662 282	1701 289	1741 295	1780 301	1820 308	1860 314	1899 320	1938 327	1978 333	2017 339	369
50	2056 345	2095 352	2134 358	2173 364	2212 370	2251 376	2289 382	2328 388	2366 394	2405 400	378
52	2443 406	2481 412	2519 418	2558 424	2596 430	2634 435	2672 441	2710 447	2747 453	2785 458	388
54	2823 464	2860 470	2898 476	2935 481	2973 487	3010 493	3048 498	3085 504	3122 509	3159 515	396
56	3196 520	3233 526	3270 531	3307 537	3344 542	3381 548	3418 553	3454 559	3491 564	3527 570	401
58	3564 575	3600 581	3637 586	3673 592	3709 597	3746 602	3782 608	3818 613	3854 618	3890 624	403
60	3926 629	3962 635	3998 640	4034 645	4069 650	4105 656	4141 661	4176 666	4212 671	4247 677	404
62	4283 682	4318 687	4353 692	4388 698	4423 703	4459 708	4493 713	4528 718	4563 723	4598 728	407
64	4633 733	4668 738	4702 743	4737 748	4771 753	4806 758	4840 763	4874 768	4909 773	4943 778	411
66	4977 783	5011 788	5045 793	5079 798	5113 803	5147 808	5181 812	5214 817	5248 822	5282 827	417
68	5315 832	5349 836	5382 841	5415 846	5449 851	5482 855	5515 860	5548 865	5581 869	5614 874	422
70	5648 879	5680 883	5713 888	5746 892	5779 897	5812 901	5844 906	5877 911	5909 915	5942 920	428
72	5974 924	6006 929	6039 933	6071 938	6103 942	6136 946	6168 951	6200 955	6231 960	6263 964	433
74	6295 968	6327 973	6359 977	6391 982	6422 986	6454 990	6486 994	6517 999	6548 1003	6580 1007	437
76	6611 1012	6643 1016	6674 1020	6705 1024	6736 1029	6767 1033	6798 1037	6829 1041	6860 1045	6891 1050	441
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 -08FOA319-112 CFM56-5B6/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 02701 .990 .000 .000 0 FCOM-NO-02-05-30-016-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL290			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	2904 438	2938 442	2971 447	3005 452	3039 457	3072 462	3106 466	3139 471	3172 476	3206 481	418
66	3239 485	3272 490	3305 495	3338 499	3371 504	3404 509	3437 513	3470 518	3502 522	3535 527	424
68	3568 531	3600 536	3633 540	3665 545	3697 549	3730 554	3762 558	3794 563	3826 567	3859 572	431
70	3891 576	3923 581	3955 585	3986 589	4018 594	4050 598	4082 602	4113 607	4145 611	4177 615	436
72	4208 620	4240 624	4271 628	4302 632	4334 637	4365 641	4396 645	4427 649	4459 654	4490 658	441
74	4521 662	4552 666	4582 670	4613 674	4644 679	4675 683	4706 687	4736 691	4767 695	4798 699	444
76	4828 703	4859 708	4889 712	4919 716	4950 720	4980 724	5010 728	5040 732	5071 736	5101 740	446
78	5131 744	5161 748	5191 752	5221 756	5250 760	5280 764	5310 768	5340 772	5369 776	5399 780	448
80	5429 784	5458 788	5488 792	5517 796	5546 800	5576 803	5605 807	5634 811	5663 815	5692 819	450
82	5722 823	5751 827	5780 831	5808 834	5837 838	5866 842	5895 846	5924 850	5952 853	5981 857	452
84	6010 861	6038 865	6067 869	6095 872	6124 876	6152 880	6180 884	6208 887	6237 891	6265 895	453
86	6293 898	6321 902	6349 906	6377 909	6405 913	6433 917	6460 920	6488 924	6516 928	6543 931	455
88	6571 935	6598 939	6626 942	6653 946	6681 949	6708 953	6735 957	6763 960	6790 964	6817 967	457
90	6844 971	6871 974	6898 978	6925 981	6952 985	6979 988	7006 992	7032 995	7059 999	7086 1002	460
92	7113 1006	7139 1009	7166 1013	7192 1016	7219 1019	7245 1023	7271 1026	7298 1030	7324 1033	7350 1037	462
ECON AIR CONDITIONING ΔFUEL = − 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL310			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	3012 443	3047 448	3081 452	3116 457	3150 462	3185 467	3219 472	3254 476	3288 481	3322 486	433
66	3357 490	3391 495	3425 500	3459 504	3493 509	3527 514	3561 518	3594 523	3628 528	3662 532	437
68	3696 537	3729 541	3763 546	3796 550	3829 555	3863 560	3896 564	3929 568	3962 573	3996 577	441
70	4029 582	4062 586	4094 591	4127 595	4160 600	4193 604	4226 609	4258 613	4291 617	4323 622	443
72	4356 626	4388 631	4421 635	4453 639	4485 644	4517 648	4549 652	4581 657	4613 661	4645 665	445
74	4677 669	4709 674	4741 678	4773 682	4804 686	4836 691	4868 695	4899 699	4930 703	4962 708	447
76	4993 712	5024 716	5056 720	5087 724	5118 728	5149 733	5180 737	5211 741	5242 745	5272 749	448
78	5303 753	5334 757	5364 761	5395 765	5425 769	5456 773	5486 777	5516 781	5547 785	5577 789	451
80	5607 793	5637 797	5667 801	5697 805	5727 809	5757 813	5787 817	5816 821	5846 825	5876 829	453
82	5905 833	5935 837	5964 841	5993 844	6023 848	6052 852	6081 856	6110 860	6139 864	6168 867	456
84	6198 871	6226 875	6255 879	6284 883	6313 886	6342 890	6370 894	6399 898	6427 901	6456 905	458
86	6484 909	6513 912	6541 916	6569 920	6597 923	6626 927	6654 931	6682 934	6710 938	6738 942	459
88	6766 945	6793 949	6821 953	6849 956	6876 960	6904 963	6931 967	6959 971	6986 974	7014 978	460
90	7041 981	7068 985	7095 988	7123 992	7150 995	7177 999	7204 1002	7231 1006	7257 1009	7284 1013	461
92	7311 1016	7338 1020	7364 1023	7391 1027	7417 1030	7444 1034	7470 1037	7496 1040	7523 1044	7549 1047	463
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL290			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	43 7	85 14	128 21	170 28	213 35	255 42	297 49	339 56	381 63	358
46	423 70	465 77	506 83	548 90	590 97	631 103	672 110	714 116	755 123	796 129	370
48	837 136	878 142	919 149	959 155	1000 161	1041 168	1081 174	1122 180	1162 186	1202 192	382
50	1243 199	1282 205	1322 211	1362 217	1402 223	1442 229	1482 235	1521 241	1561 247	1601 253	392
52	1640 259	1680 265	1719 271	1758 277	1797 283	1837 289	1876 295	1915 301	1953 307	1992 313	394
54	2031 319	2070 325	2109 330	2147 336	2186 342	2224 348	2263 354	2301 359	2339 365	2377 371	396
56	2416 377	2454 382	2491 388	2529 394	2567 399	2605 405	2643 411	2680 416	2718 422	2755 427	400
58	2793 433	2830 438	2867 444	2904 449	2941 455	2978 460	3015 466	3052 471	3089 476	3126 482	406
60	3162 487	3199 493	3235 498	3272 503	3308 508	3344 514	3381 519	3417 524	3453 529	3489 535	411
62	3525 540	3561 545	3596 550	3632 555	3668 560	3704 566	3739 571	3775 576	3810 581	3845 586	416
64	3881 591	3916 596	3951 601	3986 606	4021 611	4056 616	4091 621	4126 625	4161 630	4195 635	422
66	4230 640	4265 645	4299 650	4334 655	4368 659	4403 664	4437 669	4471 674	4505 678	4539 683	428
68	4573 688	4607 693	4641 697	4675 702	4709 707	4742 711	4776 716	4809 721	4843 725	4876 730	432
70	4910 734	4943 739	4976 744	5010 748	5043 753	5076 757	5109 762	5142 766	5175 771	5208 775	437
72	5241 780	5273 784	5306 788	5339 793	5371 797	5404 802	5436 806	5469 810	5501 815	5533 819	442
74	5566 824	5598 828	5630 832	5662 836	5694 841	5726 845	5758 849	5790 854	5822 858	5853 862	446
76	5885 866	5917 870	5948 875	5980 879	6011 883	6043 887	6074 891	6105 896	6136 900	6168 904	450
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 02901 . 990 .000 .000 0 FCOM-NO-02-05-30-0017-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL310			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	44 7	88 14	132 21	177 28	221 35	264 41	308 48	352 55	395 62	380
46	439 68	482 75	526 82	569 88	612 95	655 102	698 108	741 115	784 121	827 128	389
48	870 134	912 141	954 147	997 154	1039 160	1082 167	1124 173	1166 180	1208 186	1250 193	392
50	1292 199	1334 205	1375 212	1417 218	1459 224	1500 231	1542 237	1583 243	1624 249	1665 256	394
52	1706 262	1747 268	1788 274	1829 280	1869 286	1910 292	1951 298	1991 304	2031 310	2072 316	399
54	2112 322	2152 328	2192 334	2232 340	2272 346	2311 352	2351 358	2390 363	2430 369	2469 375	405
56	2509 381	2548 386	2587 392	2626 398	2665 404	2704 409	2743 415	2782 420	2821 426	2859 432	410
58	2898 437	2936 443	2975 448	3013 454	3051 459	3090 465	3128 470	3165 475	3203 481	3241 486	417
60	3279 492	3317 497	3354 502	3392 508	3429 513	3467 518	3504 523	3541 529	3579 534	3616 539	423
62	3653 544	3690 549	3727 555	3763 560	3800 565	3837 570	3873 575	3910 580	3946 585	3983 590	428
64	4019 595	4055 600	4091 605	4127 610	4163 615	4200 620	4235 625	4271 630	4307 635	4342 640	434
66	4378 645	4414 650	4449 654	4484 659	4520 664	4555 669	4590 674	4625 678	4660 683	4696 688	439
68	4731 693	4765 697	4800 702	4835 707	4870 711	4904 716	4939 721	4973 725	5007 730	5042 735	443
70	5076 739	5110 744	5144 748	5178 753	5212 757	5247 762	5280 766	5314 771	5348 775	5381 780	448
72	5415 784	5449 789	5482 793	5515 798	5549 802	5582 807	5615 811	5649 815	5682 820	5715 824	452
74	5748 828	5781 833	5814 837	5846 841	5879 846	5912 850	5944 854	5977 858	6009 863	6042 867	455
76	6074 871	6107 875	6139 880	6171 884	6203 888	6235 892	6267 897	6299 901	6331 905	6363 909	458
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 03101 . 990 .000 .000 0 FCOM-N0-02-05-30-018-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL290			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	45 8	90 15	135 23	180 31	224 38	269 46	313 53	358 61	402 68	349
42	446 76	490 83	534 90	578 98	622 105	666 112	709 120	753 127	796 134	839 141	358
44	883 148	926 155	969 162	1012 169	1054 176	1097 183	1140 190	1182 197	1225 203	1267 210	367
46	1310 217	1352 224	1394 230	1436 237	1478 243	1520 250	1562 257	1603 263	1645 270	1686 276	377
48	1728 283	1769 289	1810 295	1852 302	1893 308	1934 314	1975 321	2016 327	2056 333	2097 339	387
50	2138 346	2179 352	2219 358	2259 364	2300 370	2340 376	2380 382	2421 388	2461 394	2501 400	394
52	2541 407	2581 412	2620 418	2660 424	2700 430	2740 436	2779 442	2819 448	2858 454	2898 460	398
54	2937 466	2976 472	3015 478	3054 484	3094 490	3133 496	3172 501	3210 507	3249 513	3288 519	399
56	3327 525	3365 530	3404 536	3442 542	3480 547	3519 553	3557 559	3595 564	3633 570	3671 576	402
58	3709 581	3747 587	3785 592	3822 598	3860 603	3898 609	3935 614	3972 620	4010 625	4047 631	407
60	4084 636	4121 642	4158 647	4195 652	4232 658	4269 663	4306 668	4342 674	4379 679	4416 684	412
62	4452 690	4489 695	4525 700	4561 705	4597 710	4634 716	4670 721	4706 726	4741 731	4777 736	418
64	4813 741	4849 746	4885 751	4920 756	4956 761	4991 766	5027 771	5062 776	5097 781	5133 786	424
66	5168 791	5203 796	5238 801	5273 806	5308 810	5343 815	5377 820	5412 825	5447 830	5481 834	429
68	5516 839	5550 844	5585 849	5619 853	5653 858	5688 863	5722 868	5756 872	5790 877	5824 882	434
70	5858 886	5891 891	5925 896	5959 900	5993 905	6026 909	6060 914	6093 918	6127 923	6160 927	438
72	6193 932	6227 936	6260 941	6293 945	6326 950	6359 954	6392 959	6425 963	6458 968	6491 972	443
74	6523 977	6556 981	6589 985	6621 990	6654 994	6686 998	6718 1003	6751 1007	6783 1011	6815 1015	447
76	6848 1020	6880 1024	6912 1028	6944 1032	6976 1037	7007 1041	7039 1045	7071 1049	7103 1053	7134 1058	452
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0 -08FOA319-112 CFM56-5B6/P SA2220000C5KG330 0 018590 0 0 1 1.0 .0 .00 02901 .990 .000 .000 0 FCOM-NO-02-05-30-017-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL310			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	47 8	93 15	140 23	187 31	234 38	280 46	326 53	372 61	418 68	363
42	464 76	510 83	556 90	601 97	647 105	693 112	738 119	783 126	828 133	873 140	374
44	918 147	963 154	1008 161	1052 168	1097 175	1142 182	1186 189	1230 196	1274 202	1318 209	385
46	1363 216	1406 223	1450 229	1494 236	1538 243	1581 249	1625 256	1668 263	1712 269	1755 276	392
48	1798 282	1841 289	1884 295	1927 302	1970 308	2013 315	2056 321	2099 328	2141 334	2184 341	395
50	2227 347	2269 354	2311 360	2353 366	2396 373	2438 379	2480 385	2521 392	2563 398	2605 404	396
52	2647 411	2688 417	2729 423	2771 429	2812 435	2854 441	2894 448	2935 454	2976 460	3017 466	401
54	3058 472	3099 478	3139 484	3180 490	3220 496	3261 502	3301 508	3341 513	3381 519	3421 525	406
56	3461 531	3501 537	3540 543	3580 548	3620 554	3659 560	3699 565	3738 571	3777 577	3817 582	411
58	3856 588	3895 594	3934 599	3972 605	4011 610	4050 616	4089 621	4127 627	4166 632	4204 638	418
60	4243 643	4281 649	4319 654	4357 659	4395 665	4433 670	4471 675	4509 681	4546 686	4584 691	425
62	4622 696	4659 702	4696 707	4734 712	4771 717	4808 722	4845 728	4882 733	4919 738	4956 743	430
64	4993 748	5030 753	5067 758	5103 763	5140 768	5176 773	5213 778	5249 783	5285 788	5322 793	435
66	5358 798	5394 803	5430 808	5466 813	5502 818	5538 822	5573 827	5609 832	5644 837	5680 842	440
68	5716 847	5751 851	5786 856	5821 861	5857 866	5892 870	5927 875	5962 880	5996 884	6031 889	444
70	6066 894	6101 898	6135 903	6170 907	6205 912	6239 917	6273 921	6308 926	6342 930	6376 935	450
72	6410 939	6444 944	6478 948	6512 953	6546 957	6580 962	6613 966	6647 970	6680 975	6714 979	455
74	6748 984	6781 988	6814 992	6847 997	6881 1001	6914 1005	6947 1010	6980 1014	7013 1018	7046 1023	458
76	7079 1027	7111 1031	7144 1035	7177 1040	7209 1044	7242 1048	7274 1052	7307 1057	7339 1061	7371 1065	459
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0-08FOA319-112 CFM56-5B6/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 03101 .990 .000 .000 0 FCOM-NO-02-05-30-018-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL 330			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	3116 446	3152 451	3188 456	3223 461	3259 466	3295 471	3330 476	3366 480	3401 485	3436 490	439
66	3472 495	3507 500	3542 504	3577 509	3612 514	3647 519	3682 523	3716 528	3751 533	3786 537	442
68	3821 542	3855 547	3889 551	3924 556	3958 561	3992 565	4026 570	4060 575	4095 579	4129 584	443
70	4163 588	4196 593	4230 597	4264 602	4297 606	4331 611	4364 615	4397 620	4431 624	4464 629	445
72	4497 633	4530 638	4563 642	4596 647	4629 651	4662 655	4695 660	4727 664	4760 668	4792 673	448
74	4825 677	4857 681	4890 686	4922 690	4954 694	4986 699	5018 703	5050 707	5082 711	5114 715	450
76	5146 720	5177 724	5209 728	5241 732	5272 736	5304 741	5335 745	5366 749	5398 753	5429 757	454
78	5460 761	5491 765	5522 769	5553 773	5584 777	5615 782	5645 786	5676 790	5706 794	5737 798	455
80	5768 802	5798 806	5828 810	5858 814	5889 818	5919 822	5949 826	5979 829	6009 833	6039 837	456
82	6068 841	6098 845	6128 849	6157 853	6187 857	6216 861	6246 864	6275 868	6304 872	6333 876	457
84	6363 880	6392 884	6420 887	6449 891	6478 895	6507 899	6536 902	6564 906	6593 910	6621 914	459
86	6650 917	6678 921	6706 925	6734 928	6763 932	6791 936	6819 939	6846 943	6874 947	6902 950	460
88	6930 954	6957 957	6985 961	7012 965	7040 968	7067 972	7094 975	7121 979	7148 982	7175 986	460
90	7202 989	7229 993	7256 996								460
92											
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL 350			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	3216 451	3252 456	3289 461	3325 466	3362 471	3399 475	3435 480	3471 485	3507 490	3543 495	442
66	3579 500	3615 505	3651 510	3687 514	3722 519	3758 524	3793 529	3829 533	3864 538	3899 543	445
68	3935 548	3970 552	4005 557	4039 562	4074 566	4109 571	4144 576	4178 580	4213 585	4247 589	448
70	4282 594	4316 599	4350 603	4384 608	4418 612	4453 617	4486 621	4520 626	4554 630	4588 635	450
72	4621 639	4655 644	4688 648	4721 653	4755 657	4788 661	4821 666	4854 670	4887 675	4920 679	451
74	4953 683	4985 688	5018 692	5050 696	5083 701	5115 705	5148 709	5180 713	5212 718	5244 722	453
76	5276 726	5308 730	5340 734	5371 739	5403 743	5435 747	5466 751	5497 755	5529 759	5560 764	454
78	5591 768	5622 772	5653 776	5684 780	5715 784	5746 788	5776 792	5807 796	5837 800	5868 804	455
80	5898 808	5928 812	5958 816	5988 820	6018 824	6048 828	6078 832	6107 836	6137 839	6166 843	456
82	6196 847	6225 851	6254 855	6283 859	6312 863	6341 866	6370 870	6398 874	6427 878	6455 881	456
84	6483 885	6512 889	6540 893	6569 896	6597 900						456
86											
88											
90											
92											
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL330			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	46 7	92 14	138 21	184 28	230 36	276 43	322 50	367 57	413 64	388
46	458 71	503 78	548 84	594 91	639 98	684 105	728 112	773 119	817 125	862 132	391
48	906 139	950 145	994 152	1038 159	1082 165	1126 172	1170 178	1214 185	1257 191	1301 198	398
50	1344 204	1387 211	1430 217	1473 223	1516 230	1559 236	1602 242	1644 249	1687 255	1730 261	404
52	1772 267	1814 274	1856 280	1898 286	1940 292	1983 298	2024 304	2066 310	2107 316	2149 322	410
54	2191 328	2232 334	2273 340	2314 346	2355 352	2397 358	2437 363	2478 369	2519 375	2559 381	418
56	2600 387	2640 392	2681 398	2721 404	2761 409	2802 415	2841 421	2881 426	2921 432	2961 437	423
58	3001 443	3040 448	3080 454	3119 459	3159 465	3198 470	3237 476	3276 481	3315 487	3354 492	429
60	3393 497	3432 503	3470 508	3509 513	3547 519	3586 524	3624 529	3663 535	3701 540	3739 545	434
62	3777 550	3815 555	3853 561	3891 566	3928 571	3966 576	4004 581	4041 586	4079 591	4116 596	439
64	4153 601	4190 606	4227 611	4264 616	4301 621	4338 626	4375 631	4412 636	4448 641	4485 646	444
66	4522 651	4558 656	4594 661	4630 665	4667 670	4703 675	4739 680	4775 685	4811 689	4847 694	449
68	4883 699	4918 704	4954 708	4989 713	5025 718	5060 723	5095 727	5131 732	5166 737	5201 741	452
70	5236 746	5271 750	5306 755	5341 760	5375 764	5410 769	5445 773	5479 778	5514 782	5548 787	454
72	5582 792	5616 796	5651 800	5685 805	5719 809	5753 814	5786 818	5820 823	5854 827	5887 832	456
74	5921 836	5954 840	5988 845	6021 849	6054 854	6088 858	6120 862	6153 867	6186 871	6219 875	456
76	6252 880	6284 884	6317 888	6349 892	6382 897	6414 901	6446 905	6479 909	6511 914	6543 918	457
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

11.0 -08FOA320-214 CFM56-5B4/P SA22200000C5KG330 0 018590 0 0 1 1.0 .0 .00 03301 . 990 .000 .000 0 FCOM-NO-02-05-30-019-180

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL350			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	48 7	96 14	143 22	191 29	239 36	286 43	333 50	380 57	428 64	395
46	475 72	521 78	568 85	615 92	661 99	708 106	754 113	800 120	846 127	892 133	401
48	938 140	983 147	1029 153	1074 160	1120 167	1165 173	1210 180	1255 186	1300 193	1345 199	409
50	1390 206	1435 212	1479 219	1523 225	1568 231	1612 238	1656 244	1700 250	1744 257	1788 263	416
52	1832 269	1875 275	1918 281	1962 287	2005 294	2048 300	2091 306	2134 312	2177 318	2220 324	423
54	2263 330	2305 336	2347 342	2390 347	2432 353	2474 359	2516 365	2558 371	2600 377	2642 382	429
56	2684 388	2725 394	2767 400	2808 405	2850 411	2891 417	2932 422	2973 428	3014 434	3055 439	434
58	3096 445	3136 450	3177 456	3217 461	3258 467	3298 472	3338 478	3378 483	3418 489	3458 494	440
60	3498 499	3538 505	3578 510	3617 515	3657 521	3696 526	3735 531	3775 537	3814 542	3853 547	444
62	3892 552	3931 558	3969 563	4008 568	4047 573	4086 578	4124 583	4162 588	4200 594	4239 599	448
64	4277 604	4315 609	4353 614	4391 619	4428 624	4466 629	4504 634	4541 639	4578 644	4616 649	450
66	4653 654	4690 659	4727 664	4764 669	4801 673	4838 678	4874 683	4911 688	4947 693	4984 698	452
68	5020 703	5056 707	5092 712	5128 717	5164 722	5200 726	5236 731	5271 736	5307 741	5342 745	452
70	5378 750	5413 755	5448 759	5483 764	5518 769	5553 773	5587 778	5622 782	5657 787	5691 791	453
72	5726 796	5760 800	5794 805	5828 809	5862 814	5896 818	5930 823	5963 827	5997 832	6030 836	454
74	6064 841	6097 845	6130 849	6163 854	6196 858	6229 862	6262 867	6295 871	6327 875	6359 880	455
76	6392 884	6424 888	6457 892	6489 897	6522 901						455
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL330			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	49 8	97 15	146 23	194 30	243 38	291 45	339 53	387 60	435 68	381
42	483 75	531 83	579 90	626 97	674 105	721 112	769 119	816 126	863 134	910 141	389
44	957 148	1004 155	1050 163	1097 170	1144 177	1190 184	1237 191	1283 198	1329 205	1375 212	391
46	1422 219	1467 226	1513 233	1559 240	1604 247	1650 254	1695 261	1740 268	1786 274	1831 281	393
48	1876 288	1921 295	1965 302	2010 308	2055 315	2099 322	2143 328	2188 335	2232 341	2276 348	399
50	2320 354	2364 361	2407 367	2451 374	2495 380	2538 387	2582 393	2625 399	2668 406	2711 412	405
52	2754 418	2797 424	2840 431	2882 437	2925 443	2968 449	3010 455	3052 461	3094 467	3137 474	412
54	3179 480	3221 486	3262 491	3304 497	3346 503	3388 509	3429 515	3470 521	3512 527	3553 533	419
56	3594 539	3635 544	3676 550	3717 556	3758 562	3799 567	3839 573	3880 579	3920 584	3960 590	424
58	4001 596	4041 601	4081 607	4121 612	4161 618	4201 624	4240 629	4280 635	4320 640	4359 645	430
60	4399 651	4438 656	4477 662	4516 667	4556 672	4595 678	4634 683	4672 688	4711 694	4750 699	435
62	4789 704	4827 710	4865 715	4904 720	4942 725	4981 730	5019 736	5057 741	5094 746	5132 751	440
64	5170 756	5208 761	5246 766	5283 771	5321 776	5358 781	5395 786	5433 791	5470 796	5507 801	446
66	5544 806	5581 811	5618 816	5654 821	5691 826	5728 830	5764 835	5801 840	5837 845	5874 850	451
68	5910 855	5946 859	5982 864	6018 869	6054 874	6090 878	6126 883	6161 888	6197 892	6233 897	454
70	6268 902	6304 907	6339 911	6374 916	6410 920	6445 925	6480 930	6515 934	6550 939	6584 944	455
72	6619 948	6654 953	6688 957	6723 962	6758 966	6792 971	6826 975	6860 980	6894 984	6929 989	456
74	6963 993	6996 998	7030 1002	7064 1007	7098 1011	7132 1015	7165 1020	7198 1024	7232 1029	7265 1033	457
76	7298 1037	7331 1042	7364 1046	7397 1050	7430 1055	7463 1059	7496 1063	7528 1067	7561 1072	7593 1076	457
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

