

Preface

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Chapter P1

Section 0

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A319/320/321 Operations Manual Volume 1 Delta Air Lines, Inc.

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Preface**Model Identification****Chapter P1****Section 1****General**

The airplanes listed in the table below are covered in the operations manual. The numbers are used to distinguish data peculiar to one or more, but not all of the airplanes. Where data applies to all airplanes listed, no reference is made to individual airplane numbers.

The table permits flight crew correlation of configuration differences by Registry Number in alpha/numeric order within an operator's fleet for airplanes covered in this manual. Configuration data reflects the airplane as delivered configuration and is updated for service bulletin incorporations in conformance with the policy stated in the introduction section of this chapter.

Airplane number is supplied by the operator. Registry number is supplied by the national regulatory agency. Serial and Model numbers are supplied by Airbus.

A319

Ship Number	Registry Number	Serial Number	Model
3101	N301NB	1058	A319-114
3102	N302NB	1062	A319-114
3114	N314NB	1191	A319-114
3115	N315NB	1230	A319-114
3116	N316NB	1249	A319-114
3117	N317NB	1324	A319-114
3118	N318NB	1325	A319-114
3119	N319NB	1346	A319-114
3120	N320NB	1392	A319-114
3121	N321NB	1414	A319-114
3122	N322NB	1434	A319-114
3123	N323NB	1453	A319-114
3124	N324NB	1456	A319-114
3125	N325NB	1483	A319-114



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Ship Number	Registry Number	Serial Number	Model
3126	N326NB	1498	A319-114
3127	N327NB	1501	A319-114
3128	N328NB	1520	A319-114
3129	N329NB	1543	A319-114
3130	N330NB	1549	A319-114
3131	N331NB	1567	A319-114
3132	N332NB	1570	A319-114
3133	N333NB	1582	A319-114
3134	N334NB	1659	A319-114
3135	N335NB	1662	A319-114
3136	N336NB	1683	A319-114
3137	N337NB	1685	A319-114
3138	N338NB	1693	A319-114
3139	N339NB	1709	A319-114
3140	N340NB	1714	A319-114
3141	N341NB	1738	A319-114
3142	N442NB	1746	A319-114
3143	N343NB	1752	A319-114
3144	N344NB	1766	A319-114
3145	N345NB	1774	A319-114
3146	N346NB	1796	A319-114
3147	N347NB	1800	A319-114
3148	N348NB	1810	A319-114
3149	N348NB	1815	A319-114
3151	N351NB	1820	A319-114
3152	N352NB	1824	A319-114

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Ship Number	Registry Number	Serial Number	Model
3153	N353NB	1828	A319-114
3154	N354NB	1833	A319-114
3155	N355NB	1839	A319-114
3157	N357NB	1875	A319-114
3158	N358NB	1897	A319-114
3159	N359NB	1923	A319-114
3160	N360NB	1959	A319-114
3161	N361NB	1976	A319-114
3162	N362NB	1982	A319-114
3163	N363NB	1990	A319-114
3164	N364NB	2002	A319-114
3165	N365NB	2013	A319-114
3166	N366NB	2026	A319-114
3168	N368NB	2039	A319-114
3169	N369NB	2047	A319-114
3170	N370NB	2087	A319-114
3171	N371NB	2095	A319-114

A320

Ship Number	Registry Number	Serial Number	Tabulation Number
3209	N209US	0118	A-320-211
3210	N310NW	0121	A-320-211
3211	N311US	0125	A320-211
3212	N312US	0152	A-320-211
3213	N313US	0153	A-320-211
3214	N314US	0160	A-320-211

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Ship Number	Registry Number	Serial Number	Tabulation Number
3215	N315US	0171	A-320-211
3216	N316US	0192	A-320-211
3217	N317US	0197	A-320-211
3218	N318US	0206	A-320-211
3219	N319US	0208	A-320-211
3220	N320US	0213	A-320-211
3221	N321US	0262	A-320-211
3222	N322US	0263	A-320-211
3223	N323US	0272	A-320-211
3224	N324US	0273	A-320-211
3225	N325US	0281	A-320-211
3226	N326US	0282	A-320-211
3227	N327NW	0297	A-320-211
3228	N328NW	0298	A-320-211
3229	N329NW	0306	A-320-211
3230	N330NW	0307	A-320-211
3231	N331NW	0318	A-320-211
3232	N332NW	0319	A-320-211
3233	N333NW	0329	A-320-211
3234	N334NW	0339	A-320-212
3235	N335NW	0340	A-320-212
3236	N336NW	0355	A-320-212
3237	N337NW	0358	A-320-212
3238	N338NW	0360	A-320-212
3239	N339NW	0367	A-320-212