11.0-08F0A319-112 CFM56-5B6/P SA22200000C5KG330 0 018590 0 0 1 1.0 .00 03301 .990 .000 .000 0 FCOM-NO-02-05-30-019-190

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL 350			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	51 8	102 16	153 24	204 32	254 39	305 47	355 55	405 63	456 70	387
42	506 78	556 86	605 93	655 101	705 109	754 116	803 124	853 131	902 139	951 146	390
44	1000 154	1048 161	1097 168	1145 176	1194 183	1242 190	1290 197	1338 205	1386 212	1433 219	396
46	1481 226	1529 233	1576 240	1623 247	1670 254	1718 261	1764 268	1811 275	1858 282	1904 289	403
48	1951 295	1997 302	2043 309	2090 316	2136 322	2182 329	2227 336	2273 342	2319 349	2364 355	410
50	2410 362	2455 368	2500 375	2545 381	2590 388	2635 394	2680 400	2724 407	2769 413	2813 419	418
52	2858 426	2902 432	2946 438	2990 444	3034 450	3078 457	3121 463	3165 469	3208 475	3251 481	424
54	3295 487	3338 493	3381 499	3424 505	3467 511	3510 517	3552 523	3595 529	3637 535	3680 540	430
56	3722 546	3765 552	3807 558	3849 564	3891 569	3933 575	3974 581	4016 586	4057 592	4099 598	435
58	4140 603	4181 609	4222 615	4264 620	4305 626	4346 631	4386 637	4427 642	4467 648	4508 653	442
60	4549 659	4589 664	4629 669	4669 675	4709 680	4749 686	4789 691	4829 696	4868 701	4908 707	446
62	4948 712	4987 717	5026 723	5066 728	5105 733	5144 738	5183 743	5222 749	5260 754	5299 759	450
64	5338 764	5376 769	5415 774	5453 779	5492 784	5530 790	5568 795	5606 800	5644 805	5681 810	451
66	5719 815	5757 820	5794 825	5832 830	5869 835	5907 839	5944 844	5981 849	6018 854	6054 859	452
68	6091 864	6128 869	6164 874	6201 879	6238 883	6274 888	6310 893	6346 898	6382 903	6418 907	452
70	6454 912	6490 917	6525 922	6561 926	6596 931	6632 936	6667 940	6702 945	6737 950	6772 954	453
72	6807 959	6841 963	6876 968	6910 973	6945 977	6980 982	7014 986	7048 991	7082 995	7116 1000	453
74	7150 1004	7183 1009	7217 1013	7251 1018	7284 1022	7318 1026	7351 1031	7384 1035	7417 1040	7450 1044	453
76	7483 1048	7516 1053	7548 1057	7580 1061	7613 1066	7645 1070	7678 1074	7710 1078	7743 1083	7775 1087	453
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL 370			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	3301 454	3338 459	3375 464	3412 469	3449 474	3486 479	3522 484	3559 489	3596 493	3632 498	448
66	3669 503	3705 508	3741 513	3777 518	3813 522	3849 527	3885 532	3921 537	3956 542	3992 546	449
68	4028 551	4063 556	4098 560	4133 565	4168 570	4203 574	4238 579	4273 584	4307 588	4342 593	451
70	4377 597	4411 602	4445 606	4479 611	4513 615	4548 620	4581 624	4615 629	4648 633	4682 638	452
72	4716 642	4749 647	4782 651	4815 655	4848 660	4881 664	4914 668	4946 673	4979 677	5011 681	453
74	5044 686	5076 690	5108 694	5140 698	5172 703	5204 707	5236 711	5267 715	5299 719	5330 724	454
76	5362 728	5393 732	5423 736	5454 740	5485 744	5516 748	5546 752	5577 756			453
78											
80											
82											
84											
86											
88											
90											
92											
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL390			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
64	3359 454	3396 459	3433 464	3470 469	3507 474	3544 479	3581 484	3617 489	3653 493	3690 498	453
66	3726 503	3762 508	3797 512	3833 517	3869 522	3905 527	3940 531	3975 536	4010 541	4045 545	454
68	4080 550	4114 554	4149 559	4183 563	4217 568	4252 573					454
70											
72											
74											
76											
78											
80											
82											
84											
86											
88											
90											
92											
ECON AIR CONDITIONING ΔFUEL = - 0.6 %				ENGINE ANTI ICE ON ΔFUEL = + 3 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0%		DISTANCE (NM) TIME (MIN)		LR FL390			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
44	0 0	51 7	102 14	152 21	203 29	254 36	304 43	354 50	404 57	454 64	425
46	505 71	554 78	603 84	653 91	702 98	752 105	800 112	849 118	898 125	947 132	431
48	996 138	1044 145	1092 152	1140 158	1188 165	1236 171	1283 178	1331 184	1378 191	1426 197	437
50	1473 204	1520 210	1567 216	1614 223	1661 229	1707 235	1754 242	1800 248	1846 254	1892 260	442
52	1938 266	1984 273	2029 279	2075 285	2121 291	2166 297	2211 303	2256 309	2301 315	2346 321	446
54	2391 327	2435 333	2479 339	2524 345	2568 351	2612 357	2656 362	2699 368	2743 374	2786 380	449
56	2830 386	2873 391	2916 397	2959 403	3002 409	3045 414	3087 420	3129 426	3171 431	3213 437	449
58	3256 442	3297 448	3339 453	3380 459	3422 465	3463 470	3504 475	3545 481	3586 486	3627 492	451
60	3667 497	3707 502	3747 508	3787 513	3827 518	3867 524	3907 529	3947 534	3986 539	4025 545	452
62	4064 550	4103 555	4142 560	4182 565	4221 571						452
64											
66											
68											
70											
72											
74											
76											
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 2.5 %				TOTAL ANTI ICE ON ΔFUEL = + 5 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL 370			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	53 8	106 16	158 24	211 32	264 40	316 48	368 56	420 63	473 71	394
42	525 79	576 87	627 94	679 102	730 110	782 117	832 125	883 132	934 140	985 147	401
44	1035 155	1085 162	1136 169	1186 177	1236 184	1286 191	1335 198	1385 205	1434 213	1483 220	410
46	1533 227	1582 234	1630 241	1679 248	1728 255	1777 262	1825 269	1873 276	1921 282	1969 289	417
48	2018 296	2065 303	2113 309	2160 316	2208 323	2255 330	2302 336	2349 343	2396 349	2443 356	424
50	2490 362	2536 369	2583 375	2629 382	2675 388	2722 395	2767 401	2813 407	2859 413	2905 420	431
52	2951 426	2996 432	3041 438	3086 445	3131 451	3177 457	3221 463	3266 469	3311 475	3355 481	437
54	3400 487	3444 493	3488 499	3532 505	3576 511	3620 517	3664 523	3707 529	3751 535	3794 541	443
56	3838 546	3881 552	3924 558	3967 564	4010 570	4053 575	4095 581	4138 587	4180 592	4223 598	447
58	4265 604	4307 609	4349 615	4391 621	4433 626	4475 632	4516 637	4558 643	4599 648	4641 654	448
60	4682 659	4723 665	4764 670	4805 676	4845 681	4886 687	4926 692	4967 697	5007 703	5047 708	450
62	5088 713	5127 719	5167 724	5207 729	5246 735	5286 740	5325 745	5364 750	5403 756	5443 761	450
64	5482 766	5520 771	5559 776	5597 781	5636 786	5674 792	5712 797	5750 802	5788 807	5826 812	450
66	5864 817	5901 822	5939 827	5976 832	6013 837	6051 842	6087 847	6124 852	6161 856	6198 861	451
68	6234 866	6271 871	6307 876	6343 881	6379 885	6415 890	6451 895	6486 900	6522 904	6557 909	451
70	6592 914	6628 918	6663 923	6698 928	6734 933						451
72											
74											
76											
LOW AIR CONDITIONING ΔFUEL = − 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

R

INTEGRATED CRUISE											
MAX. CRUISE THRUST LIMITS NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG=33.0%		DISTANCE (NM) TIME (MIN)		LR FL 390			
WEIGHT (1000KG)	0	.2	.4	.6	.8	1.0	1.2	1.4	1.6	1.8	TAS (KT)
40	0 0	55 8	109 16	164 24	218 32	273 40	327 48	380 55	434 63	488 71	409
42	542 79	595 86	648 94	701 101	754 109	807 116	859 124	911 131	964 139	1016 146	418
44	1068 153	1120 161	1171 168	1223 175	1274 182	1326 190	1377 197	1427 204	1478 211	1529 218	426
46	1580 225	1630 232	1680 239	1730 246	1781 253	1831 260	1880 266	1930 273	1979 280	2029 287	432
48	2078 294	2127 300	2176 307	2224 313	2273 320	2322 327	2370 333	2418 340	2466 346	2514 353	439
50	2562 359	2610 366	2657 372	2705 379	2752 385	2800 391	2847 398	2893 404	2940 410	2987 416	444
52	3034 423	3080 429	3126 435	3173 441	3219 447	3265 454	3310 460	3356 466	3402 472	3447 478	448
54	3493 484	3538 490	3582 496	3627 502	3672 508	3717 514	3761 520	3805 526	3850 532	3894 538	450
56	3938 543	3982 549	4025 555	4069 561	4112 567	4156 573	4198 578	4241 584	4284 590	4327 595	450
58	4370 601	4412 607	4454 612	4496 618	4538 623	4580 629	4622 635	4663 640	4704 646	4746 651	450
60	4787 657	4828 662	4869 668	4909 673	4950 678	4991 684	5031 689	5071 694	5111 700	5151 705	450
62	5191 710	5230 716	5269 721	5308 726	5347 731	5386 736	5425 742	5464 747	5503 752		451
64											
66											
68											
70											
72											
74											
76											
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %				TOTAL ANTI ICE ON ΔFUEL = + 7 %			

CLIMB CORRECTION

The planner must correct the values for the fuel and the time obtained from the integrated cruise tables with the numbers given in the following tables. The tables which are established for M.78 and long range speed, take into account climbing from the brake release point at 250kt/300kt/M.78.

M.78 and LONG RANGE SPEED

R

CORRECTION ON FUEL CONSUMPTION (1000 KG)										
FL	WEIGHT AT BRAKE RELEASE (1000 KG)									Time Correction
	60	64	68	72	76	80	84	88	92	
390	1.0	1.1	1.1	—	—	—	—	—	—	3.3
370	1.0	1.0	1.1	1.1	1.2	—	—	—	—	3.8
350	0.9	1.0	1.0	1.1	1.1	1.2	1.2	—	—	4.5
330	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	—	5.0
310	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	5.0
290	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	5.0
270	0.8	0.8	0.9	0.9	0.9	1.0	1.1	1.1	1.2	5.0
250	0.7	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	5.0
200	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.9	0.9	4.0
150	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.8	3.0
100	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.6	0.6	3.0

STEP CLIMB CORRECTION

When the flight includes one or more step climbs (2000 feet below FL290, 4000 feet above), apply a correction of 70 kg per step climb to the fuel consumption.

R

DESCENT CORRECTION

Correct the fuel and time values determined in the integrated cruise tables as follows to take into account the descent down to 1500 feet followed by a 6 minute IFR approach and landing.

R

CORRECTION ON FUEL CONSUMPTION (1000 KG)								
FL	WEIGHT OVERHEAD DESTINATION (1000 KG)							
	60	64	68	72	76	80	84	Time Correction
390	0.2	0.2	—	—	—	—	—	10 min
370	0.2	0.2	0.2	0.3	—	—	—	10 min
350	0.2	0.2	0.2	0.3	0.3	0.4	—	10 min
330	0.1	0.2	0.2	0.2	0.3	0.3	0.4	10 min
310	0.1	0.2	0.2	0.2	0.3	0.3	0.4	10 min
290	0.1	0.2	0.2	0.2	0.2	0.3	0.4	10 min
270	0.1	0.1	0.2	0.2	0.2	0.2	0.4	10 min
250	0.1	0.1	0.1	0.2	0.2	0.2	0.3	10 min
200	0.1	0.1	0.1	0.1	0.1	0.2	0.3	9 min
150	0	0	0	0.1	0.1	0.1	0.2	8 min
100	0	0	0	0	0	0	0.1	8 min

CLIMB CORRECTION

The planner must correct the values for the fuel and the time obtained from the integrated cruise tables with the numbers given in the following tables. The tables which are established for M.78 and long range speed, take into account climbing from the brake release point at 250kt/300kt/M.78.

M.78 and LONG RANGE SPEED

CORRECTION ON FUEL CONSUMPTION (1000 KG)									
FL	WEIGHT AT BRAKE RELEASE (1000 KG)								Time Correction
	50	54	58	62	66	70	74	78	
390	0.8	0.8	0.9	0.9	—	—	—	—	4 min
370	0.8	0.8	0.9	0.9	0.9	1.0	—	—	4 min
350	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	5 min
330	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	5 min
310	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	5 min
290	0.6	0.7	0.7	0.7	0.8	0.8	0.9	0.9	5 min
270	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.9	5 min
250	0.5	0.6	0.6	0.6	0.7	0.7	0.8	0.8	5 min
200	0.4	0.5	0.5	0.5	0.6	0.6	0.6	0.7	5 min
150	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.6	4 min
100	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	3 min

STEP CLIMB CORRECTION

When the flight includes one or more step climbs (2000 feet below FL290, 4000 feet above), apply a correction of 50 kg per step climb to the fuel consumption.

DESCENT CORRECTION

Correct the fuel and time values determined in the integrated cruise tables as follows to take into account the descent down to 1500 feet followed by a 6 minute IFR approach and landing.

CORRECTION ON FUEL CONSUMPTION (1000 KG)								
FL	WEIGHT OVERHEAD DESTINATION (1000 KG)							Time Correction
	46	50	54	58	62	66	70	
390	0.1	0.1	0.2	0.2	0.2	0.3	—	10 min
370	0.1	0.1	0.1	0.2	0.2	0.3	0.3	10 min
350	0.1	0.1	0.1	0.2	0.2	0.2	0.3	10 min
330	0.1	0.1	0.1	0.2	0.2	0.2	0.3	10 min
310	0.1	0.1	0.1	0.2	0.2	0.2	0.3	10 min
290	0.1	0.1	0.1	0.2	0.2	0.2	0.2	10 min
270	0.1	0.1	0.1	0.1	0.2	0.2	0.2	10 min
250	0.1	0.1	0.1	0.1	0.2	0.2	0.2	10 min
200	0	0.1	0.1	0.1	0.1	0.1	0.2	10 min
150	0	0	0.1	0.1	0.1	0.1	0.1	9 min
100	0	0	0	0	0	0.1	0.1	8 min

CLIMB CORRECTION

The planner must correct the values for the fuel and the time obtained from the integrated cruise tables with the numbers given in the following tables. The tables which are established for M.78 and long range speed, take into account climbing from the brake release point at 250kt/300kt/M.78.

M.78 and LONG RANGE SPEED

R

CORRECTION ON FUEL CONSUMPTION (1000 KG)									
FL	WEIGHT AT BRAKE RELEASE (1000 KG)								Time Correction
	48	52	56	60	64	68	72	76	
390	0.8	0.9	0.9	0.9	1.0	—	—	—	3 min
370	0.8	0.8	0.9	0.9	1.0	1.0	1.0	—	4 min
350	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.1	4 min
330	0.7	0.8	0.8	0.9	0.9	1.0	1.0	1.0	4 min
310	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.0	4 min
290	0.6	0.7	0.7	0.8	0.8	0.9	0.9	1.0	4 min
270	0.6	0.6	0.7	0.7	0.8	0.8	0.9	0.9	4 min
250	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	4 min
200	0.5	0.5	0.5	0.6	0.6	0.6	0.7	0.7	3 min
150	0.4	0.4	0.4	0.5	0.5	0.5	0.6	0.6	3 min
100	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.5	2 min

STEP CLIMB CORRECTION

When the flight includes one or more step climbs (2000 feet below FL290, 4000 feet above), apply a correction of 60 kg per step climb to the fuel consumption.

R

DESCENT CORRECTION

Correct the fuel and time values determined in the integrated cruise tables as follows to take into account the descent down to 1500 feet followed by a 6 minute IFR approach and landing.

R

CORRECTION ON FUEL CONSUMPTION (1000 KG)								
FL	WEIGHT OVERHEAD DESTINATION (1000 KG)							Time Correction
	46	50	54	58	62	66	70	
390	0	0.1	0.1	0.2	0.2	—	—	10 min
370	0	0.1	0.1	0.1	0.2	0.2	0.3	10 min
350	0	0.1	0.1	0.1	0.2	0.2	0.2	10 min
330	0	0.1	0.1	0.1	0.2	0.2	0.2	10 min
310	0	0.1	0.1	0.1	0.1	0.2	0.2	10 min
290	0	0.1	0.1	0.1	0.1	0.2	0.2	10 min
270	0	0.1	0.1	0.1	0.1	0.1	0.2	10 min
250	0	0	0.1	0.1	0.1	0.1	0.2	10 min
200	0	0	0	0.1	0.1	0.1	0.1	9 min
150	0	0	0	0	0	0	0.1	8 min
100	0	0	0	0	0	0	0	8 min

INTRODUCTION

The following flight planning tables allow the planner to determine trip fuel consumption and trip time required to cover a given air distance. These tables are established for :

- Takeoff
- Climb profile 250kt/300kt/M.78
- Cruise Mach number M.78/LR
- Descent profile M.78/300kt/250kt
- Approach and landing 120 kg – 6 minute IFR
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

They are based upon a reference landing weight of 55 000 kg.

Note : 1. In the tables, the asterisk () means that a step climb of 4000 ft must be flown to reach the corresponding FL.*

2. To obtain a flight plan at optimum cruise level, the highest flight level desired within the flight has to be selected in the table.

3. For each degree Celcius above ISA temperature apply fuel correction 0.015 (kg/°C/NM) × Δ ISA (°C) × Air Distance (NM).

CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT

The fuel consumption must be corrected when the actual landing weight is different from the reference landing weight. If it is lower (or greater) than the reference landing weight, subtract (or add) the value given in the correction part of the table per 1000 kg below (or above) the reference landing weight.

EXAMPLE

The following is an example of a complete flight plan based on the assumptions :

- Zero fuel weight : 60 000 kg = landing weight at alternate airport
- Cruise M.78 at FL370
- Ground distance from departure to destination : 1800 NM
- Average wind during flight : - 40 kt (headwind)
- ISA conditions
- “En route” reserve : 5 %
- Ground distance from destination to alternate : 200 NM, no wind at FL200

To calculate the flight plan, a reverse calculation is needed, i.e. start with the landing weight at alternate (the schematic on 2.05.10 p 4 gives an overview of the calculation to be performed).

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.40	P 2
	QUICK DETERMINATION OF F-PLN		SEQ. 180	REV 23

1. Alternate fuel and time
 - From 2.05.50 p 2 ;
 - Alternate time = 40 min
 - Alternate fuel : $1\,559 + 11 \times (60 - 55) = 1\,614$ kg
2. Holding fuel and time
 - A 30 min holding is assumed at 1500 ft. Read from 3.05.25 p 2, holding fuel = 1 300 kg
3. At destination, the landing weight = $60\,000 + 1\,614 + 1\,300 = 62\,914$ kg
4. Evaluation of the air distance between departure and destination.
 - The “Ground distance/Air distance” conversion table from 2.05.60 p 2 shows that the corresponding air distance is : 1 975 NM.
5. Trip fuel and time
 - Enter air distance and flight level 370 (see table on 2.05.40 p 5), read the corresponding values of fuel consumption and time, for the reference landing weight and without deviation from ISA.
 - Fuel = 10 478 kg
 - Time = 4 h 37 min
 - Correction for landing weight
 - Δ fuel consumption = $146 \times (62.914 - 55) = 1\,155$ kg
 - Trip reserves (5 %) = $0.05 \times (10\,478 + 1\,155) = 582$ kg
6. Taxi fuel = 140 kg (2.05.10 p 2)
7. Total fuel on board (Block fuel) :

$$10\,478 + 1\,155 + 582 + 1\,300 + 1\,614 + 140 = 15\,269 \text{ kg}$$

INTRODUCTION

The following flight planning tables allow the planner to determine trip fuel consumption and trip time required to cover a given air distance. These tables are established for :

- Takeoff
- Climb profile 250kt/300kt/M.78
- Cruise Mach number M.78/LR
- Descent profile M.78/300kt/250kt
- Approach and landing 140 kg – 6 minute IFR
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

They are based upon a reference landing weight of 60 000 kg.

Note : 1. In the tables, the asterisk () means that a step climb of 4000 ft must be flown to reach the corresponding FL.*

2. To obtain a flight plan at optimum cruise level, the highest flight level desired within the flight has to be selected in the table.

3. For each degree Celcius above ISA temperature apply fuel correction 0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM).

CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT

The fuel consumption must be corrected when the actual landing weight is different from the reference landing weight. If it is lower (or greater) than the reference landing weight, subtract (or add) the value given in the correction part of the table per 1000 kg below (or above) the reference landing weight.

EXAMPLE

The following is an example of a complete flight plan based on the assumptions :

- Zero fuel weight : 65 000 kg = landing weight at alternate airport
- Cruise M.78 at FL370
- Ground distance from departure to destination : 1800 NM
- Average wind during flight : - 40 kt (headwind)
- ISA conditions
- “En route” reserve : 5 %
- Ground distance from destination to alternate : 200 NM, no wind at FL200

To calculate the flight plan, a reverse calculation is needed, i.e. start with the landing weight at alternate (the schematic on 2.05.10 p 4 gives an overview of the calculation to be performed).

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.40	P 2
	QUICK DETERMINATION OF F-PLN		SEQ. 175	REV 24

1. Alternate fuel and time
 - From 2.05.50 p 2 ;
- R Alternate time = 39 min
- R Alternate fuel : $1\,720 + 11 \times (65 - 60) = 1\,775$ kg
2. Holding fuel and time
 - A 30 min holding is assumed at 1500 ft. Read from 3.05.25 p 2, holding fuel =
- R 1 258 kg
- R 3. At destination, the landing weight = $65\,000 + 1\,775 + 1\,258 = 68\,033$ kg
4. Evaluation of the air distance between departure and destination.
 - The “Ground distance/Air distance” conversion table from 2.05.60 p 2 shows that the
- R corresponding air distance is : 1 979 NM.
5. Trip fuel and time
 - Enter air distance and flight level 370 (see table on 2.05.40 p 5), read the corresponding values of fuel consumption and time, for the reference landing weight and without deviation from ISA.
- R Fuel = 11 650 kg
- R Time = 4 h 38 min
- Correction for landing weight
- R Δ fuel consumption = $159 \times (68.033 - 60) = 1\,278$ kg
- R Trip reserves (5 %) = $0.05 \times (11\,650 + 1\,278) = 647$ kg
6. Taxi fuel = 160 kg (2.05.10 p 2)
7. Total fuel on board (Block fuel) :
- R $11\,650 + 1\,278 + 647 + 1\,258 + 1\,775 + 160 = 16\,768$ kg

INTRODUCTION

The following flight planning tables allow the planner to determine trip fuel consumption and trip time required to cover a given air distance :

These tables are established for :

- Takeoff
- Climb profile 250kt/300kt/M.78
- Cruise Mach number M.78/LR
- Descent profile M.78/300kt/250kt
- Approach and landing 110 kg – 6 minute IFR
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

They are based upon a reference landing weight of 50 000 kg

Note : 1. In the tables, the asterisk () means that a step climb of 4000 ft must be flown to reach the corresponding FL.*

2. To obtain a flight plan at optimum cruise level, the highest flight level desired within the flight has to be selected in the table.

3. For each degree Celcius above ISA temperature apply fuel correction 0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM).

CORRECTION FOR DEVIATION FROM REFERENCE LANDING WEIGHT

The fuel consumption must be corrected when the actual landing weight is different from the reference landing weight.

If it is lower (or greater) than the reference landing weight, subtract (or add) the value given in the correction part of the table per 1000 kg below (or above) the reference landing weight.

EXAMPLE

The following is an example of a complete flight plan based on the assumptions :

- Zero fuel weight : 55 000 kg = landing weight at alternate airport
- Cruise M.78 at FL370
- Ground distance from departure to destination : 1800 NM
- Average wind during flight : - 40 kt (headwind)
- ISA conditions
- “En route” reserve : 5 %
- Ground distance from destination to alternate : 200 NM, no wind at FL200

To calculate the flight plan, a reverse calculation is needed, i.e. start with the landing weight at alternate (the schematic on 2.05.10 p 4 gives an overview of the calculation to be performed).

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i>  FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.40	P 2
	QUICK DETERMINATION OF F-PLN		SEQ 190	REV 23

1. Alternate fuel and time
 - From 2.05.50 p2 ;
 - Alternate time = 40 min
 - Alternate fuel : $1\,459 + 10 \times (60 - 55) = 1\,509$ kg
2. Holding fuel and time
 - A 30 min holding is assumed at 1500 ft. Read from 3.05.25 p2, holding fuel = 1 243 kg
3. At destination, the landing weight = $60\,000 + 1\,509 + 1\,243 = 62\,752$ kg
4. Evaluation of the air distance between departure and destination.
 - The “Ground distance/Air distance” conversion table from 2.05.60 p2 shows that the corresponding air distance is : 1 688 NM.
5. Trip fuel and time
 - Enter air distance and flight level 370 (see table on 2.05.40 p5), read the corresponding values of fuel consumption and time, for the reference landing weight and without deviation from ISA.
 - Fuel = 8 166 kg
 - Time = 3 h 59 min
 - Correction for landing weight
 - Δ fuel consumption = $155 \times (62.752 - 55) = 1\,202$ kg
 - Trip reserves (5 %) = $0.05 \times (8\,166 + 1\,202) = 469$ kg
6. Taxi fuel = 140 kg (2.05.10 p 2)
7. Total fuel on board (Block fuel) :

$$8\,166 + 1\,202 + 469 + 1\,243 + 1\,509 + 140 = 12\,729 \text{ kg}$$

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 140 KG (6MIN)										
REF. LANDING WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)				
AIR DIST. (NM)		FLIGHT LEVEL					TIME (H.MIN)			
							CORRECTION ON FUEL CONSUMPTION (KG/1000KG)			
		290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
200		1814 0.38	1802 0.38	1798 0.38	1801 0.38			13	16	
225		1973 0.41	1952 0.41	1941 0.42	1937 0.42	1940 0.42		14	17	19
250		2132 0.45	2103 0.45	2083 0.45	2073 0.45	2071 0.45	2077 0.45	15	18	21
275		2291 0.48	2253 0.48	2225 0.48	2209 0.48	2203 0.48	2206 0.48	16	19	22
300		2450 0.51	2403 0.51	2368 0.51	2345 0.52	2335 0.52	2335 0.52	16	20	24
325		2609 0.54	2554 0.55	2511 0.55	2482 0.55	2468 0.55	2464 0.55	17	21	25
350		2769 0.58	2704 0.58	2654 0.58	2619 0.58	2600 0.58	2594 0.58	18	22	27
375		2928 1.01	2855 1.01	2797 1.01	2755 1.02	2732 1.02	2724 1.02	19	23	28
400		3088 1.04	3006 1.04	2940 1.05	2892 1.05	2865 1.05	2854 1.05	19	24	30
425		3248 1.07	3157 1.08	3083 1.08	3030 1.08	2998 1.08	2984 1.08	20	25	31
450		3408 1.11	3308 1.11	3227 1.11	3167 1.12	3131 1.12	3115 1.12	21	26	33
475		3568 1.14	3459 1.14	3370 1.15	3305 1.15	3264 1.15	3246 1.15	22	27	34
500		3728 1.17	3610 1.18	3514 1.18	3442 1.18	3398 1.19	3377 1.19	22	28	36
525		3888 1.20	3762 1.21	3658 1.21	3580 1.22	3532 1.22	3508 1.22	23	29	38
550		4049 1.24	3913 1.24	3802 1.25	3718 1.25	3665 1.25	3640 1.25	24	30	39
575		4209 1.27	4065 1.27	3946 1.28	3857 1.28	3799 1.29	3772 1.29	25	32	41
600		4370 1.30	4217 1.31	4090 1.31	3995 1.32	3934 1.32	3904 1.32	25	33	43
625		4530 1.34	4369 1.34	4235 1.35	4133 1.35	4068 1.35	4036 1.35	26	34	44
650		4691 1.37	4521 1.37	4379 1.38	4272 1.38	4203 1.39	4169 1.39	27	35	46
675		4852 1.40	4673 1.41	4524 1.41	4411 1.42	4337 1.42	4301 1.42	28	36	48
700		5013 1.43	4825 1.44	4669 1.45	4550 1.45	4472 1.45	4434 1.45	29	37	50
725		5174 1.47	4978 1.47	4814 1.48	4689 1.48	4607 1.49	4568 1.49	29	38	51
750		5335 1.50	5130 1.50	4959 1.51	4829 1.52	4743 1.52	4701 1.52	30	40	53
775		5497 1.53	5283 1.54	5104 1.54	4968 1.55	4878 1.56	4835 1.56	31	41	55
800		5658 1.56	5436 1.57	5249 1.58	5108 1.58	5014 1.59	4969 1.59	32	42	57
825		5820 2.00	5589 2.00	5395 2.01	5248 2.02	5149 2.02	5103 2.02	33	43	58
ECON AIR CONDITIONING				ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.6 %				ΔFUEL = + 3 %			ΔFUEL = + 5.5 %			

FLIP23D A321-112 CFM56-5B3/P SA3420 03301.000011 0250300 .7800 .00200 140 0300350 60 0 100100 40100 18590 FCOM-NO-02-05-40-003-175

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF				TIME (H.MIN)					
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
825	5820 2.00	5589 2.00	5395 2.01	5248 2.02	5149 2.02	5103 2.02	33	43	58
850	5982 2.03	5742 2.04	5540 2.04	5388 2.05	5285 2.06	5237 2.06	34	44	60
875	6143 2.06	5895 2.07	5686 2.08	5528 2.09	5422 2.09	5372 2.09	34	45	62
900	6305 2.09	6048 2.10	5832 2.11	5669 2.12	5558 2.12	5506 2.12	35	47	64
925	6468 2.13	6202 2.13	5978 2.14	5809 2.15	5695 2.16	5642 2.16	36	48	66
950	6630 2.16	6356 2.17	6124 2.18	5950 2.19	5832 2.19	5777 2.19	37	49	68
975	6792 2.19	6509 2.20	6270 2.21	6091 2.22	5969 2.22	5913 2.22	38	50	70
1000	6954 2.22	6663 2.23	6417 2.24	6232 2.25	6106 2.26	6049 2.26	39	51	72
1025	7117 2.26	6817 2.27	6563 2.28	6373 2.29	6243 2.29	6186 2.29	39	53	74
1050	7280 2.29	6971 2.30	6710 2.31	6515 2.32	6381 2.32	6322 2.32	40	54	76
1075	7443 2.32	7125 2.33	6857 2.34	6657 2.35	6519 2.36	6459 2.36	41	55	78
1100	7605 2.35	7280 2.36	7004 2.38	6798 2.39	6657 2.39	6596 2.39	42	56	80
1125	7769 2.39	7434 2.40	7151 2.41	6940 2.42	6795 2.43	6733 2.43	43	58	82
1150	7932 2.42	7589 2.43	7299 2.44	7083 2.45	6933 2.46	6871 2.46	44	59	84
1175	8095 2.45	7743 2.46	7446 2.47	7225 2.49	7072 2.49	7008 2.49	44	60	86
1200	8259 2.48	7898 2.50	7594 2.51	7368 2.52	7210 2.53	7146 2.53	45	61	88
1225	8422 2.52	8054 2.53	7742 2.54	7510 2.55	7349 2.56	7285 2.56	46	63	90
1250	8586 2.55	8209 2.56	7890 2.57	7653 2.59	7488 2.59	7423 2.59	47	64	92
1275	8750 2.58	8364 3.00	8038 3.01	7796 3.02	7628 3.03	7562 3.03	48	65	95
1300	8914 3.02	8520 3.03	8186 3.04	7940 3.05	7768 3.06	7702 3.06	49	66	97
1325	9078 3.05	8675 3.06	8335 3.07	8083 3.09	7908 3.09	7842 3.09	50	68	99
1350	9242 3.08	8831 3.09	8484 3.11	8227 3.12	8048 3.13	7982 3.13	51	69	101
1375	9406 3.11	8987 3.13	8633 3.14	8371 3.15	8188 3.16	8124 3.16	52	70	103
1400	9571 3.15	9143 3.16	8782 3.17	8515 3.19	8329 3.20	8265 3.20	53	72	106
1425	9735 3.18	9299 3.19	8931 3.21	8659 3.22	8470 3.23	8407 3.23	54	73	108
1450	9900 3.21	9455 3.23	9080 3.24	8804 3.25	8611 3.26	8548 3.26	55	75	110
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.6 %			ΔFUEL = + 3 %			ΔFUEL = + 5.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7800 .00200 140 0300350 60 0 100100 40100 18590 FCOM-N0-02-05-40-004-175