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Ship Number	Registry Number	Serial Number	Tabulation Number
3240	N340NW	0372	A-320-212
3241	N341NW	0380	A-320-212
3242	N342NW	0381	A-320-212
3243	N343NW	0387	A-320-212
3244	N344NW	0388	A-320-212
3245	N345NW	0399	A-320-212
3247	N347NW	0408	A-320-212
3248	N348NW	0410	A-320-212
3249	N349NW	0417	A-320-212
3250	N350NA	0418	A-320-212
3251	N351NW	0766	A-320-212
3252	N352NW	0778	A-320-212
3253	N353NW	0786	A-320-212
3254	N354NW	0801	A-320-212
3255	N355NW	0807	A-320-212
3256	N356NW	0818	A-320-212
3257	N357NW	0830	A-320-212
3258	N358NW	0832	A-320-212
3259	N359NW	0832	A-320-212
3260	N360NW	0903	A-320-212
3261	N361NW	0907	A-320-212
3262	N362NW	0911	A-320-212
3263	N363NW	0923	A-320-212
3264	N364NW	0962	A-320-212
3265	N365NW	0964	A-320-212

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Ship Number	Registry Number	Serial Number	Tabulation Number
3266	N366NW	0981	A-320-212
3267	N367NW	0988	A-320-212
3268	N368NW	0996	A-320-212
3269	N369NW	1011	A-320-212
3270	N369NW	1037	A-320-212
3271	N371NW	1535	A-320-212
3272	N372NW	1633	A-320-212
3273	N373NW	1641	A-320-212
3274	N374NW	1646	A-320-212
3275	N375NC	1789	A-320-212
3276	N376NW	1812	A-320-212
3277	N377NW	2082	A-320-211
3278	N378NW	2092	A-320-211

A321

Ship Number	Registry Number	Serial Number	Tabulation Number
3001	N301DN	6923	A-321-211
3002	N302DN	7031	A-321-211
3003	N303DN	7061	A-321-211
3004	N304DN	7112	A-321-211
3005	N305DN	7149	A-321-211
3006	N306DN	7165	A-321-211
3007	N307DX	TBD	A-321-211
3008	N308DN	TBD	A-321-211
3009	N309DN	TBD	A-321-211

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Ship Number	Registry Number	Serial Number	Tabulation Number
3010	N310DN	TBD	A-321-211
3011	N311DN	TBD	A-321-211
3012	N312DN	TBD	A-321-211
3013	N313DN	TBD	A-321-211
3014	N314DN	TBD	A-321-211
3015	N315DN	TBD	A-321-211
3016	N315DN	TBD	A-321-211
3017	N317DN	TBD	A-321-211
3018	N318DX	TBD	A-321-211
3019	N319DN	TBD	A-321-211
3020	N320DN	TBD	A-321-211
3021	N321DH	TBD	A-321-211
3022	N322DN	TBD	A-321-211
3023	N323DN	TBD	A-321-211
3024	N324DX	TBD	A-321-211
3025	N325DN	TBD	A-321-211
3026	N326DN	TBD	A-321-211
3027	N327DN	TBD	A-321-211
3028	N328DN	TBD	A-321-211
3029	N329DN	TBD	A-321-211
3030	N330DX	TBD	A-321-211
3031	N331DN	TBD	A-321-211
3032	N332DN	TBD	A-321-211
3033	N333DX	TBD	A-321-211
3034	N334DN	TBD	A-321-211

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Ship Number	Registry Number	Serial Number	Tabulation Number
3035	N335DN	TBD	A-321-211
3036	N336DX	TBD	A-321-211
3037	N337DN	TBD	A-321-211
3038	N338DN	TBD	A-321-211
3039	N339DN	TBD	A-321-211
3040	N340DN	TBD	A-321-211
3041	N341DN	TBD	A-321-211
3042	N342DN	TBD	A-321-211
3043	N343DN	TBD	A-321-211
3044	N344DN	TBD	A-321-211
3045	N345DN	TBD	A-321-211

General

The manufacturer has developed normal and non-normal procedures for the A319/320/321 aircraft. Delta Air Lines, Inc. has modified some of these procedures for simplification and standardization, when appropriate, with other aircraft operated by Delta Air Lines, Inc. Finally, the FAA has approved the procedures presented in this Operations Manual.