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)			
							TIME (H.MIN)		
AIR DIST.	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
200	1628 0.38	1616 0.38	1610 0.38	1610 0.38			13	15	
225	1775 0.42	1754 0.42	1741 0.42	1734 0.42	1734 0.42		13	16	17
250	1921 0.45	1892 0.45	1871 0.45	1858 0.45	1853 0.45	1855 0.45	14	17	19
275	2068 0.48	2030 0.48	2002 0.48	1982 0.48	1972 0.49	1972 0.49	15	18	21
300	2215 0.51	2168 0.52	2132 0.52	2107 0.52	2092 0.52	2089 0.52	15	19	22
325	2361 0.55	2306 0.55	2263 0.55	2231 0.55	2211 0.55	2206 0.55	16	19	24
350	2508 0.58	2444 0.58	2394 0.58	2355 0.58	2331 0.59	2324 0.59	16	20	25
375	2655 1.01	2583 1.01	2525 1.02	2480 1.02	2451 1.02	2441 1.02	17	21	27
400	2802 1.04	2721 1.05	2656 1.05	2605 1.05	2571 1.05	2559 1.05	18	22	28
425	2950 1.08	2860 1.08	2787 1.08	2730 1.09	2691 1.09	2677 1.09	18	23	29
450	3097 1.11	2998 1.11	2918 1.12	2855 1.12	2811 1.12	2795 1.12	19	24	31
475	3244 1.14	3137 1.15	3050 1.15	2980 1.15	2932 1.15	2913 1.15	20	25	32
500	3391 1.17	3276 1.18	3181 1.18	3105 1.19	3052 1.19	3032 1.19	20	26	34
525	3539 1.21	3415 1.21	3312 1.21	3230 1.22	3173 1.22	3151 1.22	21	27	36
550	3687 1.24	3554 1.24	3444 1.25	3355 1.25	3294 1.25	3269 1.25	22	28	37
575	3834 1.27	3693 1.28	3576 1.28	3481 1.29	3415 1.29	3389 1.29	22	29	39
600	3982 1.30	3832 1.31	3708 1.31	3607 1.32	3536 1.32	3508 1.32	23	30	41
625	4130 1.34	3971 1.34	3840 1.35	3732 1.35	3657 1.36	3627 1.36	24	31	42
650	4278 1.37	4111 1.38	3972 1.38	3858 1.39	3779 1.39	3747 1.39	25	32	44
675	4426 1.40	4250 1.41	4104 1.41	3984 1.42	3900 1.42	3867 1.42	25	33	46
700	4574 1.43	4390 1.44	4236 1.45	4110 1.45	4022 1.46	3987 1.46	26	34	48
725	4722 1.47	4530 1.47	4369 1.48	4237 1.49	4144 1.49	4107 1.49	27	35	49
750	4870 1.50	4670 1.51	4501 1.51	4363 1.52	4267 1.52	4228 1.52	27	36	51
775	5019 1.53	4810 1.54	4634 1.55	4490 1.55	4389 1.56	4349 1.56	28	37	53
800	5167 1.57	4950 1.57	4767 1.58	4617 1.59	4512 1.59	4471 1.59	29	38	55
825	5316 2.00	5090 2.01	4900 2.01	4744 2.02	4634 2.02	4592 2.02	29	39	56
LOW AIR CONDITIONING ΔFUEL = -0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7800 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-003-180

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE = M.78 - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF						TIME (H.MIN)			
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
825	5316 2.00	5090 2.01	4900 2.01	4744 2.02	4634 2.02	4592 2.02	29	39	56
850	5464 2.03	5231 2.04	5033 2.05	4871 2.05	4757 2.06	4714 2.06	30	40	58
875	5613 2.06	5371 2.07	5166 2.08	4998 2.09	4880 2.09	4836 2.09	31	41	60
900	5762 2.10	5512 2.10	5299 2.11	5125 2.12	5004 2.13	4958 2.13	32	42	62
925	5911 2.13	5652 2.14	5433 2.15	5253 2.15	5127 2.16	5080 2.16	32	43	63
950	6060 2.16	5793 2.17	5566 2.18	5380 2.19	5251 2.19	5203 2.19	33	44	65
975	6209 2.19	5934 2.20	5700 2.21	5508 2.22	5374 2.23	5326 2.23	34	45	67
1000	6358 2.23	6075 2.24	5833 2.24	5636 2.25	5498 2.26	5449 2.26	35	46	69
1025	6507 2.26	6216 2.27	5967 2.28	5763 2.29	5622 2.29	5572 2.29	35	47	71
1050	6657 2.29	6357 2.30	6101 2.31	5892 2.32	5746 2.33	5695 2.33	36	48	73
1075	6806 2.32	6498 2.33	6235 2.34	6020 2.35	5871 2.36	5819 2.36	37	49	74
1100	6955 2.36	6639 2.37	6369 2.38	6148 2.39	5995 2.39	5943 2.39	38	50	76
1125	7105 2.39	6781 2.40	6503 2.41	6276 2.42	6120 2.43	6067 2.43	38	51	78
1150	7255 2.42	6923 2.43	6638 2.44	6405 2.45	6245 2.46	6191 2.46	39	52	80
1175	7405 2.45	7064 2.47	6772 2.48	6534 2.49	6370 2.49	6316 2.49	40	53	82
1200	7555 2.49	7206 2.50	6907 2.51	6662 2.52	6495 2.53	6441 2.53	41	55	84
1225	7705 2.52	7348 2.53	7041 2.54	6791 2.56	6621 2.56	6566 2.56	41	56	86
1250	7855 2.55	7490 2.56	7176 2.58	6921 2.59	6746 3.00	6691 3.00	42	57	87
1275	8005 2.58	7632 3.00	7311 3.01	7050 3.02	6872 3.03	6817 3.03	43	58	89
1300	8155 3.02	7775 3.03	7446 3.04	7179 3.06	6998 3.06	6943 3.06	44	59	91
1325	8305 3.05	7917 3.06	7582 3.08	7309 3.09	7124 3.10	7069 3.10	45	60	93
1350	8456 3.08	8059 3.10	7717 3.11	7439 3.12	7251 3.13	7195 3.13	45	61	95
1375	8606 3.12	8202 3.13	7852 3.14	7569 3.16	7377 3.16	7322 3.16	46	63	97
1400	8757 3.15	8345 3.16	7988 3.18	7699 3.19	7504 3.20	7449 3.20	47	64	99
1425	8908 3.18	8488 3.19	8124 3.21	7829 3.22	7631 3.23	7576 3.23	48	65	101
1450	9059 3.21	8630 3.23	8259 3.24	7959 3.26	7758 3.26	7704 3.26	49	66	103
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2 %			ΔFUEL = + 4.5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7800 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-004-180

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF						TIME (H.MIN)			
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
825	5089 1.59	4852 2.00	4647 2.01	4472 2.02	4333 2.02	4239 2.02	26	34	46
850	5232 2.03	4986 2.03	4774 2.04	4592 2.05	4447 2.05	4350 2.05	27	35	47
875	5375 2.06	5120 2.07	4900 2.07	4711 2.08	4562 2.09	4461 2.09	27	35	49
900	5518 2.09	5255 2.10	5027 2.11	4831 2.12	4677 2.12	4572 2.12	28	36	50
925	5661 2.12	5389 2.13	5154 2.14	4951 2.15	4791 2.15	4683 2.15	28	37	51
950	5805 2.16	5524 2.16	5281 2.17	5072 2.18	4906 2.19	4795 2.19	29	38	53
975	5948 2.19	5658 2.20	5408 2.21	5192 2.22	5021 2.22	4906 2.22	30	39	54
1000	6091 2.22	5793 2.23	5535 2.24	5313 2.25	5137 2.25	5018 2.25	30	40	56
1025	6234 2.25	5928 2.26	5662 2.27	5433 2.28	5252 2.29	5130 2.29	31	41	57
1050	6378 2.29	6062 2.30	5790 2.31	5554 2.32	5368 2.32	5242 2.32	32	41	58
1075	6521 2.32	6197 2.33	5917 2.34	5675 2.35	5483 2.36	5355 2.36	32	42	60
1100	6665 2.35	6332 2.36	6045 2.37	5796 2.38	5599 2.39	5467 2.39	33	43	61
1125	6809 2.38	6467 2.39	6172 2.41	5917 2.42	5715 2.42	5580 2.42	34	44	63
1150	6952 2.42	6603 2.43	6300 2.44	6038 2.45	5831 2.46	5693 2.46	34	45	64
1175	7096 2.45	6738 2.46	6428 2.47	6160 2.48	5948 2.49	5806 2.49	35	46	65
1200	7240 2.48	6873 2.49	6556 2.50	6281 2.52	6064 2.52	5920 2.52	36	47	67
1225	7384 2.51	7009 2.53	6684 2.54	6403 2.55	6180 2.56	6033 2.56	36	48	68
1250	7528 2.55	7144 2.56	6812 2.57	6524 2.58	6297 2.59	6147 2.59	37	48	70
1275	7672 2.58	7280 2.59	6941 3.00	6646 3.02	6414 3.02	6261 3.02	38	49	71
1300	7817 3.01	7415 3.02	7069 3.04	6768 3.05	6531 3.06	6375 3.06	38	50	73
1325	7961 3.04	7551 3.06	7197 3.07	6890 3.08	6648 3.09	6489 3.09	39	51	74
1350	8105 3.08	7687 3.09	7326 3.10	7012 3.12	6765 3.13	6603 3.13	40	52	76
1375	8250 3.11	7823 3.12	7455 3.14	7134 3.15	6882 3.16	6718 3.16	40	53	78
1400	8394 3.14	7959 3.16	7583 3.17	7256 3.18	6999 3.19	6832 3.19	41	54	79
1425	8539 3.17	8095 3.19	7712 3.20	7379 3.22	7117 3.23	6947 3.23	42	55	81
1450	8684 3.21	8231 3.22	7841 3.24	7501 3.25	7234 3.26	7062 3.26	42	56	82
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 2 %			ΔFUEL = + 4.5 %			

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-NO-02-05-40-004-190

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 140 KG (6MIN)										
REF. LANDING WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)				
AIR DIST. (NM)		FLIGHT LEVEL					TIME (H.MIN)			
							CORRECTION ON FUEL CONSUMPTION (KG/1000KG)			
		290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
1450		9900 3.21	9455 3.23	9080 3.24	8804 3.25	8611 3.26	8548 3.26	55	75	110
1475		10065 3.24	9611 3.26	9229 3.27	8948 3.29	8752 3.30	8691 3.30	56	76	112
1500		10230 3.28	9768 3.29	9379 3.31	9093 3.32	8894 3.33	8833 3.33	57	77	115
1525		10395 3.31	9925 3.32	9529 3.34	9238 3.35	9035 3.36	8976 3.36	57	79	117
1550		10560 3.34	10081 3.36	9679 3.37	9383 3.39	9177 3.40	9119 3.40	58	80	119
1575		10726 3.37	10238 3.39	9829 3.41	9529 3.42	9320 3.43	9263 3.43	59	82	122
1600		10891 3.41	10396 3.42	9979 3.44	9674 3.46	9462 3.46	9408 3.46*	60	83	124
1625		11057 3.44	10553 3.46	10129 3.47	9820 3.49	9604 3.50	9554 3.50*	61	85	126
1650		11223 3.47	10710 3.49	10280 3.50	9966 3.52	9747 3.53	9699 3.53*	62	86	128
1675		11389 3.50	10868 3.52	10431 3.54	10112 3.56	9890 3.56	9845 3.56*	63	87	131
1700		11555 3.54	11026 3.55	10582 3.57	10259 3.59	10033 4.00	9991 4.00*	64	89	133
1725		11721 3.57	11184 3.59	10733 4.00	10405 4.02	10177 4.03	10137 4.03*	65	90	135
1750		11887 4.00	11342 4.02	10885 4.04	10552 4.06	10321 4.07	10284 4.06*	66	92	137
1775		12054 4.03	11500 4.05	11036 4.07	10699 4.09	10465 4.10	10430 4.10*	67	93	140
1800		12221 4.07	11658 4.09	11188 4.10	10847 4.12	10609 4.13	10577 4.13*	68	95	142
1825		12388 4.10	11817 4.12	11340 4.14	10994 4.16	10754 4.17	10725 4.16*	69	96	144
1850		12555 4.13	11975 4.15	11492 4.17	11142 4.19	10899 4.20	10872 4.20*	70	98	146
1875		12722 4.17	12134 4.18	11644 4.20	11290 4.22	11044 4.23	11020 4.23*	71	99	149
1900		12889 4.20	12293 4.22	11796 4.24	11438 4.26	11189 4.27	11167 4.27*	72	101	151
1925		13057 4.23	12453 4.25	11948 4.27	11586 4.29	11335 4.30	11315 4.30*	73	102	153
1950		13225 4.26	12612 4.28	12101 4.30	11735 4.32	11480 4.33	11463 4.33*	74	104	155
1975		13393 4.30	12772 4.32	12255 4.34	11884 4.36	11626 4.37	11612 4.37*	75	105	158
2000		13560 4.33	12931 4.35	12408 4.37	12032 4.39	11772 4.40	11760 4.40*	76	107	160
2025		13729 4.36	13091 4.38	12562 4.40	12181 4.42	11919 4.44	11909 4.43*	78	108	161
2050		13897 4.39	13251 4.41	12716 4.44	12331 4.46	12065 4.47	12058 4.47*	79	110	163
2075		14065 4.43	13411 4.45	12871 4.47	12480 4.49	12212 4.50	12207 4.50*	80	112	165
ECON AIR CONDITIONING				ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.6 %				ΔFUEL = + 3 %			ΔFUEL = + 5.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7800 .00200 140 0300350 60 0 100100 40100 18590 FCOM-NO-02-05-40-005-175

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF				TIME (H.MIN)					
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075	14065 4.43	13411 4.45	12871 4.47	12480 4.49	12212 4.50	12207 4.50*	80	112	165
2100	14234 4.46	13572 4.48	13025 4.50	12630 4.52	12360 4.54	12356 4.53*	81	113	167
2125	14402 4.49	13732 4.51	13180 4.53	12780 4.56	12507 4.57	12506 4.57*	82	115	169
2150	14571 4.52	13893 4.55	13334 4.57	12930 4.59	12656 5.00	12656 5.00*	83	116	171
2175	14740 4.56	14054 4.58	13489 5.00	13081 5.02	12804 5.04	12806 5.03*	84	118	173
2200	14909 4.59	14214 5.01	13645 5.03	13232 5.06	12953 5.07	12956 5.07*	85	119	175
2225	15078 5.02	14376 5.04	13800 5.07	13382 5.09	13102 5.10	13107 5.10*	86	121	177
2250	15248 5.05	14537 5.08	13955 5.10	13534 5.12	13252 5.14	13258 5.13*	87	123	179
2275	15417 5.09	14698 5.11	14111 5.13	13685 5.16	13401 5.17	13409 5.17*	88	124	181
2300	15587 5.12	14860 5.14	14267 5.17	13836 5.19	13551 5.21	13560 5.20*	89	126	183
2325	15757 5.15	15021 5.18	14423 5.20	13988 5.23	13701 5.24	13711 5.23*	90	128	186
2350	15926 5.18	15183 5.21	14579 5.23	14140 5.26	13851 5.27	13863 5.27*	91	129	188
2375	16097 5.22	15345 5.24	14736 5.27	14292 5.29	14002 5.31	14014 5.30*	93	131	190
2400	16267 5.25	15508 5.27	14893 5.30	14444 5.33	14153 5.34	14166 5.33*	94	132	192
2425	16437 5.28	15670 5.31	15050 5.33	14597 5.36	14304 5.37	14319 5.37*	95	134	194
2450	16608 5.32	15832 5.34	15207 5.37	14749 5.39	14455 5.41	14471 5.40*	96	136	196
2475	16778 5.35	15995 5.37	15364 5.40	14903 5.43	14607 5.44	14624 5.43*	97	138	199
2500	16949 5.38	16158 5.41	15522 5.43	15056 5.46	14758 5.47	14777 5.47*	98	139	201
2525	17120 5.41	16321 5.44	15680 5.47	15210 5.49	14911 5.51	14930 5.50*	99	141	203
2550	17292 5.45	16484 5.47	15838 5.50	15363 5.53	15064 5.54	15084 5.54*	100	143	205
2575	17463 5.48	16647 5.50	15996 5.53	15517 5.56	15217 5.57	15238 5.57*	101	144	208
2600	17635 5.51	16811 5.54	16154 5.57	15672 5.59	15370 6.01	15392 6.00*	102	146	210
2625	17806 5.54	16974 5.57	16313 6.00	15826 6.03	15524 6.04	15546 6.04*	103	148	213
2650	17978 5.58	17138 6.00	16471 6.03	15981 6.06	15677 6.08	15701 6.07*	104	150	215
2675	18150 6.01	17302 6.04	16630 6.06	16135 6.09	15832 6.11	15856 6.10*	106	151	218
2700	18322 6.04	17467 6.07	16790 6.10	16291 6.13	15986 6.14	16011 6.14*	107	153	220
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.6 %			ΔFUEL = + 3 %			ΔFUEL = + 5.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7800 .00200 140 0300350 60 0 100100 40100 18590 FCOM-N0-02-05-40-006-175

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)			
							TIME (H.MIN)		
AIR DIST.	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
1450	9059 3.21	8630 3.23	8259 3.24	7959 3.26	7758 3.26	7704 3.26	49	66	103
1475	9210 3.25	8773 3.26	8395 3.27	8089 3.29	7885 3.30	7832 3.30	49	67	105
1500	9361 3.28	8917 3.29	8531 3.31	8220 3.32	8013 3.33	7944 3.33*	50	68	107
1525	9512 3.31	9060 3.33	8668 3.34	8351 3.36	8141 3.37	8074 3.37*	51	70	109
1550	9664 3.34	9203 3.36	8804 3.37	8481 3.39	8268 3.40	8205 3.40*	52	71	111
1575	9815 3.38	9347 3.39	8940 3.41	8612 3.42	8396 3.43	8336 3.43*	53	72	113
1600	9967 3.41	9490 3.42	9077 3.44	8744 3.46	8525 3.47	8467 3.47*	53	73	115
1625	10119 3.44	9634 3.46	9214 3.47	8875 3.49	8653 3.50	8598 3.50*	54	74	117
1650	10271 3.47	9778 3.49	9351 3.51	9006 3.52	8782 3.53	8730 3.53*	55	76	119
1675	10423 3.51	9922 3.52	9488 3.54	9138 3.56	8910 3.57	8862 3.57*	56	77	121
1700	10575 3.54	10066 3.56	9625 3.57	9270 3.59	9039 4.00	8993 4.00*	57	78	123
1725	10727 3.57	10210 3.59	9762 4.01	9402 4.02	9168 4.03	9125 4.03*	58	79	125
1750	10880 4.00	10354 4.02	9900 4.04	9534 4.06	9298 4.07	9257 4.07*	59	81	127
1775	11032 4.04	10499 4.05	10038 4.07	9667 4.09	9427 4.10	9390 4.10*	59	82	129
1800	11185 4.07	10643 4.09	10176 4.11	9800 4.12	9558 4.13	9522 4.13*	60	83	131
1825	11337 4.10	10788 4.12	10314 4.14	9933 4.16	9689 4.17	9655 4.17*	61	84	133
1850	11490 4.13	10932 4.15	10452 4.17	10066 4.19	9820 4.20	9788 4.20*	62	86	135
1875	11643 4.17	11077 4.19	10590 4.21	10199 4.22	9951 4.24	9921 4.23*	63	87	137
1900	11796 4.20	11222 4.22	10729 4.24	10333 4.26	10082 4.27	10054 4.27*	64	88	139
1925	11949 4.23	11367 4.25	10867 4.27	10466 4.29	10214 4.30	10188 4.30*	65	90	141
1950	12102 4.26	11512 4.28	11006 4.30	10600 4.33	10346 4.34	10321 4.33*	66	91	144
1975	12255 4.30	11658 4.32	11145 4.34	10734 4.36	10478 4.37	10455 4.37*	66	92	146
2000	12408 4.33	11803 4.35	11283 4.37	10868 4.39	10610 4.40	10589 4.40*	67	94	148
2025	12562 4.36	11948 4.38	11423 4.40	11002 4.43	10742 4.44	10723 4.44*	68	95	150
2050	12716 4.40	12094 4.42	11562 4.44	11137 4.46	10875 4.47	10858 4.47*	69	97	152
2075	12869 4.43	12240 4.45	11701 4.47	11271 4.49	11008 4.50	10992 4.50*	70	98	155
LOW AIR CONDITIONING ΔFUEL = -0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7800 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-005-180

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)			
AIR DIST.		FLIGHT LEVEL					CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075	12869 4.43	12240 4.45	11701 4.47	11271 4.49	11008 4.50	10992 4.50*	70	98	155
2100	13023 4.46	12386 4.48	11840 4.50	11406 4.53	11141 4.54	11127 4.54*	71	99	157
2125	13177 4.49	12532 4.51	11980 4.54	11541 4.56	11275 4.57	11262 4.57*	72	101	159
2150	13331 4.53	12678 4.55	12120 4.57	11676 4.59	11408 5.01	11397 5.00*	73	102	161
2175	13485 4.56	12824 4.58	12260 5.00	11811 5.03	11542 5.04	11532 5.04*	74	104	163
2200	13640 4.59	12970 5.01	12400 5.04	11947 5.06	11676 5.07	11667 5.07*	75	105	165
2225	13794 5.02	13117 5.05	12540 5.07	12082 5.09	11810 5.11	11803 5.10*	76	107	168
2250	13948 5.06	13264 5.08	12680 5.10	12218 5.13	11945 5.14	11939 5.14*	77	108	170
2275	14103 5.09	13410 5.11	12821 5.14	12354 5.16	12080 5.17	12074 5.17*	78	109	172
2300	14258 5.12	13557 5.14	12962 5.17	12490 5.19	12214 5.21	12210 5.20*	79	111	174
2325	14412 5.15	13704 5.18	13102 5.20	12627 5.23	12350 5.24	12347 5.24*	80	112	177
2350	14567 5.19	13851 5.21	13243 5.24	12764 5.26	12485 5.27	12483 5.27*	81	114	179
2375	14723 5.22	13998 5.24	13384 5.27	12900 5.29	12621 5.31	12620 5.30*	81	115	181
2400	14878 5.25	14146 5.28	13526 5.30	13037 5.33	12758 5.34	12757 5.34*	82	117	183
2425	15034 5.28	14293 5.31	13667 5.33	13174 5.36	12894 5.37	12894 5.37*	83	119	186
2450	15190 5.32	14441 5.34	13808 5.37	13312 5.39	13031 5.41	13032 5.40*	84	120	188
2475	15346 5.35	14588 5.37	13950 5.40	13449 5.43	13168 5.44	13169 5.44*	85	122	190
2500	15502 5.38	14736 5.41	14092 5.43	13587 5.46	13305 5.48	13307 5.47*	86	123	192
2525	15658 5.41	14884 5.44	14234 5.47	13725 5.49	13442 5.51	13445 5.50*	87	125	195
2550	15815 5.45	15033 5.47	14376 5.50	13863 5.53	13580 5.54	13584 5.54*	88	126	197
2575	15971 5.48	15181 5.51	14518 5.53	14001 5.56	13718 5.58	13722 5.57*	89	128	199
2600	16128 5.51	15330 5.54	14660 5.57	14139 5.59	13856 6.01	13861 6.00*	90	129	201
2625	16284 5.55	15479 5.57	14803 6.00	14278 6.03	13994 6.04	14000 6.04*	91	131	204
2650	16441 5.58	15628 6.00	14946 6.03	14416 6.06	14133 6.08	14139 6.07*	92	133	206
2675	16598 6.01	15777 6.04	15089 6.07	14555 6.09	14271 6.11	14279 6.10*	93	134	209
2700	16755 6.04	15926 6.07	15232 6.10	14694 6.13	14410 6.14	14418 6.14*	94	136	211
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2 %			ΔFUEL = + 4.5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7800 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-006-180

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF						TIME (H.MIN)			
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075	12330 4.42	11667 4.44	11100 4.46	10602 4.49	10219 4.50	9997 4.50	61	82	126
2100	12477 4.45	11806 4.48	11231 4.50	10728 4.52	10340 4.53	10117 4.53	62	83	128
2125	12624 4.49	11946 4.51	11363 4.53	10853 4.55	10462 4.57	10237 4.57	62	84	130
2150	12771 4.52	12085 4.54	11495 4.56	10979 4.59	10583 5.00	10357 5.00	63	85	132
2175	12918 4.55	12224 4.57	11627 5.00	11105 5.02	10705 5.03	10477 5.03	64	86	133
2200	13066 4.58	12363 5.01	11759 5.03	11231 5.05	10826 5.07	10598 5.07	65	87	135
2225	13213 5.02	12503 5.04	11891 5.06	11358 5.09	10948 5.10	10718 5.10	66	88	137
2250	13361 5.05	12642 5.07	12024 5.10	11484 5.12	11070 5.13	10839 5.13	66	89	139
2275	13509 5.08	12782 5.11	12156 5.13	11611 5.15	11192 5.17	10960 5.17	67	90	141
2300	13656 5.12	12922 5.14	12289 5.16	11738 5.19	11315 5.20	11082 5.20	68	91	143
2325	13804 5.15	13062 5.17	12421 5.20	11865 5.22	11438 5.24	11203 5.24	69	93	145
2350	13952 5.18	13202 5.20	12554 5.23	11992 5.25	11562 5.27	11325 5.27	70	94	147
2375	14100 5.21	13342 5.24	12687 5.26	12119 5.29	11686 5.30	11448 5.30	71	95	149
2400	14248 5.25	13482 5.27	12820 5.30	12246 5.32	11810 5.34	11572 5.34	71	96	151
2425	14397 5.28	13622 5.30	12953 5.33	12374 5.36	11934 5.37	11696 5.37	72	97	153
2450	14545 5.31	13763 5.34	13086 5.36	12501 5.39	12058 5.40	11820 5.40	73	98	155
2475	14694 5.34	13903 5.37	13219 5.40	12629 5.42	12182 5.44	11944 5.44	74	100	156
2500	14842 5.38	14044 5.40	13352 5.43	12757 5.46	12307 5.47	12069 5.47	75	101	158
2525	14991 5.41	14185 5.43	13486 5.46	12885 5.49	12432 5.50	12194 5.50	76	102	160
2550	15140 5.44	14326 5.47	13619 5.49	13013 5.52	12556 5.54	12319 5.54	76	103	162
2575	15288 5.47	14467 5.50	13753 5.53	13141 5.56	12681 5.57	12445 5.57	77	105	164
2600	15437 5.51	14608 5.53	13887 5.56	13269 5.59	12807 6.00	12570 6.00	78	106	166
2625	15586 5.54	14749 5.57	14021 5.59	13398 6.02	12932 6.04	12696 6.04	79	107	169
2650	15735 5.57	14890 6.00	14155 6.03	13526 6.06	13058 6.07	12823 6.07	80	108	171
2675	15885 6.00	15032 6.03	14289 6.06	13655 6.09	13183 6.11	12949 6.11	81	110	173
2700	16034 6.04	15173 6.06	14423 6.09	13784 6.12	13309 6.14	13076 6.14	82	111	175
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 2 %			ΔFUEL = + 4.5 %			