These procedures are intended to be followed during normal ground operations and in flight. Deviations from these procedures should be made only with good cause and based on the safest course of action. The captain's best judgment must be applied if an abnormality occurs that is not covered by these procedures.

Manual Rights

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Corrections to the Manual

Log on to the Delta Flight Operations Portal, <http://dlnet.delta.com> and submit a Publications Change Request (PCR) to correct any errors or discrepancies discovered in this manual, or to submit a suggested change to any Aircraft Operating Manual, Volume 1, Volume 2, Quick Reference Handbook (QRH), Flight Crew Training Manual (FCTM), Normal Checklist, Airway Manual (AM), Flight Operations Manual (FOM), Operating Experience (OE/TOE) Guide, Fleet Bulletin (FB), or All Pilot Bulletin (APB).

There are links to the PCR form on each fleet page and also on the Flight Ops Manuals/Library Services page. Once submitted, the PCR is automatically routed to the applicable Fleet Technical Manager and Technical Writer for that manual.

Organization

The operations manual is organized in the following manner.

Volume 1

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Limitations - Covers operational limitations.
- Normal Procedures - Covers all amplified normal operating procedures and are based on a thorough analysis of crew activity required to operate the aircraft, and reflect the latest knowledge and experience available.
- Normal Operational Information - Contains reference material used to support normal procedures.
- Supplementary Procedures is organized by system and covers:
 - any procedure that is non-routine in nature
 - any first-flight-of-the-day test or other systems test
 - guidance on lengthy operating procedures
 - adverse weather procedures and guidance
- Differences - Notes differences between aircraft models and variants.

Volume 2

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Contains general aircraft and systems information. These chapters are generally subdivided into sections covering controls and indicators and systems descriptions.

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QRH

- Non-normal checklists - Contains checklists used to manage non-normal situations.
- Non-Normal Operational Information - Contains reference material used to support non-normal procedures.
- Non-Normal Checklist Instructions - Contains non-normal checklist instructions; evacuation flow/philosophy.
- Revision Record - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.

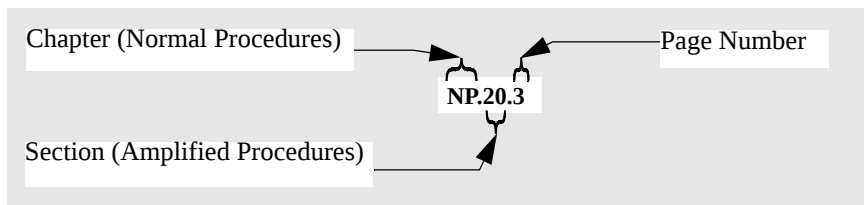
FCTM

- Preface - Contains general information regarding the manual's purpose, structure, and content. It also contains lists of abbreviations, a record of revisions and a list of effective pages.
- Provides information and recommendations on aircraft operations, maneuvers, techniques and human factors.

Page Numbering

This manual uses a decimal page numbering system. The page number is divided into three fields; chapter, section, and page. An example of a page number for the Normal Procedures chapter follows:

Example Page Number



Warnings, Cautions, and Notes

The following levels of written advisories are used throughout the manual and are not to be confused with ECAM messages, which are identified in separate text.

Warning - A warning is an instruction about a hazard that if ignored could result in injury, loss of aircraft control, or loss of life. A warning will appear prior to the applicable step or item.

WARNING: Do not pressurize any hydraulic or pneumatic system until clearance is obtained from Maintenance.

Caution - A caution is an instruction concerning a hazard that if ignored could result in damage to equipment. A caution will appear prior to the applicable step or item.

CAUTION: Do not set takeoff thrust until oil temperature is above 50°C.

Note - A note provides amplified information, instruction, or emphasis. A note will appear after the applicable step or item.

Note: The checklist must not be modified in any way.