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-NO-02-05-40-006-190

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
200	1785 0.39	1788 0.39	1793 0.38	1799 0.38			16	17	
225	1931 0.43	1930 0.42	1930 0.42	1932 0.42	1939 0.42		17	18	19
250	2077 0.46	2071 0.46	2067 0.45	2066 0.45	2070 0.45	2077 0.45	18	19	21
275	2224 0.50	2213 0.49	2204 0.49	2199 0.49	2201 0.48	2207 0.48	20	21	23
300	2370 0.54	2354 0.53	2342 0.52	2333 0.52	2333 0.52	2337 0.52	21	22	24
325	2517 0.57	2496 0.56	2479 0.56	2467 0.55	2464 0.55	2467 0.55	22	24	26
350	2664 1.01	2639 1.00	2617 0.59	2601 0.59	2596 0.59	2597 0.58	24	25	28
375	2811 1.05	2781 1.04	2755 1.03	2735 1.02	2728 1.02	2728 1.02	25	27	30
400	2958 1.08	2923 1.07	2894 1.06	2869 1.06	2860 1.05	2859 1.05	26	28	32
425	3105 1.12	3066 1.11	3032 1.10	3004 1.09	2992 1.09	2990 1.08	28	30	34
450	3253 1.16	3209 1.14	3171 1.13	3138 1.13	3125 1.12	3122 1.12	29	31	36
475	3401 1.19	3352 1.18	3309 1.16	3273 1.16	3258 1.15	3254 1.15	30	32	37
500	3549 1.23	3496 1.21	3449 1.20	3409 1.19	3391 1.19	3386 1.18	32	34	39
525	3697 1.26	3639 1.25	3588 1.23	3544 1.23	3524 1.22	3518 1.22	33	35	41
550	3845 1.30	3783 1.28	3727 1.27	3680 1.26	3658 1.26	3651 1.25	35	37	43
575	3994 1.34	3927 1.32	3867 1.30	3816 1.30	3791 1.29	3784 1.28	36	38	45
600	4143 1.37	4071 1.35	4006 1.34	3952 1.33	3925 1.32	3917 1.32	37	40	47
625	4292 1.41	4216 1.39	4146 1.37	4088 1.37	4060 1.36	4050 1.35	39	41	49
650	4441 1.45	4360 1.42	4287 1.41	4224 1.40	4194 1.39	4183 1.38	40	43	51
675	4590 1.48	4505 1.46	4427 1.44	4361 1.43	4329 1.42	4317 1.42	41	44	53
700	4739 1.52	4650 1.49	4567 1.47	4498 1.47	4463 1.46	4451 1.45	43	46	55
725	4889 1.55	4795 1.53	4708 1.51	4635 1.50	4598 1.49	4586 1.48	44	47	57
750	5039 1.59	4941 1.56	4849 1.54	4772 1.54	4734 1.53	4720 1.52	46	49	58
775	5189 2.03	5086 2.00	4990 1.58	4910 1.57	4869 1.56	4855 1.55	47	50	60
800	5339 2.06	5232 2.03	5131 2.01	5047 2.00	5005 1.59	4990 1.58	48	52	62
825	5490 2.10	5378 2.07	5273 2.05	5185 2.04	5141 2.03	5125 2.02	50	53	64
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 3 %			ΔFUEL = + 4.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7801 .00200 140 0300350 60 0 100100 40100 18590 FCOM-N0-02-05-40-008-175

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : M.78 - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF			ISA CG = 33.0 %		FUEL CONSUMED (KG)				
							TIME (H.MIN)		
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2700	16755 6.04	15926 6.07	15232 6.10	14694 6.13	14410 6.14	14418 6.14*	94	136	211
2725	16912 6.08	16076 6.10	15375 6.13	14833 6.16	14550 6.18	14558 6.17*	95	137	214
2750	17070 6.11	16225 6.14	15519 6.17	14973 6.20	14689 6.21	14698 6.20*	96	139	216
2775	17227 6.14	16375 6.17	15663 6.20	15113 6.23	14829 6.25	14838 6.24*	97	141	218
2800	17385 6.17	16525 6.20	15807 6.23	15254 6.26	14969 6.28	14979 6.27*	99	142	220
2825	17542 6.21	16675 6.24	15951 6.27	15395 6.30	15109 6.31	15119 6.31*	100	144	222
2850	17700 6.24	16825 6.27	16095 6.30	15535 6.33	15251 6.35	15260 6.34*	101	146	225
2875	17858 6.27	16975 6.30	16240 6.33	15677 6.36	15393 6.38	15402 6.37*	102	148	227
2900	18016 6.30	17125 6.33	16384 6.36	15818 6.40	15535 6.41	15543 6.41*	103	150	229
2925	18175 6.34	17275 6.37	16529 6.40	15960 6.43	15675 6.45*	15685 6.44*	104	151	231
2950	18333 6.37	17426 6.40	16674 6.43	16101 6.46	15820 6.48*	15827 6.47*	105	153	234
2975	18492 6.40	17577 6.43	16819 6.46	16243 6.50	15964 6.52*	15969 6.51*	106	155	236
3000	18650 6.43	17727 6.47	16964 6.50	16385 6.53	16109 6.55*	16112 6.54*	107	157	238
3025	18809 6.47	17878 6.50	17109 6.53	16528 6.56	16255 6.58*	16254 6.57*	108	159	240
3050	18968 6.50	18030 6.53	17255 6.56	16670 7.00	16400 7.01*	16397 7.01*	109	161	243
3075	19127 6.53	18181 6.56	17401 7.00	16813 7.03	16545 7.05*	16540 7.04*	110	162	245
3100	19286 6.56	18333 7.00	17546 7.03	16956 7.06	16691 7.08*	16683 7.07*	111	164	247
LOW AIR CONDITIONING ΔFUEL = -0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2 %			TOTAL ANTI ICE ON ΔFUEL = + 4.5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7800 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-007-180

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG) TIME (H.MIN)			
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
200	1599 0.39	1602 0.39	1605 0.39	1609 0.38			15	16	
225	1732 0.43	1731 0.43	1730 0.42	1731 0.42	1733 0.42		16	17	18
250	1865 0.47	1860 0.46	1855 0.46	1852 0.45	1852 0.45	1855 0.45	18	19	20
275	1998 0.51	1989 0.50	1980 0.49	1974 0.49	1971 0.49	1973 0.48	19	20	21
300	2132 0.54	2118 0.54	2105 0.53	2096 0.52	2090 0.52	2090 0.52	20	21	23
325	2265 0.58	2247 0.57	2231 0.56	2218 0.56	2209 0.55	2208 0.55	22	23	25
350	2399 1.02	2377 1.01	2357 1.00	2341 0.59	2329 0.59	2325 0.59	23	24	26
375	2532 1.06	2507 1.05	2483 1.04	2463 1.03	2448 1.02	2443 1.02	24	26	28
400	2666 1.09	2637 1.08	2609 1.07	2586 1.06	2568 1.06	2562 1.05	25	27	30
425	2801 1.13	2767 1.12	2735 1.11	2708 1.10	2688 1.09	2680 1.09	27	28	31
450	2935 1.17	2897 1.16	2861 1.14	2831 1.13	2808 1.12	2798 1.12	28	30	33
475	3069 1.21	3027 1.19	2988 1.18	2954 1.17	2928 1.16	2917 1.15	29	31	35
500	3204 1.24	3158 1.23	3114 1.21	3078 1.20	3048 1.19	3036 1.19	31	33	37
525	3339 1.28	3289 1.26	3241 1.25	3201 1.23	3169 1.22	3155 1.22	32	34	38
550	3474 1.32	3420 1.30	3368 1.28	3325 1.27	3290 1.26	3275 1.25	33	36	40
575	3609 1.36	3551 1.34	3496 1.32	3448 1.30	3411 1.29	3394 1.29	35	37	42
600	3744 1.39	3682 1.37	3623 1.35	3572 1.34	3532 1.32	3514 1.32	36	38	44
625	3880 1.43	3813 1.41	3750 1.39	3696 1.37	3653 1.36	3634 1.35	38	40	46
650	4016 1.47	3945 1.45	3878 1.42	3821 1.41	3774 1.39	3754 1.39	39	41	48
675	4152 1.50	4076 1.48	4006 1.46	3945 1.44	3896 1.43	3875 1.42	40	43	49
700	4288 1.54	4208 1.52	4134 1.49	4070 1.47	4018 1.46	3996 1.45	42	44	51
725	4424 1.58	4340 1.55	4262 1.53	4194 1.51	4140 1.49	4117 1.49	43	46	53
750	4561 2.02	4473 1.59	4391 1.56	4319 1.54	4262 1.53	4238 1.52	44	47	55
775	4697 2.05	4605 2.03	4520 2.00	4445 1.58	4385 1.56	4360 1.55	46	48	57
800	4834 2.09	4738 2.06	4648 2.03	4570 2.01	4507 1.59	4482 1.59	47	50	59
825	4971 2.13	4870 2.10	4777 2.07	4696 2.05	4630 2.03	4604 2.02	48	51	60
LOW AIR CONDITIONING ΔFUEL = -0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 2.5 %			TOTAL ANTI ICE ON ΔFUEL = + 5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7801 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-008-180

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF				TIME (H.MIN)					
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
200	1503 0.39	1501 0.39	1502 0.39	1504 0.38	1507 0.38		15	16	16
225	1629 0.43	1621 0.43	1618 0.42	1616 0.42	1617 0.42	1619 0.41	16	17	17
250	1754 0.47	1742 0.47	1734 0.46	1729 0.45	1726 0.45	1727 0.45	17	18	19
275	1880 0.51	1862 0.50	1851 0.50	1842 0.49	1836 0.48	1834 0.48	18	20	20
300	2006 0.54	1983 0.54	1968 0.53	1955 0.53	1946 0.52	1942 0.52	19	21	22
325	2132 0.58	2104 0.58	2085 0.57	2069 0.56	2057 0.55	2049 0.55	20	22	23
350	2258 1.02	2225 1.02	2202 1.01	2182 1.00	2167 0.99	2157 0.98	22	24	25
375	2384 1.06	2346 1.05	2319 1.04	2296 1.03	2278 1.02	2265 1.02	23	25	26
400	2511 1.10	2468 1.09	2436 1.08	2410 1.07	2389 1.06	2374 1.05	24	26	28
425	2638 1.13	2589 1.13	2554 1.12	2524 1.10	2500 1.09	2482 1.08	25	28	29
450	2764 1.17	2711 1.17	2672 1.15	2638 1.14	2611 1.13	2591 1.12	26	29	31
475	2891 1.21	2832 1.20	2790 1.19	2753 1.18	2722 1.16	2699 1.15	27	30	32
500	3018 1.25	2954 1.24	2908 1.23	2867 1.21	2833 1.20	2808 1.18	29	32	34
525	3145 1.29	3076 1.28	3026 1.26	2982 1.25	2945 1.23	2917 1.22	30	33	35
550	3273 1.32	3199 1.32	3144 1.30	3097 1.28	3057 1.27	3026 1.25	31	34	37
575	3400 1.36	3321 1.35	3263 1.34	3212 1.32	3168 1.30	3136 1.29	32	36	38
600	3528 1.40	3443 1.39	3381 1.37	3327 1.35	3280 1.33	3245 1.32	33	37	40
625	3655 1.44	3566 1.43	3500 1.41	3442 1.39	3393 1.37	3355 1.35	35	39	41
650	3783 1.47	3689 1.47	3619 1.45	3558 1.42	3505 1.40	3465 1.39	36	40	43
675	3911 1.51	3812 1.50	3738 1.48	3673 1.46	3617 1.44	3575 1.42	37	41	45
700	4039 1.55	3935 1.54	3857 1.52	3789 1.49	3730 1.47	3685 1.45	38	43	46
725	4167 1.59	4058 1.58	3977 1.56	3905 1.53	3843 1.51	3795 1.49	40	44	48
750	4296 2.02	4182 2.02	4096 1.59	4021 1.57	3956 1.54	3906 1.52	41	45	49
775	4424 2.06	4305 2.05	4216 2.03	4137 2.00	4069 1.57	4016 1.55	42	47	51
800	4553 2.10	4429 2.09	4336 2.06	4254 2.04	4182 2.01	4127 1.59	43	48	52
825	4682 2.14	4553 2.13	4456 2.10	4370 2.07	4295 2.04	4238 2.02	45	50	54
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 4 %			ΔFUEL = + 7 %			

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7800 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-NO-02-05-40-008-190

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
825	5490 2.10	5378 2.07	5273 2.05	5185 2.04	5141 2.03	5125 2.02	50	53	64
850	5641 2.13	5524 2.10	5414 2.08	5323 2.07	5277 2.06	5261 2.05	51	55	66
875	5791 2.17	5671 2.14	5556 2.11	5461 2.11	5413 2.09	5396 2.08	53	56	68
900	5943 2.21	5818 2.17	5698 2.15	5600 2.14	5550 2.13	5532 2.12	54	58	70
925	6094 2.24	5965 2.21	5841 2.18	5739 2.17	5687 2.16	5669 2.15	56	60	72
950	6246 2.28	6112 2.24	5983 2.22	5878 2.21	5824 2.19	5806 2.18	57	61	74
975	6397 2.31	6259 2.28	6126 2.25	6017 2.24	5962 2.23	5943 2.22	58	63	76
1000	6549 2.35	6407 2.31	6269 2.28	6156 2.28	6100 2.26	6080 2.25	60	64	78
1025	6701 2.39	6554 2.34	6412 2.32	6296 2.31	6238 2.29	6218 2.28	61	66	80
1050	6854 2.42	6702 2.38	6555 2.35	6436 2.34	6376 2.33	6356 2.32	63	67	82
1075	7006 2.46	6850 2.41	6699 2.39	6576 2.38	6514 2.36	6494 2.35	64	69	84
1100	7159 2.49	6999 2.45	6843 2.42	6716 2.41	6653 2.39	6632 2.38	66	70	86
1125	7312 2.53	7147 2.48	6987 2.45	6857 2.45	6792 2.43	6771 2.42	67	72	88
1150	7465 2.56	7296 2.52	7131 2.49	6998 2.48	6931 2.46	6910 2.45	69	74	90
1175	7619 3.00	7445 2.55	7275 2.52	7138 2.51	7070 2.49	7049 2.48	70	75	92
1200	7772 3.03	7594 2.58	7419 2.56	7280 2.55	7210 2.53	7189 2.52	71	77	94
1225	7926 3.07	7743 3.02	7564 2.59	7421 2.58	7350 2.56	7328 2.55	73	79	97
1250	8080 3.11	7893 3.05	7708 3.02	7563 3.02	7490 2.59	7468 2.58	74	80	99
1275	8234 3.14	8042 3.09	7853 3.06	7705 3.05	7630 3.03	7609 3.02	76	82	101
1300	8389 3.18	8192 3.12	7999 3.09	7847 3.08	7771 3.06	7751 3.05	77	84	103
1325	8544 3.21	8343 3.16	8144 3.13	7990 3.12	7912 3.09	7892 3.08	79	85	105
1350	8699 3.25	8493 3.19	8290 3.16	8132 3.15	8053 3.13	8035 3.11	80	87	107
1375	8854 3.28	8644 3.22	8436 3.19	8275 3.18	8194 3.16	8177 3.15	82	89	109
1400	9009 3.32	8795 3.26	8582 3.23	8419 3.22	8336 3.19	8320 3.18	83	90	111
1425	9165 3.35	8946 3.29	8728 3.26	8562 3.25	8478 3.23	8464 3.21	85	92	113
1450	9321 3.39	9097 3.33	8874 3.30	8706 3.29	8620 3.26	8607 3.25	86	94	115
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 3 %			ΔFUEL = + 4.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7801 .00200 140 0300350 60 0 100100 40100 18590 FCOM-NO-02-05-40-009-175

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
1450	9321 3.39	9097 3.33	8874 3.30	8706 3.29	8620 3.26	8607 3.25	86	94	115
1475	9477 3.42	9249 3.36	9021 3.33	8850 3.32	8763 3.29	8751 3.28	87	95	118
1500	9633 3.46	9400 3.39	9168 3.36	8994 3.35	8906 3.33	8896 3.31	89	97	120
1525	9790 3.49	9552 3.43	9315 3.40	9139 3.39	9049 3.36	9040 3.35	90	99	122
1550	9946 3.53	9704 3.46	9462 3.43	9283 3.42	9192 3.39	9185 3.38	92	101	124
1575	10103 3.56	9857 3.49	9610 3.47	9428 3.45	9335 3.43	9332 3.41*	93	102	126
1600	10260 4.00	10009 3.53	9758 3.50	9573 3.49	9479 3.46	9477 3.45*	95	104	128
1625	10418 4.03	10162 3.56	9906 3.53	9719 3.52	9623 3.49	9622 3.48*	96	106	130
1650	10576 4.06	10315 4.00	10054 3.57	9865 3.55	9768 3.53	9767 3.51*	98	108	133
1675	10734 4.10	10469 4.03	10202 4.00	10010 3.59	9912 3.56	9913 3.55*	99	109	135
1700	10892 4.13	10622 4.06	10351 4.04	10157 4.02	10057 3.59	10059 3.58*	101	111	137
1725	11050 4.17	10776 4.10	10499 4.07	10303 4.06	10202 4.03	10205 4.02*	102	113	139
1750	11209 4.20	10931 4.13	10649 4.10	10450 4.09	10347 4.06	10351 4.05*	104	115	141
1775	11368 4.24	11085 4.16	10798 4.14	10597 4.12	10493 4.09	10497 4.08*	105	117	144
1800	11527 4.27	11240 4.20	10948 4.17	10744 4.16	10639 4.13	10644 4.12*	107	118	146
1825	11687 4.31	11395 4.23	11098 4.20	10892 4.19	10786 4.16	10791 4.15*	108	120	148
1850	11846 4.34	11550 4.26	11248 4.24	11040 4.22	10933 4.19	10939 4.18*	110	122	150
1875	12006 4.38	11705 4.30	11398 4.27	11188 4.26	11080 4.23	11087 4.22*	111	124	153
1900	12166 4.41	11861 4.33	11549 4.30	11337 4.29	11227 4.26	11234 4.25*	113	126	155
1925	12326 4.44	12016 4.36	11699 4.34	11485 4.32	11375 4.29	11383 4.28*	114	128	157
1950	12487 4.48	12172 4.40	11850 4.37	11634 4.36	11523 4.33	11531 4.32*	116	129	159
1975	12647 4.51	12327 4.43	12001 4.41	11784 4.39	11671 4.36	11680 4.35*	117	131	162
2000	12808 4.55	12483 4.46	12153 4.44	11933 4.42	11819 4.39	11828 4.38*	119	133	164
2025	12969 4.58	12638 4.50	12304 4.47	12083 4.46	11968 4.43	11978 4.42*	121	135	166
2050	13131 5.01	12794 4.53	12456 4.51	12233 4.49	12117 4.46	12127 4.45*	122	137	169
2075	13292 5.05	12950 4.57	12608 4.54	12383 4.52	12267 4.49	12276 4.48*	124	139	171
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 3 %			ΔFUEL = + 4.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7801 .00200 140 0300350 60 0 100100 40100 18590 FCOM-N0-02-05-40-010-175

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
825	4971 2.13	4870 2.10	4777 2.07	4696 2.05	4630 2.03	4604 2.02	48	51	60
850	5108 2.16	5003 2.13	4907 2.10	4821 2.08	4753 2.06	4726 2.05	50	53	62
875	5246 2.20	5137 2.17	5036 2.14	4947 2.11	4876 2.09	4849 2.09	51	54	64
900	5383 2.24	5270 2.21	5166 2.17	5073 2.15	5000 2.13	4971 2.12	53	56	66
925	5521 2.27	5403 2.24	5295 2.21	5200 2.18	5123 2.16	5094 2.15	54	57	68
950	5659 2.31	5537 2.28	5425 2.24	5326 2.22	5247 2.20	5218 2.19	55	59	70
975	5797 2.35	5671 2.31	5555 2.28	5453 2.25	5371 2.23	5341 2.22	57	60	72
1000	5936 2.38	5805 2.35	5686 2.31	5580 2.28	5495 2.26	5465 2.25	58	62	74
1025	6074 2.42	5939 2.38	5816 2.35	5707 2.32	5620 2.30	5589 2.29	60	63	75
1050	6213 2.46	6073 2.42	5947 2.38	5834 2.35	5744 2.33	5713 2.32	61	65	77
1075	6352 2.49	6207 2.46	6077 2.42	5961 2.39	5869 2.36	5837 2.35	62	66	79
1100	6491 2.53	6342 2.49	6208 2.45	6089 2.42	5994 2.40	5962 2.39	64	67	81
1125	6630 2.57	6477 2.53	6340 2.49	6217 2.45	6119 2.43	6087 2.42	65	69	83
1150	6770 3.00	6612 2.56	6471 2.52	6345 2.49	6244 2.46	6212 2.45	67	70	85
1175	6910 3.04	6747 3.00	6603 2.56	6473 2.52	6370 2.50	6337 2.49	68	72	87
1200	7049 3.08	6883 3.03	6734 2.59	6601 2.55	6495 2.53	6463 2.52	69	73	89
1225	7190 3.11	7018 3.07	6866 3.02	6729 2.59	6621 2.56	6589 2.55	71	75	91
1250	7330 3.15	7154 3.10	6999 3.06	6858 3.02	6747 3.00	6715 2.59	72	76	93
1275	7470 3.18	7290 3.14	7131 3.09	6987 3.06	6874 3.03	6841 3.02	74	78	95
1300	7611 3.22	7426 3.18	7264 3.13	7116 3.09	7000 3.06	6968 3.05	75	79	97
1325	7752 3.26	7562 3.21	7396 3.16	7246 3.12	7127 3.10	7095 3.09	77	81	99
1350	7893 3.29	7699 3.25	7529 3.20	7375 3.16	7254 3.13	7223 3.12	78	83	101
1375	8035 3.33	7836 3.28	7663 3.23	7505 3.19	7381 3.16	7350 3.15	80	84	103
1400	8176 3.37	7973 3.32	7796 3.26	7635 3.22	7509 3.20	7478 3.19	81	86	105
1425	8318 3.40	8110 3.35	7930 3.30	7765 3.26	7637 3.23	7606 3.22	82	87	107
1450	8460 3.44	8247 3.39	8063 3.33	7896 3.29	7764 3.26	7735 3.25	84	89	109
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2.5 %			ΔFUEL = + 5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7801 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-009-180

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
1450	8460 3.44	8247 3.39	8063 3.33	7896 3.29	7764 3.26	7735 3.25	84	89	109
1475	8602 3.47	8384 3.42	8197 3.37	8026 3.32	7892 3.30	7863 3.29	85	90	111
1500	8744 3.51	8522 3.46	8332 3.40	8157 3.36	8021 3.33	7990 3.32*	87	92	113
1525	8887 3.55	8660 3.49	8466 3.43	8288 3.39	8149 3.36	8121 3.35*	88	93	115
1550	9029 3.58	8798 3.53	8600 3.47	8419 3.42	8278 3.40	8251 3.39*	90	95	117
1575	9172 4.02	8936 3.56	8735 3.50	8550 3.46	8407 3.43	8400 3.42*	91	96	119
1600	9315 4.05	9075 4.00	8870 3.54	8682 3.49	8536 3.46	8513 3.45*	93	98	121
1625	9458 4.09	9213 4.03	9005 3.57	8813 3.52	8665 3.50	8644 3.49*	94	100	123
1650	9601 4.12	9352 4.07	9141 4.00	8945 3.56	8795 3.53	8775 3.52*	96	101	125
1675	9745 4.16	9491 4.10	9276 4.04	9078 3.59	8924 3.56	8907 3.55*	97	103	127
1700	9888 4.20	9630 4.14	9411 4.07	9210 4.02	9054 3.59	9039 3.59*	99	104	129
1725	10032 4.23	9770 4.17	9546 4.11	9342 4.06	9185 4.03	9170 4.02*	100	106	131
1750	10176 4.27	9910 4.21	9682 4.14	9474 4.09	9315 4.06	9303 4.05*	102	108	133
1775	10321 4.30	10050 4.24	9818 4.17	9607 4.12	9446 4.09	9435 4.09*	103	109	135
1800	10465 4.34	10190 4.27	9954 4.21	9740 4.16	9577 4.13	9567 4.12*	105	111	138
1825	10610 4.37	10330 4.31	10090 4.24	9873 4.19	9708 4.16	9700 4.15*	106	113	140
1850	10755 4.41	10470 4.34	10226 4.28	10006 4.22	9840 4.19	9833 4.19*	108	114	142
1875	10900 4.45	10611 4.38	10363 4.31	10140 4.26	9972 4.23	9966 4.22*	109	116	144
1900	11045 4.48	10752 4.41	10500 4.34	10273 4.29	10105 4.26	10100 4.26*	111	118	146
1925	11191 4.52	10893 4.45	10637 4.38	10407 4.32	10237 4.29	10233 4.29*	112	119	148
1950	11337 4.55	11034 4.48	10774 4.41	10541 4.36	10370 4.33	10367 4.32*	114	121	151
1975	11483 4.59	11176 4.52	10911 4.45	10675 4.39	10503 4.36	10501 4.36*	115	123	153
2000	11629 5.02	11318 4.55	11049 4.48	10810 4.42	10636 4.39	10635 4.39*	117	124	155
2025	11775 5.06	11460 4.58	11187 4.51	10944 4.46	10769 4.43	10769 4.42*	118	126	157
2050	11922 5.09	11602 5.02	11325 4.55	11079 4.49	10903 4.46	10904 4.46*	120	128	159
2075	12068 5.13	11744 5.05	11463 4.58	11214 4.52	11037 4.49	11039 4.49*	121	129	162
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2.5 %			ΔFUEL = + 5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7801 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-010-180

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
1450	7943 3.48	7706 3.45	7509 3.39	7336 3.34	7185 3.29	7074 3.25	77	86	96
1475	8075 3.51	7835 3.48	7634 3.43	7456 3.37	7302 3.32	7190 3.29	78	87	97
1500	8208 3.55	7963 3.52	7758 3.46	7577 3.41	7420 3.36	7306 3.32	79	89	99
1525	8340 3.59	8092 3.56	7883 3.50	7698 3.44	7538 3.39	7422 3.35	81	90	101
1550	8473 4.03	8221 3.59	8007 3.53	7820 3.48	7657 3.42	7539 3.39	82	92	103
1575	8606 4.06	8350 4.03	8132 3.57	7941 3.51	7775 3.46	7656 3.42	83	93	104
1600	8739 4.10	8479 4.06	8257 4.00	8062 3.55	7894 3.49	7773 3.45	85	94	106
1625	8872 4.14	8609 4.10	8383 4.04	8184 3.58	8013 3.52	7890 3.49	86	96	108
1650	9005 4.18	8738 4.14	8508 4.07	8306 4.01	8131 3.56	8007 3.52	88	97	110
1675	9139 4.21	8868 4.17	8634 4.11	8428 4.05	8251 3.59	8124 3.55	89	99	112
1700	9272 4.25	8998 4.21	8760 4.14	8551 4.08	8370 4.02	8242 3.59	90	100	114
1725	9406 4.29	9129 4.24	8886 4.18	8673 4.12	8490 4.06	8361 4.02	92	102	115
1750	9539 4.33	9259 4.28	9012 4.21	8796 4.15	8610 4.09	8479 4.05	93	103	117
1775	9673 4.36	9389 4.32	9138 4.25	8919 4.18	8730 4.12	8597 4.09	95	105	119
1800	9808 4.40	9520 4.35	9265 4.28	9042 4.22	8850 4.16	8716 4.12	96	106	121
1825	9942 4.44	9651 4.39	9392 4.32	9165 4.25	8970 4.19	8835 4.15	97	108	123
1850	10076 4.48	9782 4.42	9519 4.35	9288 4.29	9091 4.22	8954 4.19	99	109	125
1875	10211 4.51	9914 4.46	9646 4.39	9412 4.32	9211 4.26	9074 4.22	100	111	127
1900	10345 4.55	10045 4.50	9773 4.42	9536 4.35	9332 4.29	9193 4.25	102	112	129
1925	10480 4.59	10177 4.53	9900 4.46	9659 4.39	9453 4.32	9313 4.29	103	114	131
1950	10615 5.03	10309 4.57	10028 4.49	9784 4.42	9575 4.36	9433 4.32	105	116	132
1975	10750 5.06	10441 5.00	10156 4.53	9908 4.46	9696 4.39	9553 4.35	106	117	134
2000	10885 5.10	10573 5.04	10284 4.56	10032 4.49	9818 4.42	9673 4.39	108	119	136
2025	11021 5.14	10706 5.07	10412 4.59	10157 4.52	9940 4.46	9794 4.42	109	120	138
2050	11158 5.17	10838 5.11	10540 5.03	10282 4.56	10062 4.49	9915 4.45	111	122	140
2075	11295 5.21	10971 5.14	10669 5.06	10407 4.59	10184 4.52	10036 4.49	112	123	142
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 4 %			ΔFUEL = + 7 %			

FLIP23D A319-112 CFM56-5B6/P SA3420 03301.000011 250300 .7801 .00200 110 0300350 50 0 100100 30 30 18590 FCOM-NO-02-05-40-010-190

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT IMC PROCEDURE : 140 KG (6MIN)										
REF. LANDING WEIGHT = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)				
AIR DIST. (NM)		FLIGHT LEVEL					TIME (H.MIN)			
							CORRECTION ON FUEL CONSUMPTION (KG/1000KG)			
		290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075		13292 5.05	12950 4.57	12608 4.54	12383 4.52	12267 4.49	12276 4.48*	124	139	171
2100		13454 5.08	13107 5.00	12760 4.57	12533 4.56	12416 4.53	12426 4.52*	125	141	173
2125		13616 5.12	13263 5.03	12912 5.01	12684 4.59	12566 4.56	12576 4.55*	127	143	175
2150		13779 5.15	13420 5.07	13065 5.04	12834 5.02	12716 4.59	12727 4.58*	128	145	178
2175		13941 5.18	13577 5.10	13218 5.08	12985 5.06	12866 5.03	12877 5.02*	130	147	180
2200		14104 5.22	13734 5.13	13371 5.11	13136 5.09	13017 5.06	13028 5.05*	131	149	182
2225		14267 5.25	13892 5.17	13525 5.14	13288 5.12	13168 5.09	13180 5.08*	133	151	185
2250		14430 5.28	14049 5.20	13678 5.18	13440 5.16	13320 5.13	13331 5.12*	135	153	187
2275		14594 5.32	14207 5.23	13832 5.21	13592 5.19	13472 5.16	13483 5.15*	136	155	189
2300		14758 5.35	14365 5.27	13986 5.24	13744 5.22	13624 5.19	13635 5.18*	138	156	191
2325		14922 5.38	14523 5.30	14141 5.28	13897 5.26	13776 5.22	13787 5.22*	139	158	194
2350		15086 5.42	14682 5.34	14295 5.31	14050 5.29	13929 5.26	13940 5.25*	141	160	196
2375		15251 5.45	14841 5.37	14450 5.34	14203 5.32	14082 5.29	14093 5.28*	142	162	198
2400		15415 5.49	15000 5.40	14605 5.38	14356 5.36	14235 5.32	14246 5.32*	144	164	201
2425		15580 5.52	15159 5.44	14760 5.41	14510 5.39	14389 5.36	14399 5.35*	146	166	203
2450		15746 5.55	15318 5.47	14916 5.44	14664 5.42	14543 5.39	14553 5.38*	147	169	205
2475		15911 5.58	15478 5.50	15071 5.48	14818 5.45	14697 5.42	14707 5.42*	149	171	208
2500		16077 6.02	15637 5.54	15227 5.51	14972 5.49	14851 5.46	14861 5.45*	150	173	210
2525		16244 6.05	15798 5.57	15384 5.55	15127 5.52	15006 5.49	15016 5.48*	152	175	212
2550		16410 6.08	15958 6.00	15540 5.58	15282 5.55	15161 5.52	15170 5.52*	154	177	215
2575		16577 6.12	16119 6.04	15697 6.01	15437 5.59	15317 5.56	15325 5.55*	155	179	217
2600		16743 6.15	16279 6.07	15854 6.05	15593 6.02	15472 5.59	15481 5.58*	157	181	219
2625		16911 6.18	16440 6.10	16011 6.08	15749 6.05	15629 6.02	15636 6.02*	158	183	221
2650		17078 6.22	16602 6.14	16169 6.11	15905 6.09	15786 6.05	15792 6.05*	160	185	223
2675		17245 6.25	16763 6.17	16327 6.15	16062 6.12	15943 6.09	15949 6.08*	161	187	226
2700		17412 6.28	16925 6.20	16485 6.18	16219 6.15	16100 6.12	16105 6.12*	163	189	228
ECON AIR CONDITIONING				ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %				ΔFUEL = + 3 %			ΔFUEL = + 4.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7801 .00200 140 0300350 60 0 100100 40100 18590 FCOM-NO-02-05-40-011-175

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 140 KG (6MIN)									
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2700	17412 6.28	16925 6.20	16485 6.18	16219 6.15	16100 6.12	16105 6.12*	163	189	228
2725	17580 6.32	17087 6.24	16643 6.21	16376 6.18	16258 6.15	16262 6.15*	165	192	230
2750	17747 6.35	17249 6.27	16802 6.25	16534 6.22	16416 6.19	16419 6.18*	166	194	232
2775	17915 6.38	17412 6.30	16960 6.28	16691 6.25	16574 6.22	16577 6.22*	168	196	235
2800	18083 6.42	17574 6.34	17119 6.31	16849 6.28	16733 6.25	16735 6.25*	169	198	237
2825	18251 6.45	17737 6.37	17279 6.35	17008 6.32	16892 6.29	16893 6.28*	171	200	239
2850	18420 6.48	17901 6.40	17438 6.38	17166 6.35	17051 6.32	17051 6.31*	173	202	242
2875	18589 6.51	18064 6.44	17599 6.41	17325 6.38	17211 6.35	17210 6.35*	174	205	244
2900	18758 6.55	18228 6.47	17760 6.45	17484 6.41	17371 6.38	17369 6.38*	176	207	246
2925	18927 6.58	18392 6.50	17921 6.48	17644 6.45	17531 6.42	17528 6.41*	177	209	249
2950	19097 7.01	18557 6.54	18082 6.51	17803 6.48	17698 6.45*	17687 6.45*	179	211	251
2975	19267 7.05	18721 6.57	18244 6.55	17963 6.51	17859 6.48*	17847 6.48*	181	214	253
3000	19437 7.08	18886 7.00	18406 6.58	18124 6.55	18020 6.52*	18007 6.51*	182	216	256
3025	19607 7.11	19051 7.04	18568 7.01	18284 6.58	18181 6.55*	18168 6.55*	184	218	258
3050	19778 7.14	19217 7.07	18731 7.05	18445 7.01	18343 6.58*	18329 6.58*	186	220	260
3075	19949 7.18	19382 7.10	18894 7.08	18607 7.04	18505 7.02*	18490 7.01*	187	223	263
3100	20120 7.21	19548 7.14	19057 7.11	18768 7.08	18667 7.05*	18652 7.05*	189	225	267
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 3 %			ΔFUEL = + 4.5 %			

FLIP23D A321-211 CFM56-5B3/P SA3420 03301.000011 0250300 .7801 .00200 140 0300350 60 0 100100 40100 18590 FCDM-N0-02-05-40-012-175

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075	12068 5.13	11744 5.05	11463 4.58	11214 4.52	11037 4.49	11039 4.49*	121	129	162
2100	12215 5.16	11887 5.09	11601 5.01	11349 4.56	11171 4.53	11174 4.52*	123	131	164
2125	12363 5.20	12029 5.12	11739 5.05	11485 4.59	11306 4.56	11309 4.56*	124	133	166
2150	12510 5.23	12172 5.16	11878 5.08	11620 5.02	11440 4.59	11444 4.59*	126	134	168
2175	12658 5.27	12315 5.19	12017 5.11	11756 5.06	11575 5.03	11579 5.02*	127	136	170
2200	12806 5.30	12459 5.22	12156 5.15	11892 5.09	11710 5.06	11715 5.06*	129	138	173
2225	12954 5.34	12603 5.26	12295 5.18	12028 5.12	11846 5.09	11851 5.09*	130	139	175
2250	13102 5.37	12746 5.29	12435 5.22	12165 5.16	11981 5.13	11987 5.12*	132	141	177
2275	13251 5.41	12891 5.33	12575 5.25	12301 5.19	12117 5.16	12124 5.16*	134	143	179
2300	13400 5.44	13035 5.36	12715 5.28	12438 5.22	12253 5.19	12260 5.19*	135	145	181
2325	13549 5.48	13179 5.39	12855 5.32	12576 5.25	12390 5.23	12397 5.22*	137	146	184
2350	13698 5.51	13324 5.43	12996 5.35	12713 5.29	12527 5.26	12534 5.26*	138	148	186
2375	13848 5.55	13469 5.46	13136 5.38	12851 5.32	12664 5.29	12672 5.29*	140	150	188
2400	13997 5.58	13614 5.50	13277 5.42	12989 5.35	12801 5.33	12809 5.32*	141	152	190
2425	14147 6.02	13760 5.53	13418 5.45	13127 5.39	12939 5.36	12947 5.36*	143	153	193
2450	14297 6.05	13906 5.56	13559 5.48	13265 5.42	13077 5.39	13085 5.39*	144	155	195
2475	14448 6.09	14051 6.00	13701 5.52	13404 5.45	13215 5.43	13223 5.42*	146	157	197
2500	14598 6.12	14197 6.03	13842 5.55	13542 5.49	13354 5.46	13362 5.45*	148	159	199
2525	14748 6.16	14344 6.06	13984 5.58	13681 5.52	13492 5.49	13500 5.49*	149	161	201
2550	14898 6.19	14490 6.10	14126 6.02	13820 5.55	13631 5.53	13639 5.52*	151	162	204
2575	15048 6.22	14637 6.13	14269 6.05	13960 5.58	13770 5.56	13778 5.55*	152	164	206
2600	15199 6.26	14784 6.17	14411 6.08	14099 6.02	13910 5.59	13917 5.59*	154	166	208
2625	15350 6.29	14931 6.20	14554 6.11	14239 6.05	14050 6.03	14057 6.02*	156	168	211
2650	15501 6.33	15078 6.23	14697 6.15	14379 6.08	14190 6.06	14197 6.05*	157	170	213
2675	15652 6.36	15225 6.27	14840 6.18	14519 6.11	14330 6.09	14337 6.09*	159	171	215
2700	15804 6.40	15373 6.30	14984 6.21	14660 6.15	14471 6.13	14477 6.12*	160	173	217
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2.5 %			ΔFUEL = + 5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300 .7801 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-011-180

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 120 KG (6MIN)									
REF. LANDING WEIGHT = 55000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %		TIME (H.MIN)			
ANTI-ICING OFF									
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
							(KG/1000KG)		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2700	15804 6.40	15373 6.30	14984 6.21	14660 6.15	14471 6.13	14477 6.12*	160	173	217
2725	15955 6.43	15521 6.33	15127 6.25	14801 6.18	14612 6.16	14618 6.15*	162	175	220
2750	16107 6.47	15669 6.37	15272 6.28	14941 6.21	14753 6.19	14758 6.19*	164	177	222
2775	16260 6.50	15818 6.40	15416 6.31	15082 6.25	14894 6.23	14899 6.22*	165	179	224
2800	16412 6.53	15966 6.43	15561 6.35	15224 6.28	15036 6.26	15041 6.25*	167	181	226
2825	16564 6.57	16115 6.47	15706 6.38	15366 6.31	15178 6.29	15182 6.29*	169	183	229
2850	16717 7.00	16264 6.50	15851 6.41	15508 6.34	15321 6.33	15324 6.32*	170	184	231
2875	16870 7.04	16413 6.53	15996 6.44	15650 6.38	15470 6.36*	15466 6.35*	172	186	233
2900	17023 7.07	16563 6.57	16142 6.48	15792 6.41	15614 6.39*	15609 6.39*	174	188	235
2925	17177 7.10	16713 7.00	16288 6.51	15935 6.44	15758 6.43*	15751 6.42*	175	190	238
2950	17330 7.14	16863 7.03	16434 6.54	16078 6.48	15903 6.46*	15894 6.45*	177	192	240
2975	17484 7.17	17013 7.07	16580 6.57	16221 6.51	16048 6.49*	16037 6.49*	179	194	242
3000	17638 7.21	17163 7.10	16726 7.01	16364 6.54	16193 6.53*	16181 6.52*	180	196	245
3025	17792 7.24	17314 7.13	16873 7.04	16508 6.58	16338 6.56*	16324 6.55*	182	198	247
3050	17947 7.27	17465 7.16	17020 7.07	16652 7.01	16483 6.59*	16468 6.59*	184	200	249
3075	18102 7.31	17616 7.20	17167 7.10	16796 7.04	16629 7.03*	16612 7.02*	185	202	252
3100	18257 7.34	17767 7.23	17315 7.14	16940 7.07	16775 7.06*	16756 7.05*	187	204	254
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = -0.5 %			ΔFUEL = + 2.5 %			ΔFUEL = + 5 %			

FLIP23D A320-214 CFM56-5B4/P SA3420 03301.000011 0250300.7801 .00200 120 0300350 55 0 100100 40100 18590 FCOM-02-05-40-012-180

A318/A319/A320/A321 AEROFLOT <i>Russian Airlines</i> FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.40	P 11
	QUICK DETERMINATION OF F-PLN		SEQ 190	REV 23

R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF				TIME (H.MIN)					
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2075	11295 5.21	10971 5.14	10669 5.06	10407 4.59	10184 4.52	10036 4.49	112	123	142
2100	11432 5.25	11104 5.18	10797 5.10	10532 5.02	10306 4.55	10157 4.52	113	125	144
2125	11569 5.28	11236 5.22	10926 5.13	10657 5.06	10429 4.59	10279 4.55	115	126	146
2150	11706 5.32	11369 5.25	11055 5.17	10783 5.09	10552 5.02	10400 4.58	116	128	148
2175	11844 5.36	11502 5.29	11185 5.20	10908 5.12	10675 5.05	10522 5.02	118	130	150
2200	11981 5.39	11636 5.32	11314 5.24	11034 5.16	10798 5.09	10644 5.05	119	131	152
2225	12119 5.43	11769 5.36	11444 5.27	11160 5.19	10921 5.12	10767 5.08	121	133	154
2250	12257 5.47	11903 5.39	11574 5.30	11287 5.22	11045 5.15	10889 5.12	123	134	156
2275	12396 5.50	12037 5.43	11704 5.34	11413 5.26	11169 5.18	11012 5.15	124	136	158
2300	12534 5.54	12170 5.46	11834 5.37	11539 5.29	11293 5.22	11135 5.18	126	137	160
2325	12673 5.57	12305 5.50	11964 5.41	11666 5.33	11417 5.25	11259 5.22	127	139	162
2350	12811 6.01	12439 5.53	12095 5.44	11793 5.36	11541 5.28	11383 5.25	129	141	164
2375	12950 6.05	12573 5.57	12226 5.47	11920 5.39	11665 5.32	11507 5.28	130	142	166
2400	13090 6.08	12708 6.00	12357 5.51	12047 5.43	11790 5.35	11631 5.32	132	144	168
2425	13229 6.12	12843 6.04	12488 5.54	12174 5.46	11914 5.38	11756 5.35	133	145	170
2450	13369 6.16	12978 6.07	12619 5.58	12302 5.49	12039 5.42	11881 5.38	135	147	172
2475	13508 6.19	13113 6.11	12751 6.01	12430 5.53	12164 5.45	12006 5.42	136	149	175
2500	13648 6.23	13249 6.14	12882 6.04	12558 5.56	12289 5.48	12131 5.45	138	150	177
2525	13788 6.26	13384 6.18	13014 6.08	12686 5.59	12415 5.52	12257 5.48	139	152	179
2550	13929 6.30	13520 6.21	13147 6.11	12814 6.03	12540 5.55	12382 5.52	141	154	181
2575	14069 6.33	13656 6.25	13279 6.15	12943 6.06	12666 5.58	12508 5.55	142	155	183
2600	14210 6.37	13792 6.28	13411 6.18	13071 6.09	12792 6.02	12635 5.58	144	157	185
2625	14351 6.41	13929 6.32	13544 6.21	13200 6.13	12918 6.05	12761 6.02	145	158	187
2650	14492 6.44	14065 6.35	13677 6.25	13329 6.16	13045 6.08	12888 6.05	147	160	189
2675	14634 6.48	14202 6.39	13810 6.28	13459 6.19	13171 6.12	13015 6.08	148	162	191
2700	14775 6.51	14339 6.42	13944 6.32	13588 6.22	13298 6.15	13142 6.12	150	163	194
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 4 %			ΔFUEL = + 7 %			

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R

FLIGHT PLANNING FROM BRAKE RELEASE TO LANDING									
CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE - DESCENT : M.78/300KT/250KT									
IMC PROCEDURE : 110 KG (6MIN)									
REF. LANDING WEIGHT = 50000 KG				ISA		FUEL CONSUMED (KG)			
NORMAL AIR CONDITIONING				CG = 33.0 %					
ANTI-ICING OFF				TIME (H.MIN)					
AIR							CORRECTION ON		
DIST.	FLIGHT LEVEL						FUEL CONSUMPTION		
(NM)	290	310	330	350	370	390	FL290 FL310	FL330 FL350	FL370 FL390
2700	14775 6.51	14339 6.42	13944 6.32	13588 6.22	13298 6.15	13142 6.12	150	163	194
2725	14917 6.55	14477 6.46	14077 6.35	13718 6.26	13425 6.18	13270 6.15	151	165	196
2750	15059 6.59	14614 6.49	14211 6.38	13848 6.29	13552 6.22	13398 6.18	153	166	198
2775	15201 7.02	14752 6.52	14345 6.42	13978 6.32	13680 6.25	13526 6.22	155	168	200
2800	15344 7.06	14889 6.56	14479 6.45	14108 6.36	13807 6.28	13654 6.25	156	170	202
2825	15486 7.09	15028 6.59	14614 6.48	14238 6.39	13935 6.31	13784 6.29*	158	171	204
2850	15629 7.13	15166 7.03	14749 6.52	14369 6.42	14063 6.35	13914 6.32*	159	173	207
2875	15772 7.16	15304 7.06	14884 6.55	14500 6.46	14191 6.38	14044 6.35*	161	175	209
2900	15915 7.20	15443 7.10	15019 6.58	14632 6.49	14320 6.41	14174 6.39*	163	176	211
2925	16059 7.23	15582 7.13	15154 7.02	14763 6.52	14449 6.45	14305 6.42*	164	178	213
2950	16202 7.27	15721 7.17	15290 7.05	14895 6.55	14578 6.48	14435 6.45*	166	180	216
2975	16346 7.31	15860 7.20	15425 7.08	15026 6.59	14707 6.51	14566 6.49*	168	181	218
3000	16490 7.34	15999 7.23	15561 7.12	15158 7.02	14837 6.55	14697 6.52*	169	183	220
3025	16635 7.38	16139 7.27	15698 7.15	15291 7.05	14967 6.58	14828 6.55*	171	184	222
3050	16779 7.41	16279 7.30	15834 7.18	15423 7.08	15096 7.01	14960 6.59*	172	186	225
3075	16924 7.45	16419 7.34	15971 7.22	15556 7.12	15227 7.04	15091 7.02*	174	188	227
3100	17069 7.48	16559 7.37	16107 7.25	15689 7.15	15357 7.08	15223 7.05*	176	190	229
LOW AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON			
ΔFUEL = - 0.5 %			ΔFUEL = + 4 %			ΔFUEL = + 7 %			

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GENERAL

The alternate planning tables allow the flight crew to determine the fuel consumption and time required to cover a given air distance from go-around at destination airport to landing at alternate airport.

These tables are established for :

- Go-around : 100 kg or 220 lb
- Climb profile : 250kt/300kt/M.78
- Long Range Speed
- Descent profile : M.78/300kt/250kt
- Approach and landing at alternate airport : 80 kg or 180 lb (4 minutes)
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

Note : 1. In the tables, the asterisk () means that a step climb of 4000 feet must be flown to reach the corresponding flight level.*

2. The flight level shown on the top of each column is the final flight level.

*3. For each degree Celsius above ISA temperature apply a fuel correction of
 0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM)
 or 0.033 (lb/°C/NM) × ΔISA (°C) × Air Distance (NM)*

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The alternate planning tables are based on a reference landing weight at alternate.

The fuel consumption must be corrected when the actual weight is different from the reference weight.

If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 80 KG (4MIN)									
REF. LDG. WT AT ALTERNATE = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)			
							TIME (H.MIN)		
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	120	140	160	180	200	FL100 FL120	FL140 FL160	FL180 FL200
20									
40	522 0.12						2		
60	676 0.16	659 0.16	660 0.16				3	4	
80	831 0.19	807 0.20	802 0.20	801 0.19	805 0.19		5	5	5
100	986 0.23	955 0.23	943 0.23	937 0.23	934 0.23	937 0.22	6	5	6
120	1140 0.27	1103 0.27	1085 0.27	1072 0.26	1064 0.26	1061 0.26	7	6	7
140	1296 0.31	1251 0.31	1227 0.30	1208 0.30	1193 0.30	1185 0.29	8	7	8
160	1451 0.34	1400 0.34	1369 0.34	1344 0.33	1323 0.33	1309 0.33	9	8	9
180	1606 0.38	1548 0.38	1511 0.37	1480 0.37	1452 0.36	1434 0.36	10	9	10
200	1762 0.42	1697 0.42	1653 0.41	1616 0.40	1582 0.40	1559 0.40	11	10	11
220	1918 0.46	1846 0.45	1796 0.44	1752 0.44	1712 0.43	1684 0.43	12	11	12
240	2074 0.49	1995 0.49	1938 0.48	1889 0.47	1842 0.47	1809 0.46	13	12	12
260	2231 0.53	2144 0.53	2081 0.51	2025 0.51	1972 0.50	1934 0.50	14	13	13
280	2387 0.57	2294 0.56	2224 0.55	2162 0.54	2103 0.54	2059 0.53	15	14	14
300	2544 1.00	2443 1.00	2367 0.59	2299 0.57	2233 0.57	2184 0.57	16	15	15
320	2701 1.04	2593 1.04	2510 1.02	2436 1.01	2364 1.01	2310 1.00	17	16	16
340	2858 1.08	2743 1.07	2653 1.06	2573 1.04	2494 1.04	2435 1.04	18	16	17
360	3014 1.12	2893 1.11	2796 1.09	2710 1.08	2625 1.08	2561 1.07	19	17	18
380	3171 1.15	3043 1.14	2940 1.13	2847 1.11	2756 1.11	2687 1.11	20	18	19
400	3329 1.19	3193 1.18	3084 1.16	2984 1.15	2886 1.15	2813 1.14	21	19	20
420	3486 1.23	3343 1.22	3227 1.20	3122 1.18	3018 1.18	2939 1.17	22	20	21
440	3643 1.26	3494 1.25	3371 1.23	3259 1.22	3149 1.22	3065 1.21	23	21	22
460	3801 1.30	3644 1.29	3515 1.27	3397 1.25	3280 1.25	3192 1.24	24	22	23
480	3959 1.34	3795 1.32	3659 1.30	3534 1.28	3412 1.29	3318 1.28	25	23	24
500	4117 1.37	3946 1.36	3803 1.34	3672 1.32	3543 1.32	3445 1.31	26	24	25
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %			TOTAL ANTI ICE ON ΔFUEL = + 6.5 %			

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GENERAL

The alternate planning tables allow the flight crew to determine the fuel consumption and time required to cover a given air distance from go-around at destination airport to landing at alternate airport.

These tables are established for :

- Go-around : 120 kg or 270 lb
- Climb profile : 250kt/300kt/M.78
- Long Range Speed
- Descent profile : M.78/300kt/250kt
- Approach and landing at alternate airport : 100 kg or 220 lb (4 minutes)
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

Note : 1. In the tables, the asterisk () means that a step climb of 4000 feet must be flown to reach the corresponding flight level.*

2. The flight level shown on the top of each column is the final flight level.

*3. For each degree Celsius above ISA temperature apply a fuel correction of
 0.015 (kg/°C/NM) × ΔISA (°C) × Air Distance (NM)
 or 0.033 (lb/°C/NM) × ΔISA (°C) × Air Distance (NM)*

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The alternate planning tables are based on a reference landing weight at alternate.

The fuel consumption must be corrected when the actual weight is different from the reference weight.

If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT GO-AROUND : 120 KG – CLIMB : 250KT/300KT/M.78 – CRUISE : LONG RANGE DESCENT : M.78/300KT/250KT – VMC PROCEDURE : 100 KG (4MIN)									
REF. LDG. WT AT ALTERNATE = 60000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)			
							TIME (H.MIN)		
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	100	120	140	160	180	200	FL100 FL120	FL140 FL160	FL180 FL200
20									
40	580 0.12						2		
60	751 0.15	729 0.16	730 0.16				3	4	
80	922 0.19	892 0.20	885 0.19	884 0.19	888 0.19		4	5	5
100	1093 0.22	1055 0.23	1040 0.23	1032 0.23	1030 0.22	1032 0.22	5	5	6
120	1264 0.26	1218 0.27	1196 0.27	1181 0.26	1173 0.26	1169 0.25	6	6	7
140	1436 0.30	1381 0.30	1351 0.30	1329 0.30	1316 0.29	1307 0.29	6	7	8
160	1607 0.33	1544 0.34	1507 0.34	1478 0.33	1460 0.33	1444 0.32	7	8	9
180	1779 0.37	1708 0.37	1663 0.37	1627 0.37	1603 0.36	1582 0.35	8	9	10
200	1951 0.40	1871 0.41	1819 0.41	1776 0.40	1747 0.39	1720 0.39	9	10	11
220	2123 0.44	2035 0.44	1975 0.44	1926 0.44	1890 0.43	1858 0.42	10	11	12
240	2295 0.47	2199 0.48	2131 0.48	2075 0.47	2034 0.46	1996 0.45	10	12	13
260	2467 0.51	2363 0.51	2287 0.51	2225 0.51	2178 0.50	2134 0.49	11	13	14
280	2639 0.55	2527 0.55	2443 0.55	2375 0.54	2322 0.53	2273 0.52	12	14	15
300	2812 0.58	2691 0.59	2600 0.58	2524 0.58	2467 0.56	2411 0.55	13	15	16
320	2985 1.02	2856 1.02	2757 1.02	2675 1.01	2611 1.00	2550 0.58	14	16	17
340	3157 1.05	3020 1.06	2914 1.06	2825 1.05	2756 1.03	2688 1.02	14	17	18
360	3330 1.09	3185 1.09	3071 1.09	2975 1.08	2900 1.06	2827 1.05	15	18	19
380	3503 1.12	3350 1.13	3228 1.13	3126 1.12	3045 1.10	2966 1.08	16	18	20
400	3677 1.16	3515 1.16	3385 1.16	3277 1.15	3190 1.13	3106 1.12	17	19	21
420	3850 1.19	3680 1.20	3542 1.20	3427 1.19	3335 1.16	3245 1.15	18	20	22
440	4023 1.23	3845 1.23	3700 1.23	3579 1.22	3481 1.20	3384 1.18	18	21	23
460	4197 1.26	4010 1.27	3857 1.27	3730 1.26	3626 1.23	3524 1.21	19	22	24
480	4371 1.30	4176 1.30	4015 1.30	3881 1.29	3772 1.26	3664 1.25	20	23	25
500	4545 1.33	4341 1.34	4173 1.34	4033 1.33	3918 1.29	3803 1.28	21	24	26
ECON AIR CONDITIONING ΔFUEL = - 0.6 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %			TOTAL ANTI ICE ON ΔFUEL = + 5 %			

FLIP23D A321-211 CFM56-5B3/P SA3520 03301.000010 100250300 .7801.00200 1000300300 60 0 10010040100 18590 FCOM-N0-02-05-50-002-175

GENERAL

The alternate planning tables allow the flight crew to determine the fuel consumption and time required to cover a given air distance from go-around at destination airport to landing at alternate airport.

These tables are established for :

- Go-around : 80 kg or 180 lb
- Climb profile : 250kt/300kt/M.78
- Long Range Speed
- Descent profile : M.78/300kt/250kt
- Approach and landing at alternate airport : 60 kg or 140 lb (4 minutes)
- ISA
- CG = 33 %
- Normal air conditioning
- Anti ice OFF

Note : 1. In the tables, the asterisk (*) means that a step climb of 4000 feet must be flown to reach the corresponding flight level.

2. The flight level shown on the top of each column is the final flight level.

3. For each degree Celsius above ISA temperature apply a fuel correction of
 $0.015 \text{ (kg/}^{\circ}\text{C/NM)} \times \Delta\text{ISA (}^{\circ}\text{C)} \times \text{Air Distance (NM)}$
 or $0.033 \text{ (lb/}^{\circ}\text{C/NM)} \times \Delta\text{ISA (}^{\circ}\text{C)} \times \text{Air Distance (NM)}$

CORRECTION FOR DEVIATION FROM REFERENCE WEIGHT

The alternate planning tables are based on a reference landing weight at alternate.

The fuel consumption must be corrected when the actual weight is different from the reference weight.

If it is lower (or greater) than the reference weight, subtract (or add) the value given in the correction part of the table per 1000 kg or 1000 lb below (or above) the reference weight.

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 60 KG (4MIN)										
REF. LDG. WT AT ALTERNATE = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)				
AIR DIST. (NM)		FLIGHT LEVEL					TIME (H.MIN)			
		100	120	140	160	180	200	FL100 FL120	FL140 FL160	FL180 FL200
20										
40		471 0.12						2		
60		618 0.17	602 0.16	603 0.16	608 0.16			4	3	
80		765 0.21	745 0.20	740 0.20	738 0.19	740 0.19	745 0.19	5	4	5
100		913 0.25	887 0.24	877 0.23	868 0.23	864 0.23	864 0.22	6	5	6
120		1061 0.30	1030 0.28	1014 0.27	999 0.27	989 0.26	983 0.26	7	6	6
140		1209 0.34	1172 0.32	1151 0.31	1130 0.30	1114 0.30	1102 0.29	9	7	7
160		1358 0.38	1315 0.36	1288 0.34	1260 0.34	1238 0.33	1221 0.33	10	8	8
180		1506 0.43	1458 0.40	1425 0.38	1391 0.37	1363 0.36	1340 0.36	11	9	9
200		1655 0.47	1602 0.44	1562 0.42	1522 0.41	1489 0.40	1459 0.40	13	10	10
220		1804 0.51	1745 0.48	1700 0.46	1653 0.44	1614 0.43	1579 0.43	14	11	11
240		1953 0.55	1889 0.52	1837 0.49	1785 0.48	1739 0.47	1698 0.47	15	12	12
260		2103 1.00	2033 0.56	1975 0.53	1916 0.52	1865 0.50	1818 0.50	16	13	13
280		2252 1.04	2177 1.00	2113 0.57	2048 0.55	1990 0.54	1938 0.53	18	14	14
300		2402 1.08	2321 1.04	2251 1.00	2179 0.59	2116 0.57	2057 0.57	19	15	15
320		2552 1.13	2466 1.07	2389 1.04	2311 1.02	2242 1.01	2177 1.00	20	16	15
340		2702 1.17	2611 1.11	2528 1.08	2443 1.06	2368 1.04	2297 1.04	21	17	16
360		2853 1.21	2755 1.15	2666 1.11	2575 1.09	2494 1.08	2417 1.07	23	18	17
380		3004 1.25	2901 1.19	2805 1.15	2708 1.13	2620 1.11	2537 1.11	24	19	18
400		3155 1.30	3046 1.22	2943 1.18	2840 1.16	2746 1.15	2657 1.14	25	20	19
420		3306 1.34	3191 1.26	3082 1.22	2972 1.20	2873 1.18	2778 1.18	26	21	20
440		3457 1.38	3337 1.30	3221 1.26	3105 1.23	2999 1.22	2898 1.21	28	22	21
460		3608 1.42	3483 1.33	3360 1.29	3238 1.27	3126 1.25	3019 1.25	29	23	22
480		3760 1.47	3629 1.37	3500 1.33	3370 1.30	3253 1.28	3139 1.28	30	24	23
500		3912 1.51	3775 1.41	3639 1.37	3503 1.34	3379 1.32	3260 1.32	31	25	23
LOW AIR CONDITIONING ΔFUEL = - 0.5 %				ENGINE ANTI ICE ON ΔFUEL = + 4 %			TOTAL ANTI ICE ON ΔFUEL = + 7 %			

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R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT								
GO-AROUND : 120 KG – CLIMB : 250KT/300KT/M.78 – CRUISE : LONG RANGE								
DESCENT : M.78/300KT/250KT – VMC PROCEDURE : 100 KG (4MIN)								
REF. LANDING WEIGHT = 60000 KG				ISA		FUEL CONSUMED (KG)		
NORMAL AIR CONDITIONING				CG = 33.0 %				
ANTI-ICING OFF						TIME (H.MIN)		
AIR						CORRECTION ON		
DIST.	FLIGHT LEVEL					FUEL CONSUMPTION		
(NM)	230	270	310	350	390	FL230 FL270	FL310 FL350	FL390 99
100	1042 0.22					6		
120	1172 0.25					8		
140	1301 0.28	1310 0.28				9		
160	1431 0.31	1431 0.31	1449 0.30			10	11	
180	1561 0.34	1551 0.34	1561 0.33			11	12	
200	1691 0.38	1672 0.37	1673 0.36	1684 0.35		12	13	
220	1821 0.41	1792 0.40	1786 0.39	1790 0.38		13	15	
240	1952 0.44	1913 0.43	1899 0.41	1896 0.41		14	16	
260	2082 0.47	2034 0.46	2012 0.44	2002 0.44	2012 0.43	15	17	17
280	2213 0.50	2155 0.49	2125 0.47	2109 0.46	2116 0.46	16	18	19
300	2344 0.53	2276 0.51	2238 0.50	2215 0.49	2219 0.49	17	19	21
320	2475 0.56	2397 0.54	2351 0.53	2322 0.52	2323 0.51	18	20	23
340	2606 0.59	2519 0.57	2464 0.56	2429 0.55	2427 0.54	19	21	24
360	2737 1.03	2640 1.00	2578 0.59	2536 0.57	2531 0.57	20	23	26
380	2868 1.06	2762 1.03	2691 1.01	2643 1.00	2636 0.59	21	24	27
400	2999 1.09	2884 1.06	2805 1.04	2750 1.03	2740 1.02	22	25	29
420	3131 1.12	3005 1.09	2919 1.07	2857 1.05	2845 1.05	23	26	30
440	3263 1.15	3127 1.12	3033 1.10	2965 1.08	2949 1.07	24	27	32
460	3395 1.18	3249 1.15	3147 1.13	3072 1.11	3054 1.10	25	28	34
480	3527 1.21	3372 1.18	3261 1.15	3180 1.14	3160 1.13	26	29	35
500	3659 1.24	3494 1.21	3376 1.18	3288 1.16	3265 1.15	27	31	37
ECON AIR CONDITIONING			ENGINE ANTI ICE ON			TOTAL ANTI ICE ON		
ΔFUEL = - 0.6 %			ΔFUEL = + 3 %			ΔFUEL = + 5 %		

FLIP23D A321-111 CFM56-5B3/P SA3520 03301.000010 100250300 .7801.00200 1000300300 60 0 10010040100 18590 FCOM-N0-02-05-50-003-175

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 80 KG (4MIN)								
REF. LANDING WEIGHT = 55000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF				ISA CG = 33.0 %		FUEL CONSUMED (KG)		
AIR		FLIGHT LEVEL				CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
DIST.	TIME (H.MIN)							
(NM)	230	270	310	350	390	FL230 FL270	FL310 FL350	FL390
100								0
120	1065 0.25					7		0
140	1183 0.29	1193 0.28				9		0
160	1301 0.32	1303 0.31	1319 0.30			10	10	0
180	1419 0.35	1413 0.34	1422 0.33			11	12	0
200	1538 0.38	1523 0.37	1524 0.36	1531 0.35		12	13	0
220	1656 0.42	1633 0.40	1627 0.39	1628 0.38		13	14	0
240	1775 0.45	1744 0.43	1730 0.42	1724 0.41		14	15	0
260	1893 0.48	1854 0.46	1832 0.45	1822 0.44	1822 0.43	15	16	17
280	2012 0.52	1965 0.49	1935 0.48	1919 0.46	1915 0.46	16	17	18
300	2131 0.55	2076 0.52	2038 0.51	2016 0.49	2009 0.49	17	18	20
320	2250 0.58	2186 0.55	2142 0.54	2113 0.52	2103 0.51	18	19	21
340	2369 1.02	2297 0.58	2245 0.56	2211 0.55	2196 0.54	19	21	23
360	2489 1.05	2408 1.01	2348 0.59	2308 0.58	2290 0.57	20	22	24
380	2608 1.08	2519 1.04	2452 1.02	2406 1.00	2385 0.59	21	23	26
400	2728 1.12	2630 1.07	2555 1.05	2504 1.03	2479 1.02	22	24	27
420	2847 1.15	2742 1.10	2659 1.08	2602 1.06	2573 1.05	23	25	27
440	2967 1.18	2853 1.13	2763 1.11	2700 1.09	2668 1.07	24	26	28
460	3087 1.21	2965 1.16	2867 1.14	2798 1.11	2762 1.10	25	27	30
480	3207 1.25	3076 1.19	2971 1.17	2896 1.14	2857 1.13	26	28	31
500	3327 1.28	3188 1.22	3075 1.20	2994 1.17	2952 1.16	27	29	32
LOW AIR CONDITIONING ΔFUEL = - 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 3 %			TOTAL ANTI ICE ON ΔFUEL = + 5 %		

FLIP23D A320-214 CFM56-5B4/P SA3520 03301.000010 100250300 .7801 .00200 80 0300300 55 0 100100 40100 18590 FCOM-02-05-50-003-180

R

ALTERNATE PLANNING FROM DESTINATION TO ALTERNATE AIRPORT GO-AROUND : 100 KG - CLIMB : 250KT/300KT/M.78 - CRUISE : LONG RANGE DESCENT : M.78/300KT/250KT - VMC PROCEDURE : 60 KG (4MIN)									
REF. LDG. WT AT ALTERNATE = 50000 KG NORMAL AIR CONDITIONING ANTI-ICING OFF					ISA CG = 33.0 %		FUEL CONSUMED (KG)		
AIR DIST. (NM)	FLIGHT LEVEL						CORRECTION ON FUEL CONSUMPTION (KG/1000KG)		
	230	250	270	290	310	330	FL230 FL250	FL270 FL290	FL310 FL330
100	871 0.22						6		
120	983 0.25	988 0.25	997 0.24				7	8	
140	1095 0.29	1096 0.28	1100 0.28	1109 0.27			8	9	
160	1207 0.32	1203 0.31	1204 0.31	1209 0.30	1215 0.30	1221 0.30	9	10	10
180	1319 0.35	1311 0.35	1308 0.34	1309 0.33	1310 0.33	1314 0.33	10	11	11
200	1431 0.39	1419 0.38	1412 0.37	1409 0.36	1406 0.36	1406 0.36	11	12	12
220	1543 0.42	1527 0.41	1516 0.40	1509 0.39	1502 0.39	1499 0.39	12	13	13
240	1655 0.46	1635 0.45	1620 0.43	1609 0.42	1598 0.42	1592 0.42	13	14	14
260	1768 0.49	1743 0.48	1724 0.47	1709 0.45	1694 0.45	1685 0.44	14	15	15
280	1880 0.52	1852 0.51	1829 0.50	1810 0.49	1791 0.48	1778 0.47	15	15	16
300	1993 0.56	1960 0.54	1933 0.53	1910 0.52	1887 0.51	1871 0.50	16	16	17
320	2106 0.59	2069 0.58	2038 0.56	2011 0.55	1983 0.54	1964 0.53	17	17	18
340	2219 1.02	2178 1.01	2143 0.59	2111 0.58	2080 0.57	2058 0.56	18	18	19
360	2332 1.06	2286 1.04	2247 1.02	2212 1.01	2176 1.00	2151 0.59	19	19	20
380	2445 1.09	2395 1.07	2352 1.05	2313 1.04	2273 1.03	2245 1.02	20	20	21
400	2558 1.13	2504 1.11	2457 1.08	2414 1.07	2370 1.06	2338 1.05	21	21	22
420	2671 1.16	2614 1.14	2563 1.11	2515 1.10	2467 1.09	2432 1.08	22	22	23
440	2785 1.19	2723 1.17	2668 1.15	2616 1.13	2564 1.12	2526 1.11	23	23	24
460	2899 1.23	2832 1.20	2773 1.18	2717 1.16	2661 1.15	2620 1.14	24	24	26
480	3012 1.26	2942 1.24	2879 1.21	2818 1.19	2758 1.18	2714 1.17	25	25	27
500	3126 1.29	3051 1.27	2984 1.24	2920 1.22	2855 1.21	2808 1.20	27	26	28
LOW AIR CONDITIONING ΔFUEL = − 0.5 %			ENGINE ANTI ICE ON ΔFUEL = + 4 %			TOTAL ANTI ICE ON Δ FUEL = + 7 %			

FLIP23D A319-112 CFM56-5B6/P SA3520 03301.000010 8025300 .7801 .00200 60 0300300 50 0 100100 30 30 18590 FCOM-NO-02-05-50-003-190

GENERAL

- R The ground distance/air distance conversion tables show the air distance for a given ground distance due to the influence of the wind.
The tables are given for:
- M.78
 - Long range speed.

M.78

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	10	11	13	15
20	15	16	18	20	23	26	30
30	22	25	27	30	34	39	45
40	30	33	36	40	45	51	60
50	37	41	45	50	56	64	75
100	75	82	90	100	113	129	150
200	150	164	180	200	225	257	300
300	225	245	270	300	338	386	450
400	300	327	360	400	450	514	600
500	375	409	450	500	563	643	750
1000	750	818	900	1000	1125	1286	1501
1500	1125	1227	1350	1500	1688	1929	2251
2000	1500	1636	1800	2000	2248	2572	3001
2500	1875	2045	2250	2500	2813	3215	3752
3000	2250	2454	2700	3000	3375	3858	4502
3500	2624	2863	3150	3500	3938	4501	5252
4000	2999	3272	3600	4000	4500	5144	6003
4500	3374	3681	4050	4500	5063	5787	6753
5000	3749	4090	4500	5000	5626	6430	7503

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7800 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-NO-03-50-002-001

R **LONG RANGE SPEED UP TO FL270**

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	10	11	13	16
20	15	16	18	20	23	27	32
30	22	24	27	30	34	40	48
40	29	32	36	40	46	53	64
50	36	40	45	50	57	66	79
100	73	80	89	100	114	133	159
200	146	160	178	200	228	266	318
300	219	241	267	300	342	398	477
400	292	321	356	400	456	531	635
500	365	401	445	500	570	664	794
1000	730	802	890	1000	1141	1328	1589
1500	1094	1203	1335	1500	1711	1992	2383
2000	1459	1604	1780	2000	2282	2656	3177
2500	1824	2005	2225	2500	2852	3320	3971
3000	2189	2406	2670	3000	3423	3984	4766
3500	2554	2807	3115	3500	3993	4648	5560
4000	2919	3208	3560	4000	4564	5312	6354
4500	3283	3609	4005	4500	5134	5976	7149
5000	3648	4010	4450	5000	5705	6640	7943

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-NO-03-50-003-001

LONG RANGE SPEED ABOVE FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	8	8	9	10	11	13	15
20	15	16	18	20	22	26	30
30	23	25	27	30	34	38	45
40	30	33	36	40	45	51	60
50	38	41	45	50	56	64	75
100	75	82	90	100	112	128	149
200	150	164	180	200	225	256	299
300	226	246	270	300	337	385	448
400	301	328	360	400	449	513	597
500	376	410	450	500	562	641	746
1000	752	820	901	1000	1124	1282	1493
1500	1128	1230	1351	1500	1685	1923	2239
2000	1504	1639	1802	2000	2247	2564	2985
2500	1880	2049	2252	2500	2809	3205	3731
3000	2256	2459	2703	3000	3371	3846	4478
3500	2632	2869	3153	3500	3933	4487	5224
4000	3008	3279	3604	4000	4494	5128	5970
4500	3383	3689	4054	4500	5056	5769	6716
5000	3759	4098	4505	5000	5618	6410	7463

FLIP23 A320211 M565A1PIP 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 77 64 43 61 18590 FCOM-NO-03-50-004-001

LONG RANGE SPEED UP TO FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	10	11	13	16
20	15	16	18	20	23	27	32
30	22	24	27	30	34	40	48
40	29	32	36	40	46	53	64
50	36	40	44	50	57	67	80
100	73	80	89	100	114	133	159
200	146	160	178	200	228	266	319
300	219	240	267	300	343	399	478
400	291	320	356	400	457	532	638
500	364	400	445	500	571	665	797
1000	728	801	889	1000	1142	1331	1595
1500	1093	1201	1334	1500	1713	1996	2392
2000	1457	1602	1779	2000	2284	2662	3189
2500	1821	2002	2224	2500	2855	3327	3987
3000	2185	2403	2668	3000	3426	3992	4784
3500	2549	2803	3113	3500	3997	4658	5581
4000	2914	3204	3558	4000	4568	5323	6378
4500	3278	3604	4003	4500	5139	5989	7176
5000	3642	4005	4447	5000	5710	6654	7973

FLIP23 A320-131 IAE V2530-A5 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 83 73 50 69 18590 FCOM-NO-03-50-003-200

LONG RANGE SPEED ABOVE FL270

R

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)				HEAD WIND
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	8	8	9	10	11	13	15
20	15	16	18	20	22	26	30
30	23	25	27	30	34	38	45
40	30	33	36	40	45	51	60
50	38	41	45	50	56	64	75
100	75	82	90	100	112	128	149
200	150	164	180	200	225	256	298
300	226	246	270	300	337	384	447
400	301	328	360	400	449	512	596
500	376	410	451	500	562	641	745
1000	752	820	901	1000	1123	1281	1491
1500	1129	1230	1352	1500	1685	1922	2236
2000	1505	1640	1802	2000	2246	2562	2981
2500	1881	2050	2253	2500	2808	3203	3727
3000	2257	2460	2703	3000	3370	3843	4472
3500	2633	2870	3154	3500	3931	4484	5217
4000	3009	3280	3604	4000	4493	5125	5963
4500	3386	3690	4055	4500	5055	5765	6708
5000	3762	4100	4506	5000	5616	6406	7454

FLIP23 A320-131 IAE V2530-A5 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 83 73 50 69 18590 FCOM-NO-03-50-004-200

LONG RANGE SPEED UP TO FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	– 50	– 100	– 150
10	7	8	9	10	12	14	17
20	14	16	18	20	23	27	34
30	21	24	26	30	35	41	51
40	28	31	35	40	46	55	68
50	36	39	44	50	58	69	84
100	71	79	88	100	116	137	169
200	142	157	176	200	232	275	338
300	213	236	264	300	347	412	507
400	284	314	352	400	463	550	676
500	355	393	440	500	579	687	845
1000	710	786	880	1000	1158	1374	1690
1500	1065	1179	1320	1500	1736	2061	2535
2000	1420	1572	1760	2000	2315	2748	3380
2500	1775	1965	2201	2500	2894	3435	4225
3000	2130	2358	2641	3000	3473	4122	5070
3500	2485	2751	3081	3500	4051	4809	5915
4000	2840	3144	3521	4000	4630	5496	6760
4500	3195	3537	3961	4500	5209	6183	7605
5000	3550	3930	4401	5000	5788	6870	8450

FLIP23 A319-114 CFM56-5A5 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 70 61 40 57 18590 FCOM-NO-03-50-003-210

LONG RANGE SPEED ABOVE FL270

GROUND DIST. (NM)	AIR DISTANCE (NM)						
	TAIL WIND		WIND COMPONENTS (KT)			HEAD WIND	
	+ 150	+ 100	+ 50	0	− 50	− 100	− 150
10	7	8	9	10	11	13	15
20	15	16	18	20	23	26	30
30	22	25	27	30	34	39	45
40	30	33	36	40	45	51	60
50	37	41	45	50	56	64	75
100	75	82	90	100	113	129	150
200	150	164	180	200	225	257	300
300	225	245	270	300	338	386	450
400	300	327	360	400	450	514	600
500	375	409	450	500	563	643	750
1000	750	818	900	1000	1125	1286	1500
1500	1125	1227	1350	1500	1688	1929	2251
2000	1500	1636	1800	2000	2250	2572	3001
2500	1875	2045	2250	2500	2813	3215	3751
3000	2250	2454	2700	3000	3375	3858	4501
3500	2625	2863	3150	3500	3938	4501	5252
4000	3000	3272	3600	4000	4500	5144	6002
4500	3375	3681	4050	4500	5063	5787	6752
5000	3749	4090	4500	5000	5625	6430	7502

FLIP23 A319-114 CFM56-5A5 3410 03301.000011 0250300 .7801 .00000 0 0300350 0 0 70 61 40 57 18590 FCOM-NO-03-50-004-210

FUEL TANKERING

GENERAL

Fuel tankering graphs allow to determine the optimum fuel quantity to be tankered as a function of the fuel price ratio between departure and destination airports. The following pages present for one flight level per page the optimum aircraft takeoff weight depending on the fuel price ratio (departure fuel price divided by destination fuel price) and on the air distance to fly.

The computed optimum takeoff weight is based on the additional fuel consumption needed for the transport of the extra (tankered) fuel and it is the weight at which the maximum profit can be achieved. The quantity of extra fuel that can be loaded is calculated as the difference between the optimum takeoff weight (including extra fuel) and the planned takeoff weight (without fuel tankering).

The graphs are established for :

- FL290, 310, 330, 350, 370, 390
- Air distances from 250 to 2500 NM
- Flight profile :

- R Climb : 250KT/300KT/M.78
- Cruise : M.78
- R Descent : M.78/300KT/250KT

Note : 1. If necessary, step climbs are performed to reach the indicated flight levels.

2. The crew/operator has to verify that the found aircraft weight complies with basic aircraft limitations (e.g. max fuel capacity) as well as with mission dependent restrictions (e.g. MLW at destination).

EXAMPLES

R **1. Fuel price ratio = 0.950**

Cruising Altitude = FL310

Planned TOW = 70 000 kg (mission weight without fuel tankering)

R Air Distance = 1500 NM

Enter graph on page 2.05.70 P.4.

For the given air distance, the optimum fuel tankering weight is 62 000 kg, which is lower than the planned takeoff weight → no fuel tankering recommended.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.70	P 2
	FUEL TANKERING		SEQ 015	REV 22

2. Fuel price ratio = 0.926

Cruising Altitude = FL350

Planned TOW = 60 000 kg (mission weight without fuel tankering)

Air Distance = 1625 NM

Enter graph on page 2.05.70 P6.

For the given air distance, the optimum fuel tankering weight is 66 000 kg, which is 6000 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 6000 kg.

Check :

- R a) new TOW less than or equal to MTOW from departure airport ;
- b) total fuel to be loaded less than or equal to maximum fuel capacity ;
- c) MLW at destination

3. Fuel price ratio = 0.914

Cruising Altitude = FL390

Planned TOW = 60 000 kg (mission weight without fuel tankering)

Air Distance = 1125 NM

Enter graph on page 2.05.70 P8.

Interpolate for the air distance of 1125 NM between the borderline and 1250 NM.

For the given air distance, the optimum fuel tankering weight is 68 000 kg, which is 8000 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 8000 kg.

Check :

- R a) new TOW less than or equal to MTOW from departure airport ;
- R b) total fuel to be loaded less than or equal to maximum fuel capacity ;
- c) MLW at destination

FUEL TANKERING

GENERAL

Fuel tankering graphs allow to determine the optimum fuel quantity to be tankered as a function of the fuel price ratio between departure and destination airports. The following pages present for one flight level per page the optimum aircraft takeoff weight depending on the fuel price ratio (departure fuel price divided by destination fuel price) and on the air distance to fly.

The computed optimum takeoff weight is based on the additional fuel consumption needed for the transport of the extra (tankered) fuel and it is the weight at which the maximum profit can be achieved. The quantity of extra fuel that can be loaded is calculated as the difference between the optimum takeoff weight (including extra fuel) and the planned takeoff weight (without fuel tankering).

The graphs are established for :

- FL290, 310, 330, 350, 370, 390
- Air distances from 250 to 2500 NM
- Flight profile :

- R Climb : 250KT/300KT/M.78
- Cruise : M.78
- R Descent : M.78/300KT/250KT

Note : 1. If necessary, step climbs are performed to reach the indicated flight levels.

2. The crew/operator has to verify that the found aircraft weight complies with basic aircraft limitations (e.g. max fuel capacity) as well as with mission dependent restrictions (e.g. MLW at destination).

EXAMPLES

R **1. Fuel price ratio = 0.942**

Cruising Altitude = FL310

Planned TOW = 64 000 kg (mission weight without fuel tankering)

R Air Distance = 2250 NM

Enter graph on page 2.05.70 P.4.

For the given air distance, the optimum fuel tankering weight is 60 000 kg, which is lower than the planned takeoff weight → no fuel tankering recommended.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.70	P 2
	FUEL TANKERING		SEQ 030	REV 22

2. Fuel price ratio = 0.914

Cruising Altitude = FL350

Planned TOW = 62 000 kg (mission weight without fuel tankering)

Air Distance = 1500 NM

Enter graph on page 2.05.70 P6.

For the given air distance, the optimum fuel tankering weight is 70 000 kg, which is 8000 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 8000 kg.

Check :

- R a) new TOW less than or equal to MTOW from departure airport ;
b) total fuel to be loaded less than or equal to maximum fuel capacity ;
c) MLW at destination

3. Fuel price ratio = 0.902

Cruising Altitude = FL390

Planned TOW = 56 000 kg (mission weight without fuel tankering)

Air Distance = 1375 NM

Enter graph on page 2.05.70 P8.

Interpolate for the air distance of 1375 NM between the borderline and 1500 NM.

For the given air distance, the optimum fuel tankering weight is 60 000 kg, which is 4000 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 4000 kg.

Check :

- R a) new TOW less than or equal to MTOW from departure airport ;
R b) total fuel to be loaded less than or equal to maximum fuel capacity ;
c) MLW at destination

FUEL TANKERING

GENERAL

Fuel tankering graphs allow to determine the optimum fuel quantity to be tankered as a function of the fuel price ratio between departure and destination airports. The following pages present for one flight level per page the optimum aircraft takeoff weight depending on the fuel price ratio (departure fuel price divided by destination fuel price) and on the air distance to fly.

The computed optimum takeoff weight is based on the additional fuel consumption needed for the transport of the extra (tankered) fuel and it is the weight at which the maximum profit can be achieved. The quantity of extra fuel that can be loaded is calculated as the difference between the optimum takeoff weight (including extra fuel) and the planned takeoff weight (without fuel tankering).

The graphs are established for :

- FL290, 310, 330, 350, 370, 390
- Air distances from 250 to 2500 NM
- Flight profile :
 - Climb : 250KT/300KT/M.78
 - Cruise : M.78
 - Descent : M.78/300KT/250KT

Note : 1. If necessary, step climbs are performed to reach the indicated flight levels.

2. The crew/operator has to verify that the found aircraft weight complies with basic aircraft limitations (e.g. max fuel capacity) as well as with mission dependent restrictions (e.g. MLW at destination).

EXAMPLES

1. Fuel price ratio = 0.944

Cruising Altitude = FL310

Planned TOW = 68 000 kg (mission weight without fuel tankering)

Air Distance = 1750 NM

Enter graph on page 2.05.70 P.4.

For the given air distance, the optimum fuel tankering weight is 64 000 kg, which is lower than the planned takeoff weight → no fuel tankering recommended.

A318/A319/A320/A321 AEROFLOT Russian Airlines FLIGHT CREW OPERATING MANUAL	FLIGHT PLANNING		2.05.70	P 2
	FUEL TANKERING		SEQ 033	REV 33

2. Fuel price ratio = 0.930

Cruising Altitude = FL350

Planned TOW = 60 000 kg (mission weight without fuel tankering)

Air Distance = 1250 NM

Enter graph on page 2.05.70 P6.

For the given air distance, the optimum fuel tankering weight is 69 000 kg, which is 9000 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 9000 kg.

Check :

- a) new TOW less than or equal to MTOW from departure airport ;
- b) total fuel to be loaded less than or equal to maximum fuel capacity ;
- c) MLW at destination

3. Fuel price ratio = 0.902

Cruising Altitude = FL390

Planned TOW = 60 000 kg (mission weight without fuel tankering)

Air Distance = 1375 NM

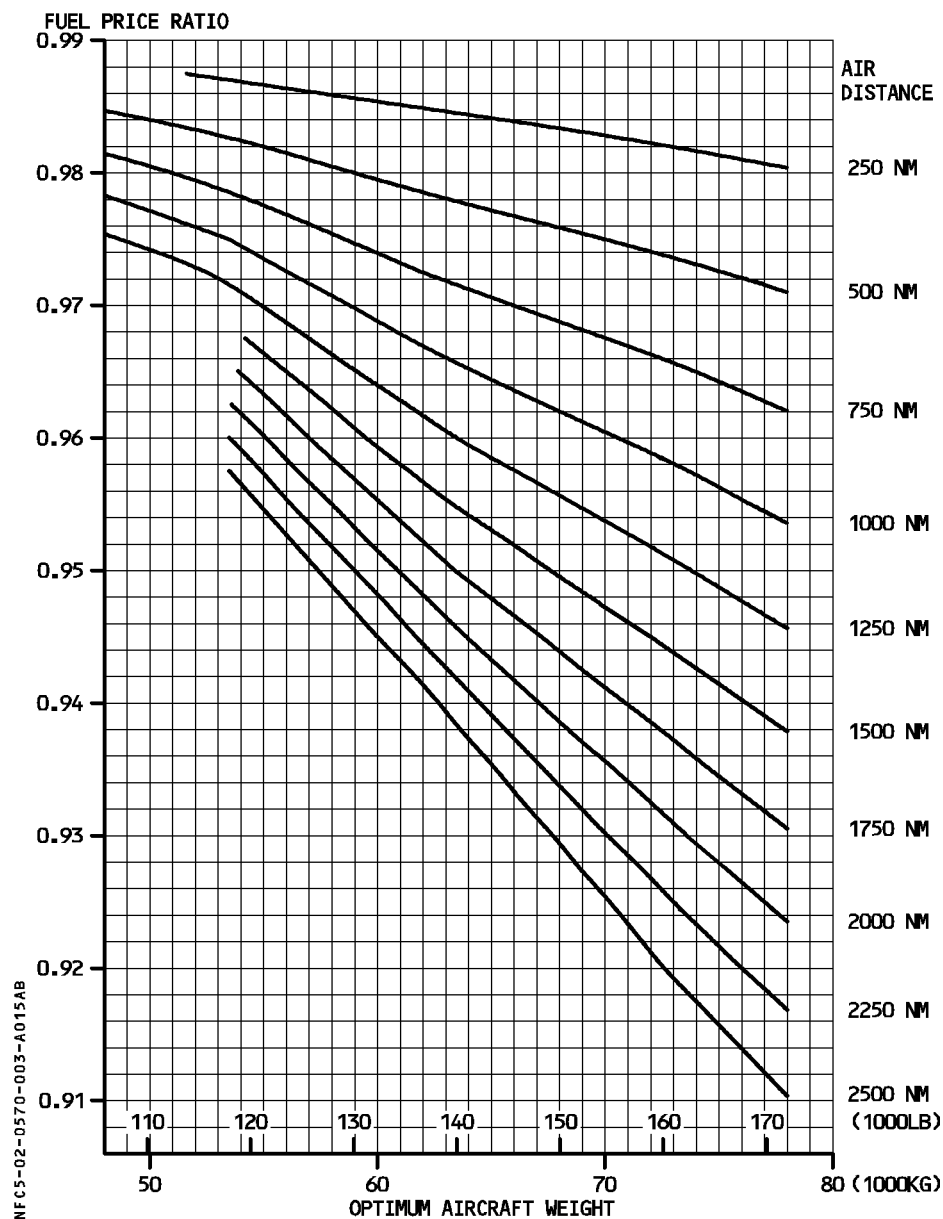
Enter graph on page 2.05.70 P8.

Interpolate for the air distance of 1375 NM between the 1250 NM and 1 500 NM. For the given air distance, the optimum fuel tankering weight is 63 500 kg, which is 3500 kg higher than the planned takeoff weight → optimum quantity of extra fuel is 3500 kg.

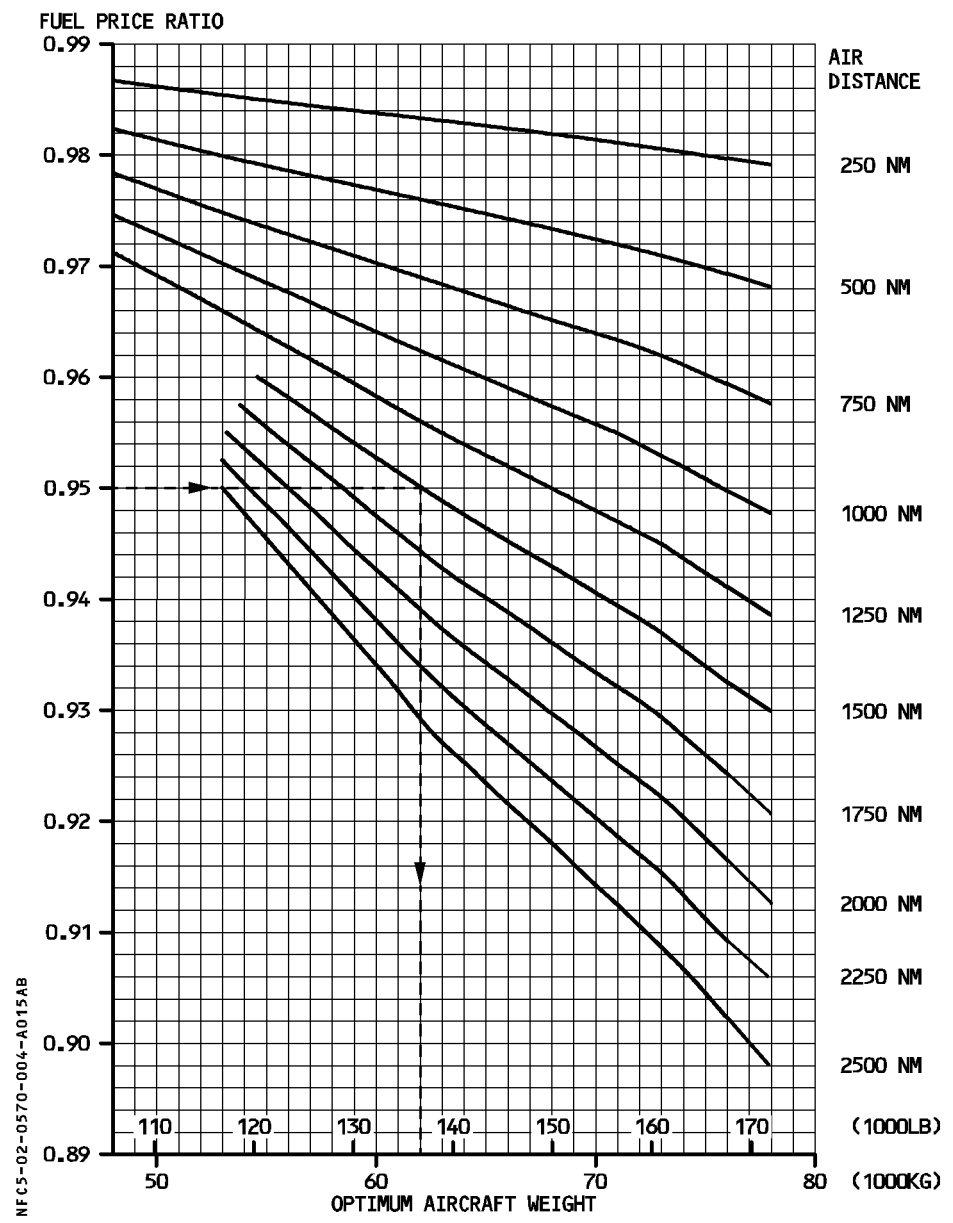
Check :

- a) new TOW less than or equal to MTOW from departure airport ;
- b) total fuel to be loaded less than or equal to maximum fuel capacity ;
- c) MLW at destination

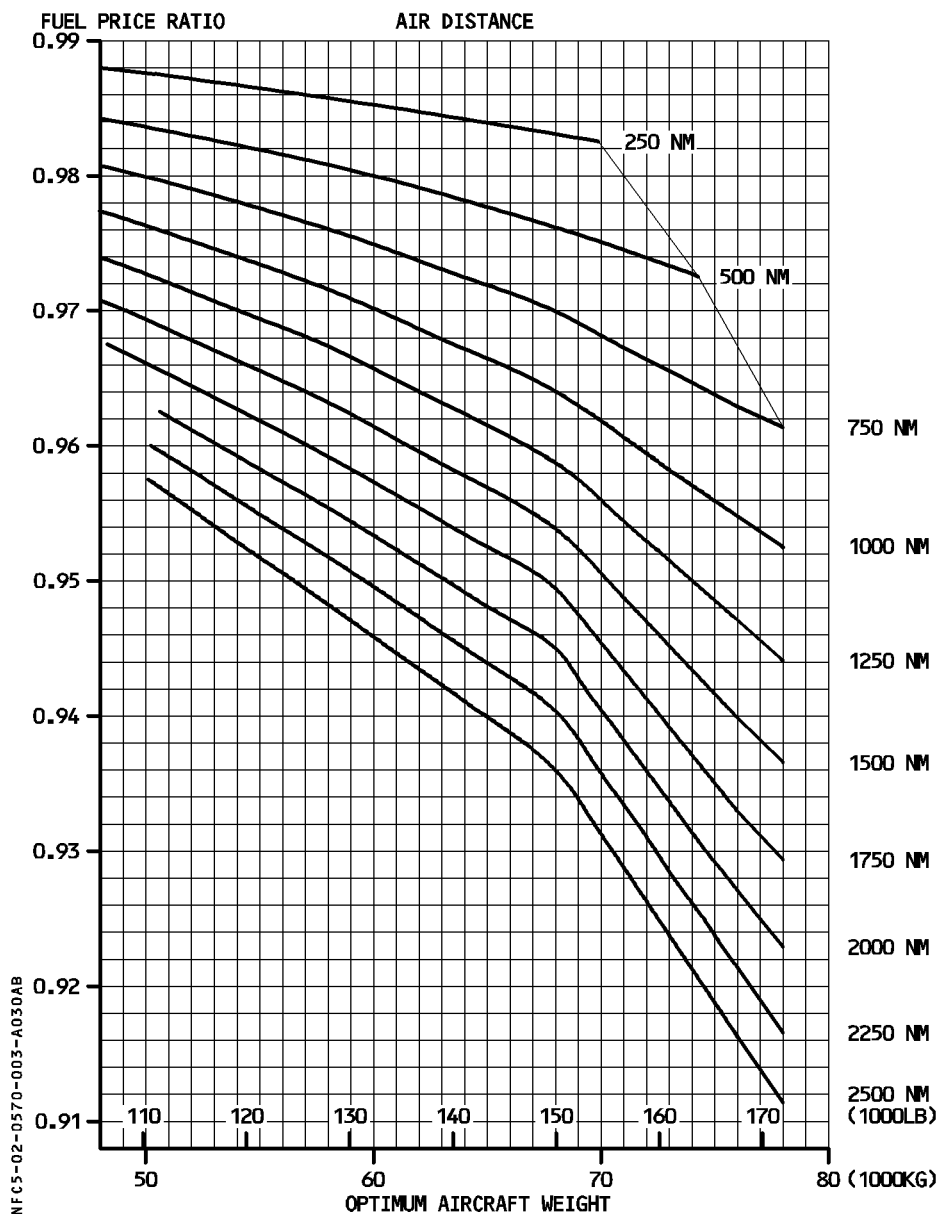
FL290



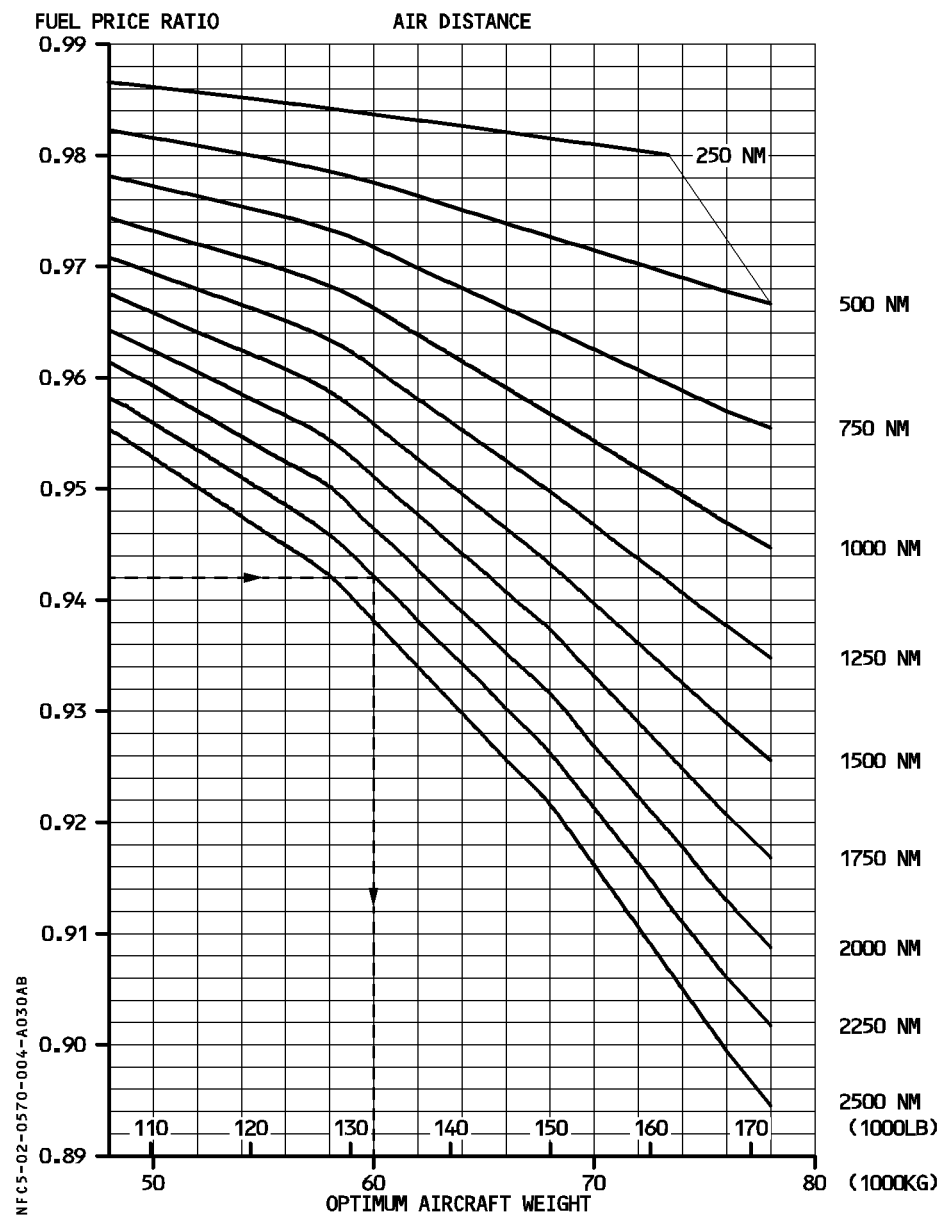
FL310



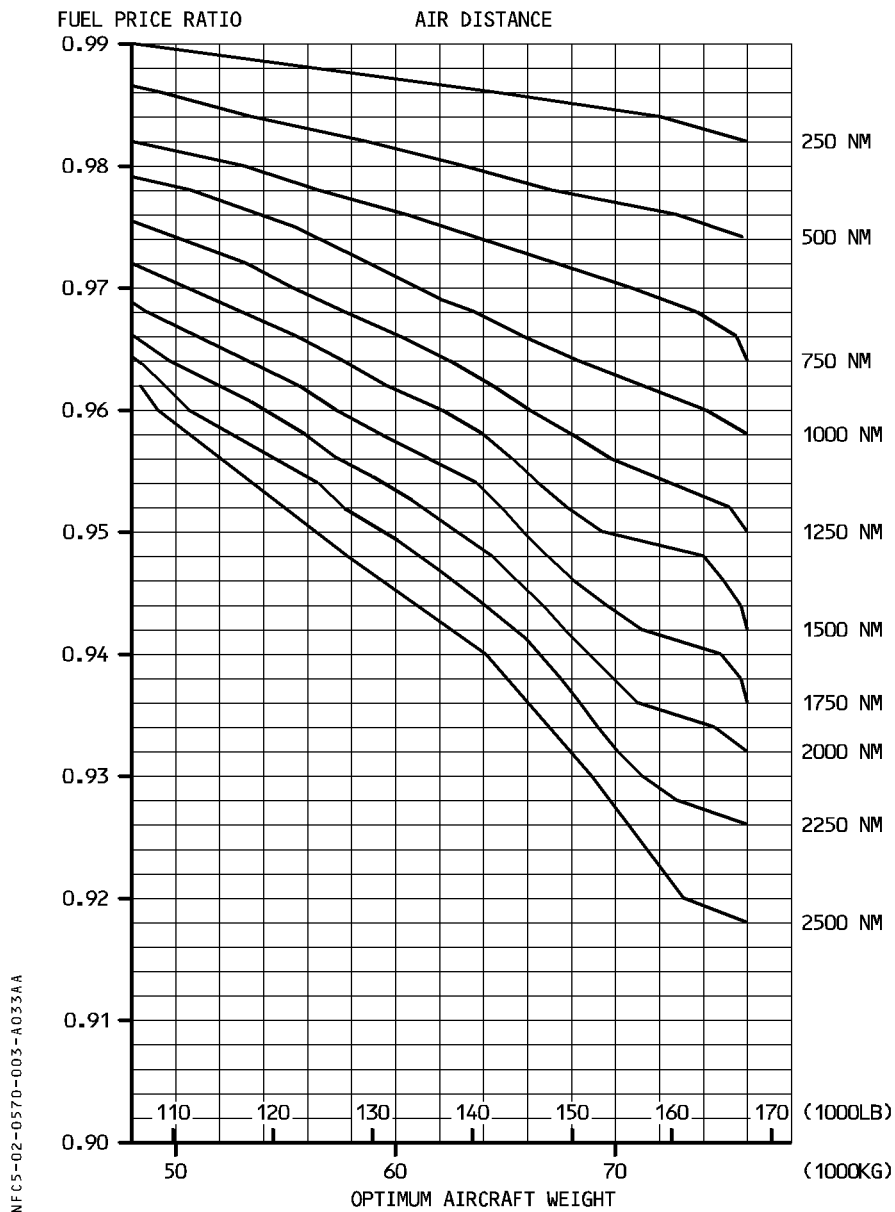
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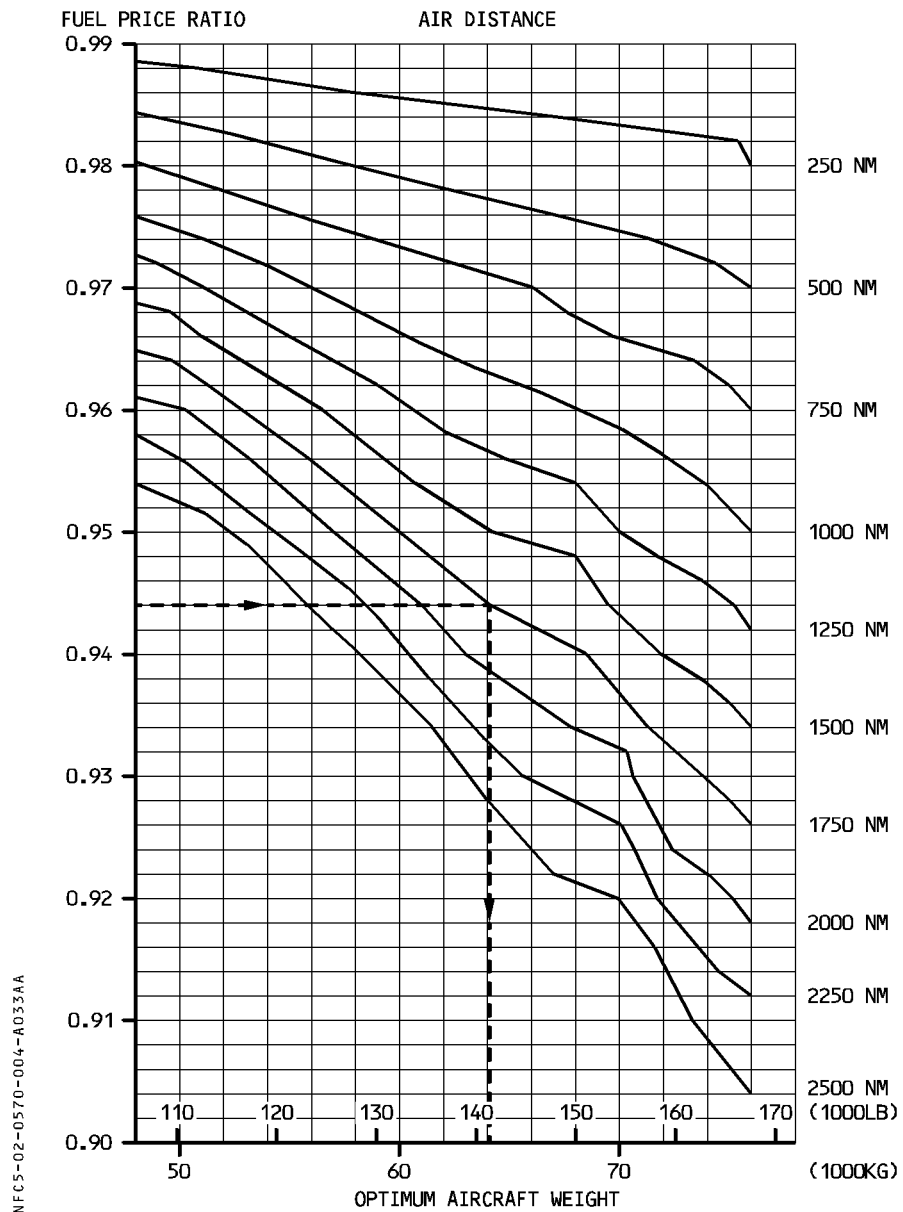
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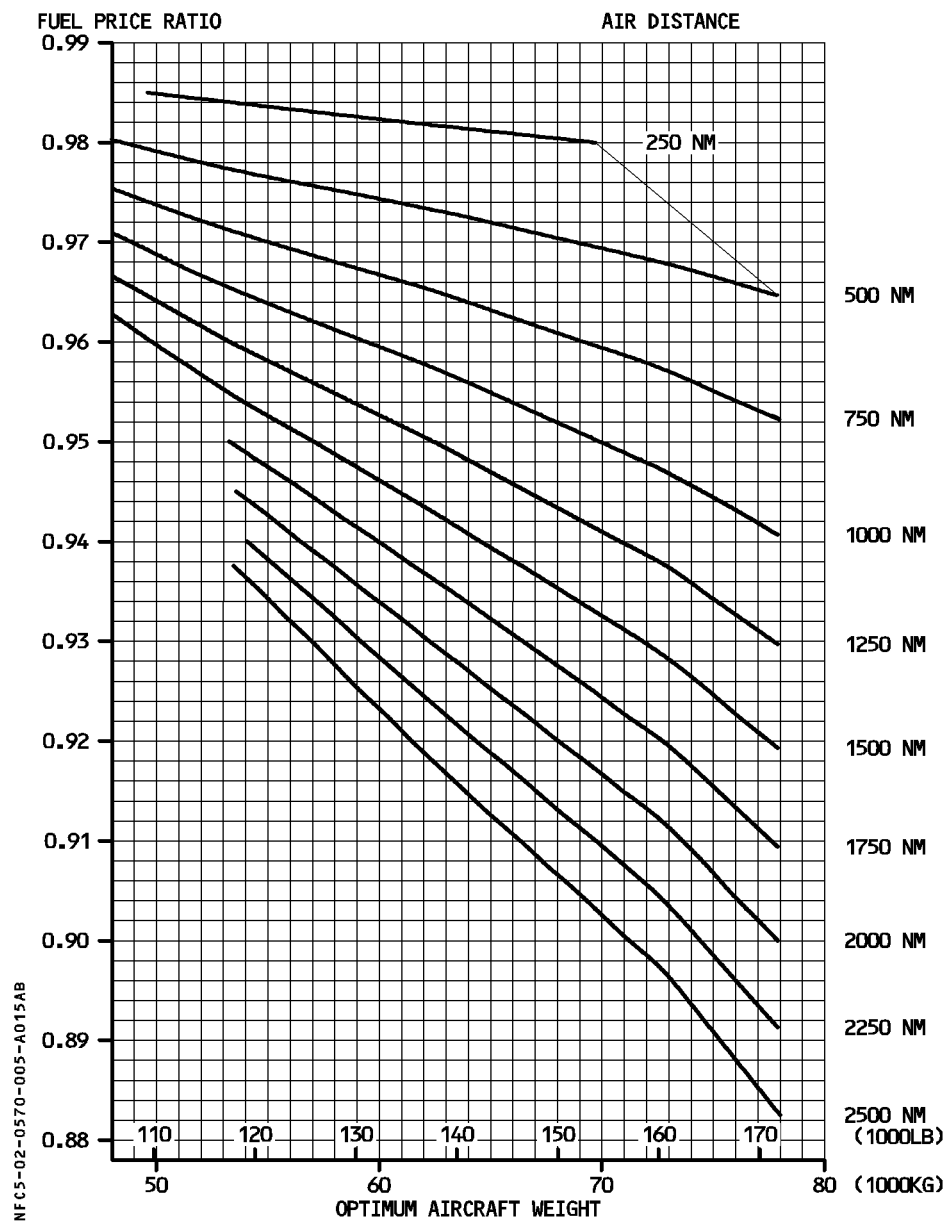
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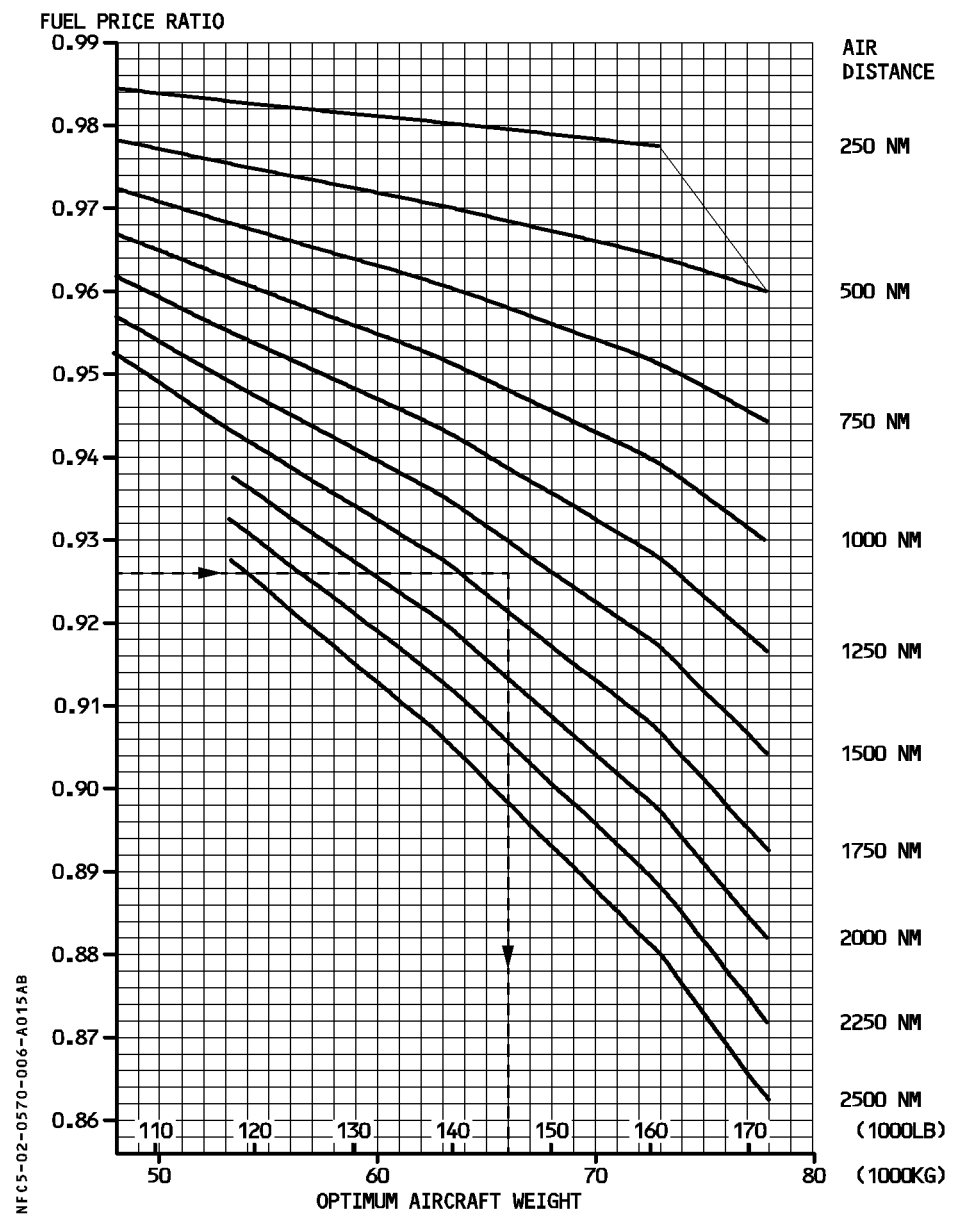
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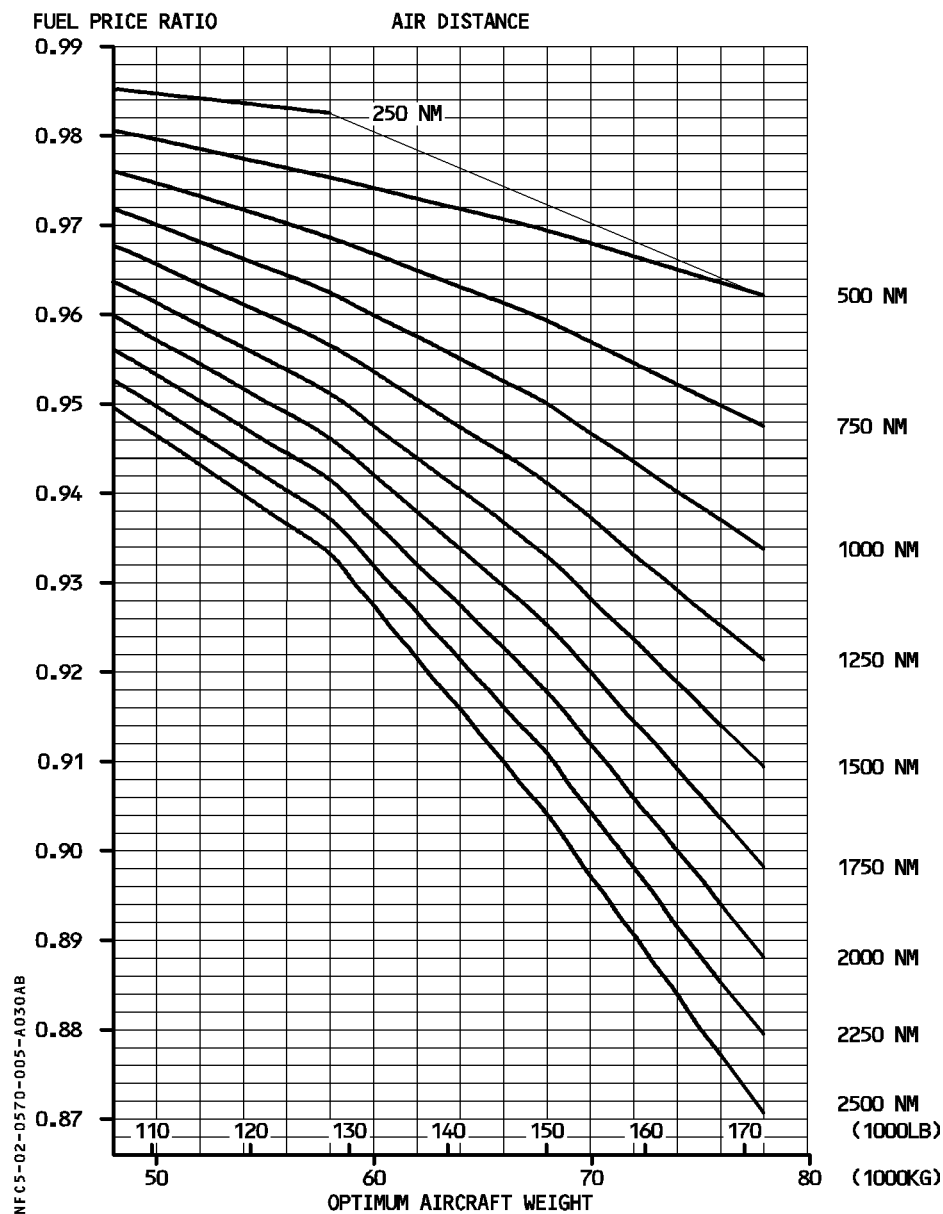
FL330



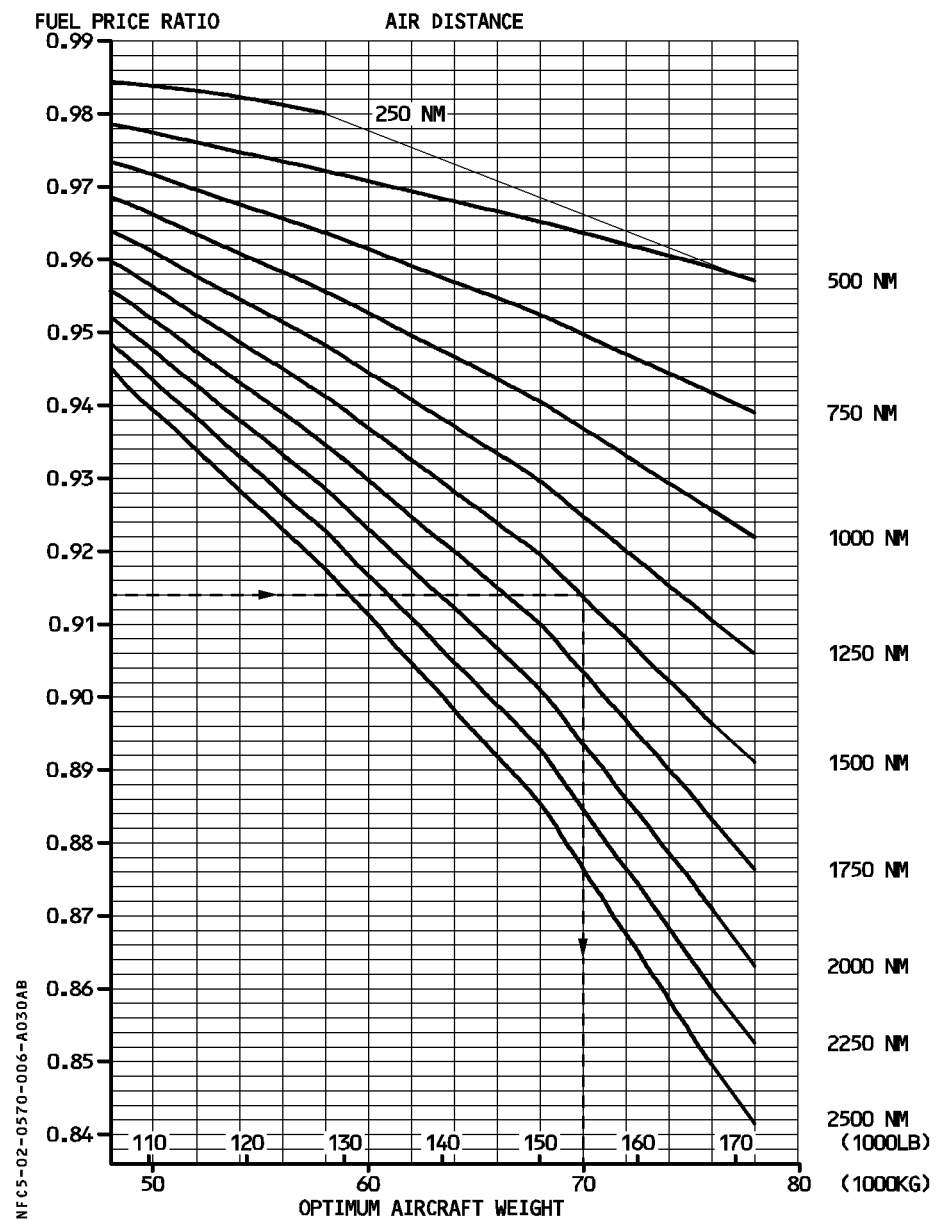
FL350



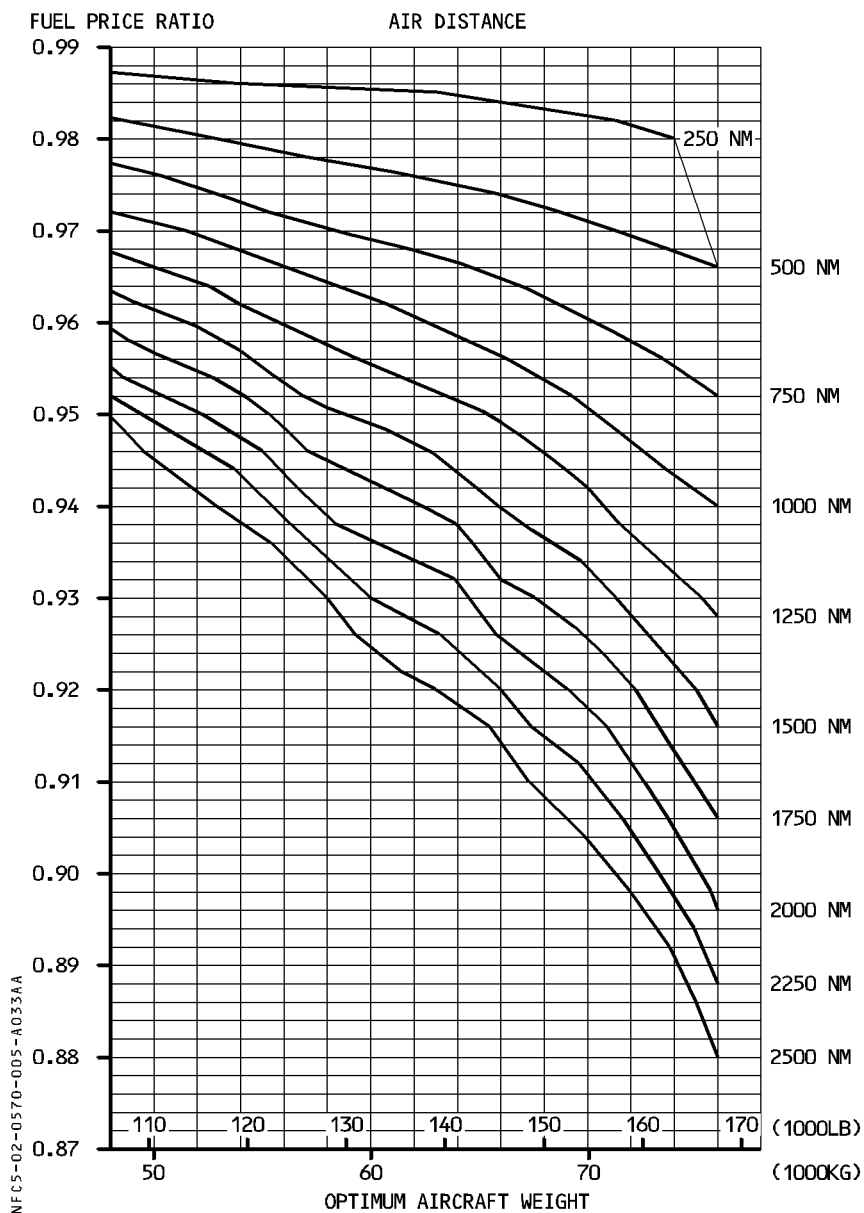
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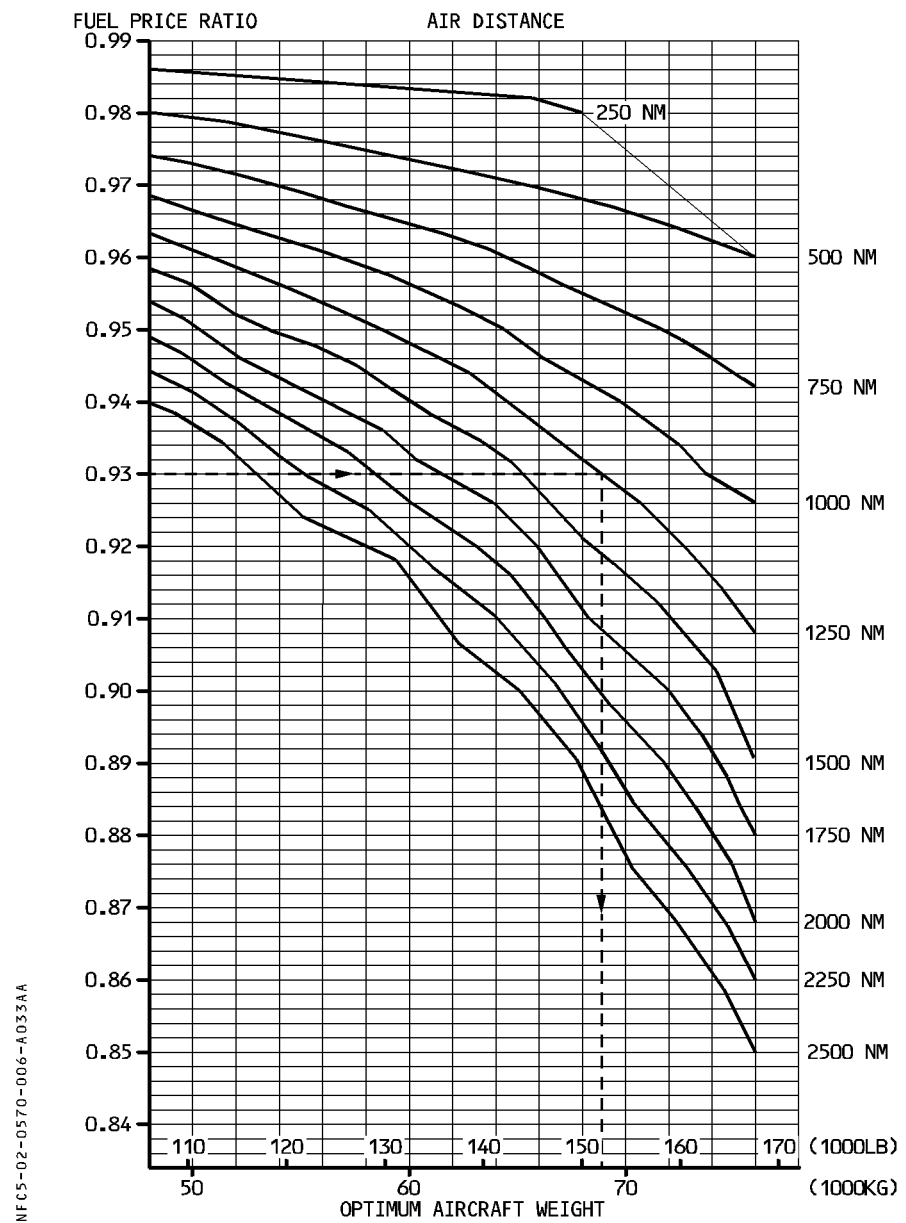
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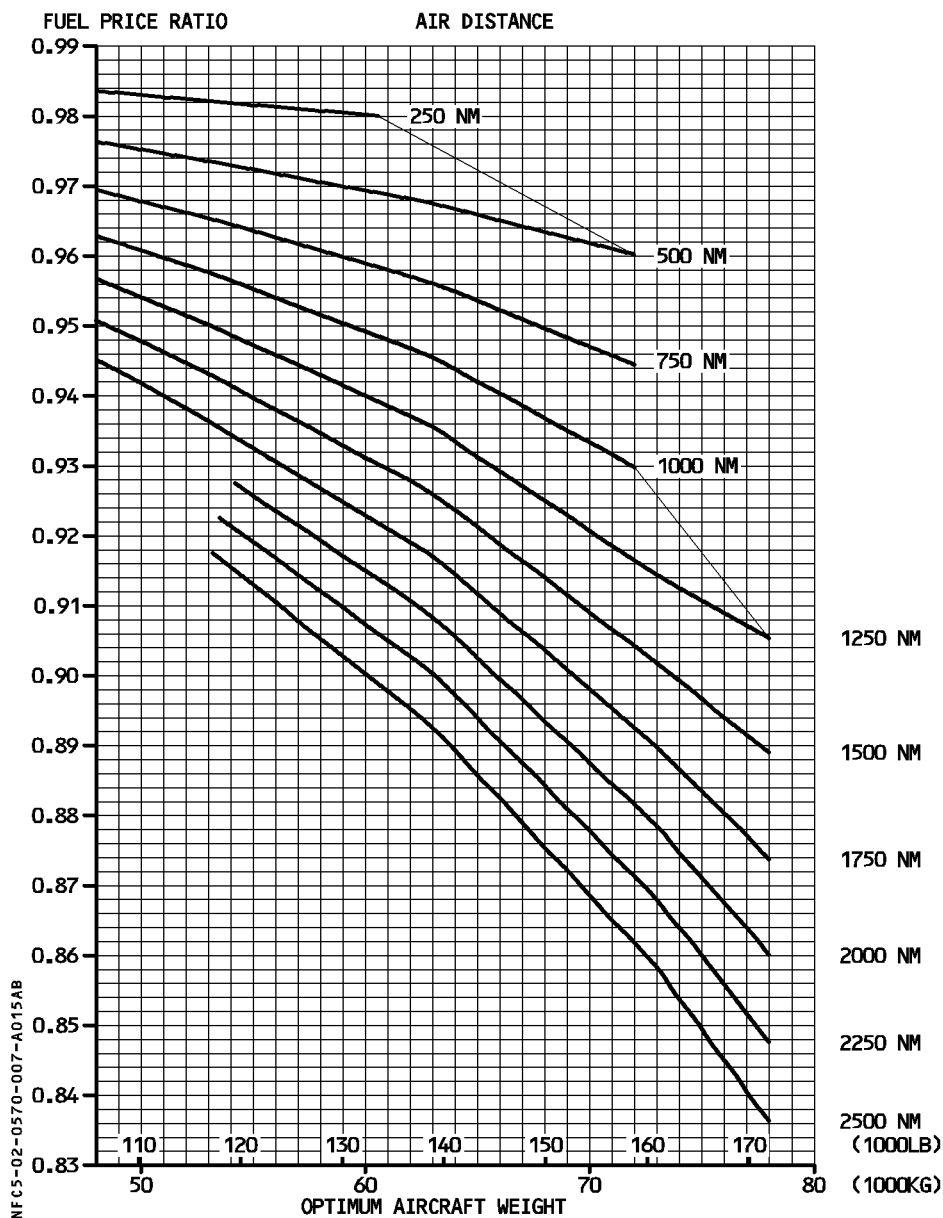
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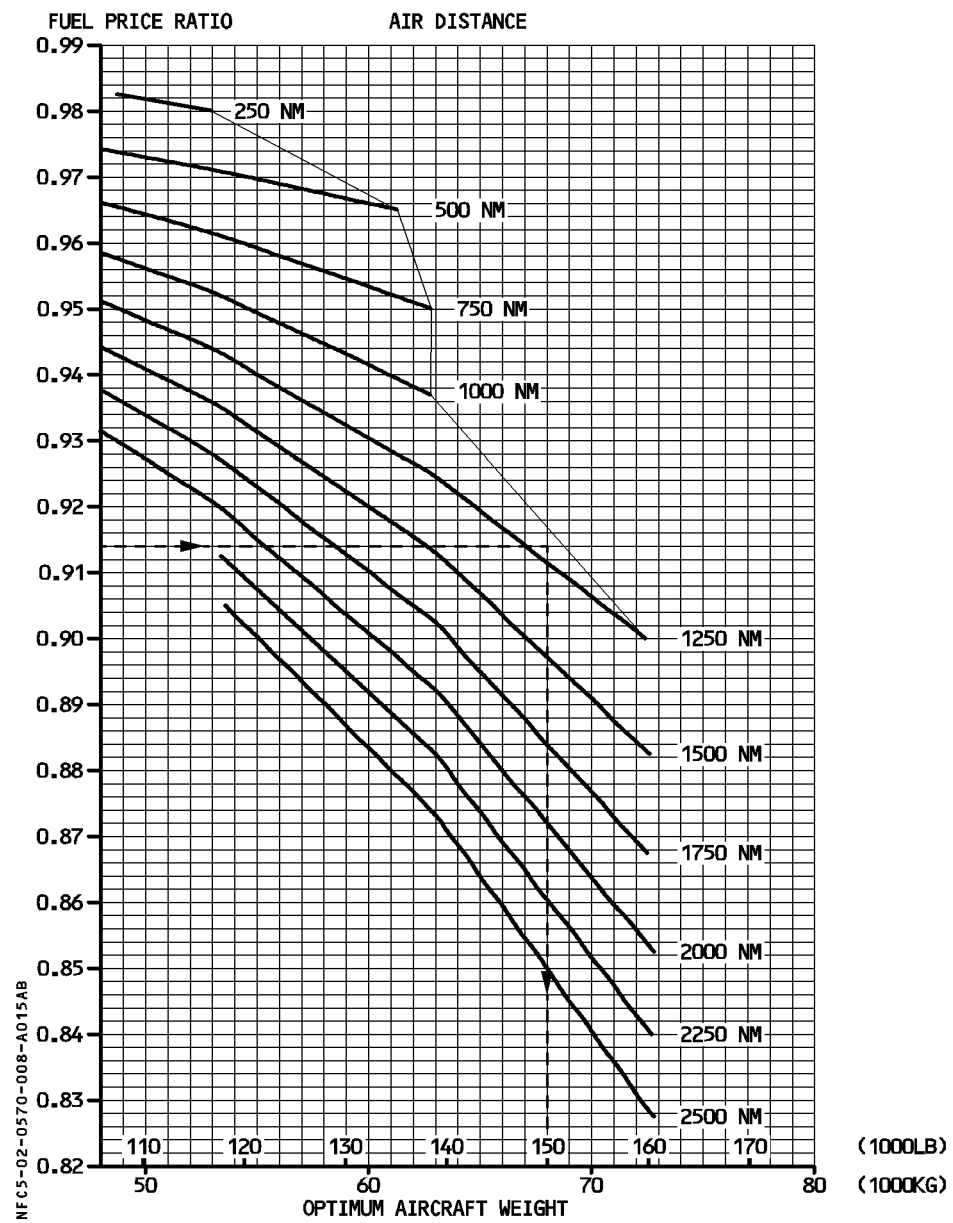
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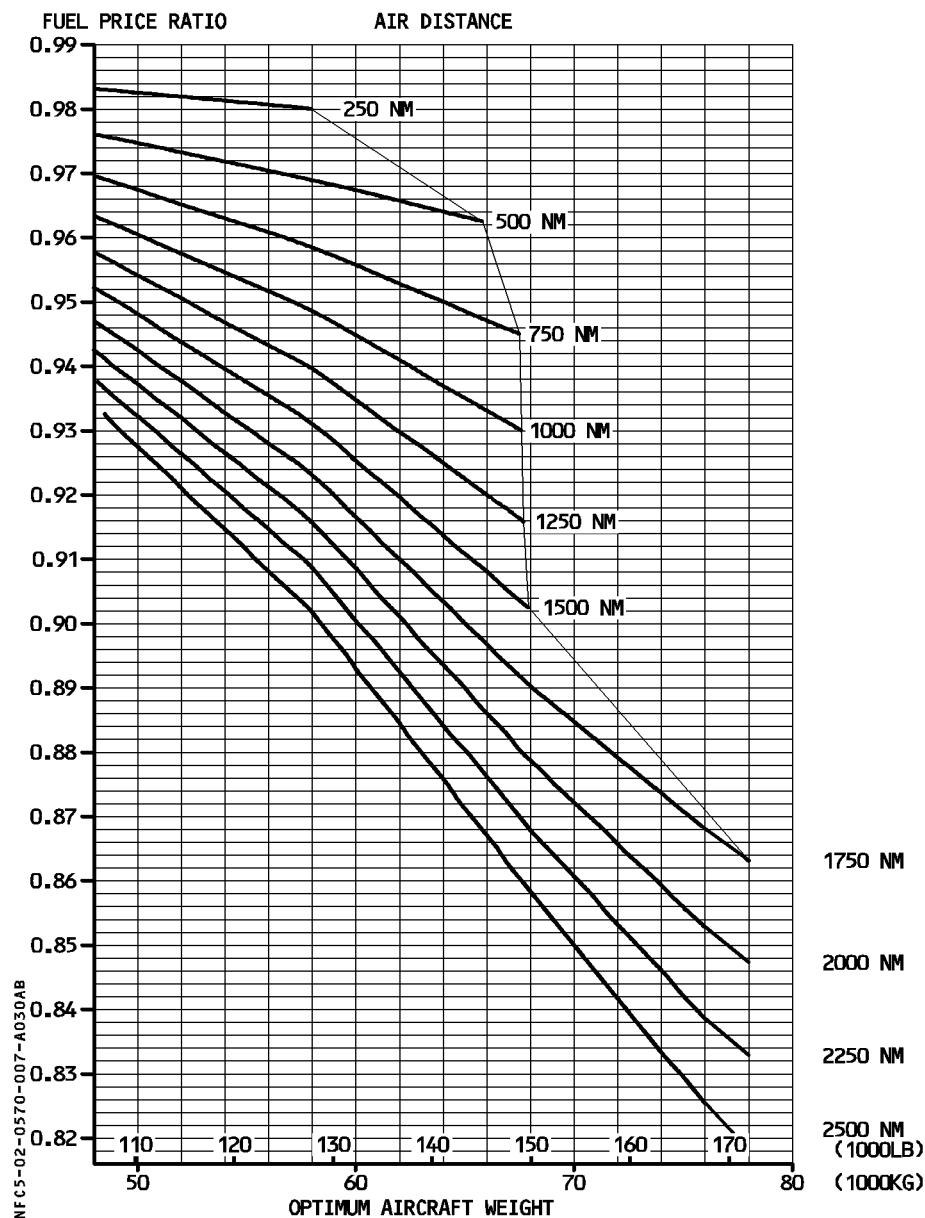
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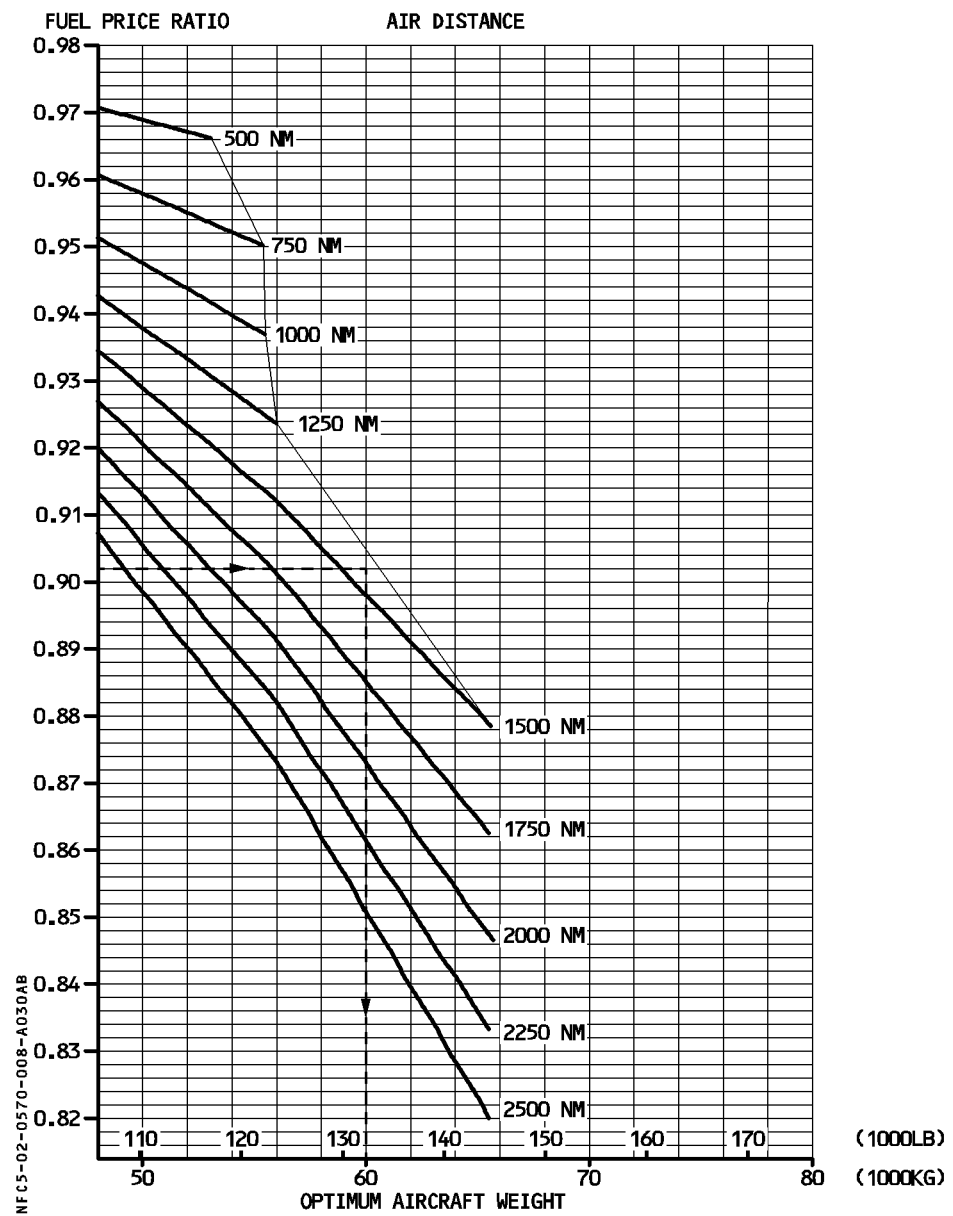
FL390



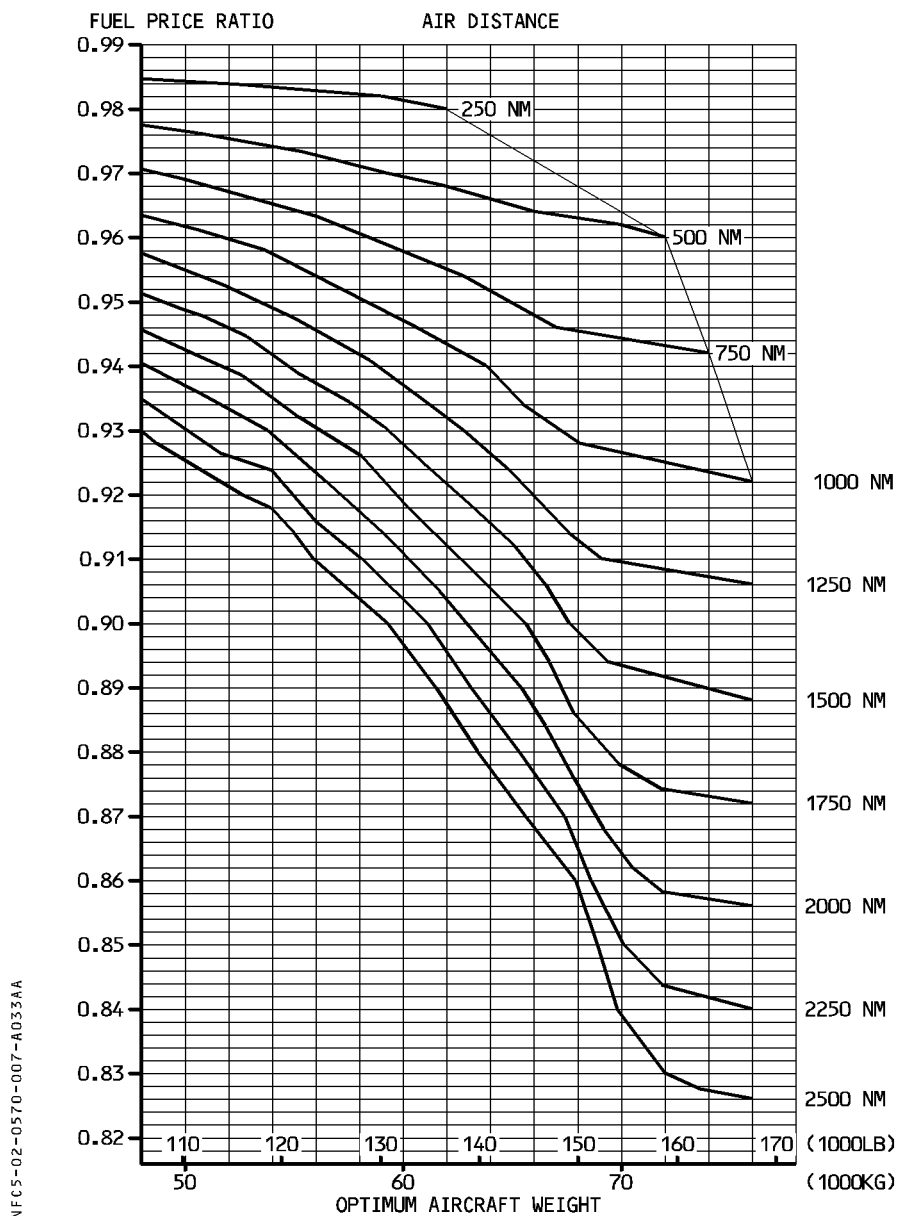
FL370



FL390



FL370



FL390