Aircraft Effectivities

Differences in aircraft configuration are shown by use of aircraft effectivities throughout Volumes 1 and 2, QRH, and the FCTM. The following rules are used to express aircraft effectivities:

- Aircraft effectivities are listed by model and/or ship number. A range of aircraft is defined by a dash, e.g. 9901- 9910. A comma in the effectivity range indicates a break in the range, e.g. 9901 - 9910, 9912 - 9925; aircraft 9911 is excluded from the range. Aircraft introduced to the fleet following manual publication are effective as subsequent ships, e.g. 9901 & Subsequent.
- Aircraft effectivities are listed in bold text throughout the manual, except in the Limitations chapter. In the Limitations chapter, aircraft effectivities are listed in bold when the effectivity applies to the entire section or subsection. When the effectivity applies only to a step within a section, it is listed in normal text.
- Aircraft effectivities apply only to the paragraph, illustration, operational note, procedural step, etc. and to subordinate items (if any). Refer to the examples below.

Example (with subordinate items):

- 9951 – 9961**
CTR TK PUMP (affected).....OFF
 Do not open the WING X FEED valve.

OUTR TK XFR.....ON

In this example, the effectivity 9951 - 9961 applies to the first procedural step (CTR TK PUMP.....) and the further indented/subordinate step (Do not...). The effectivity does not apply to the next equivalently indented step (OUTR TK XFR.....).

Example (without subordinate items):

Using ship number:

- 9951 – 9961**
CTR TK PUMP (affected).....ON
OUTR TK XFR.....OFF

In this example, the effectivity 9951 - 9961 applies to the first procedural step (CTR TK PUMP) only. The effectivity does not apply to the next procedural step (OUTR TK XFR).

Using model number:

- 767-300**
EQUIPMENT COOLING mode selector.....AUTO

In this example, the 767-300 will have the selector in the AUTO position.

When airplane effectivities are centered immediately below a checklist title, the entire checklist applies to the listed airplanes. In the following example, the FUEL L + R CTR PUMPS LO PR checklist is applicable to 9951-9961 only:

FUEL L + R CTR PUMPS LO PR
9951-9961

Preface

Abbreviations

Chapter P1

Section 3

General

The following abbreviations may be found throughout the manual. Some abbreviations may also appear in lowercase letters. Abbreviations having very limited use are explained in the chapter where they are used. Since this list is compiled across several fleets, there may be some abbreviations that do not apply to the A319/320/321 fleet.

A	
A/BRK	Autobrake
ABV	Above
AC	Alternating Current or Aircraft
ACARS	Aircraft Communications Addressing and Reporting System
ACMS	Aircraft Condition Monitoring System
ACP	Audio Control Panel
ADF	Automatic Direction Finder
ADI	Attitude Director Indicator
ADIRS	Air Data Inertial Reference System
ADIRU	Air Data Inertial Reference Unit
ADR	Air Data Reference
ADS	Automatic Dependent Surveillance
ADV	Advisory
AED	Automatic External Defibrillator
AFE	Above Field Elevation

AFM	Airplane Flight Manual (FAA approved)
AFM - DPI	Airplane Flight Manual - Digital Performance Information
AFS	Automatic Flight System (Autopilot or Autothrust)
A/G	Air/Ground
AGL	Above Ground Level
AH	Alert Height
AI	Anti-Ice
AIL	Aileron
ALT	Altitude
ALT HOLD	Altitude Hold
ALTN	Alternate
AM	Amplitude Modulation
ANP	Actual Navigational Performance
ANT	Antenna
AOA	Angle of Attack
AOC	Airline Operational Communication Data Link
A/P or AP	Autopilot
APL	Airplane

APP or APPR	Approach
APU	Auxiliary Power Unit
AR	Authorization Required
ARINC	Aeronautical Radio, Incorporated
ARPT	Airport
ARR	Arrival
ASI	Airspeed Indicator
A/SKID	Anti-Skid
ASR	Airport Surveillance Radar
ASYM	Asymmetry
ATA	Actual Time of Arrival
ATC	Air Traffic Control
A/THR	Autothrust
ATIS	Automated Terminal Information Service
ATM	Assumed Temperature Method
ATT	Attitude
AUTO	Automatic
AUX	Auxiliary
AVAIL	Available
AWABS	Automated Weight and Balance System
B	
BARO	Barometric
BAT	Battery
B/C or B/CRS or BAC or BCS	Back Course

BCL	Battery Charge Limiter
BCM	Backup Control Module
BCCR	Bulk Cargo Crew Rest
BITE	Built-In Test Equipment
BKR	Breaker
BLD	Bleed
BLW	Below
BMC	Bleed Monitoring Computer
BRG	Bearing
BRK	Brake
BRT	Bright
BSCU	Brake Steering Control Unit
BTC	Bus Tie Contactor
BTL	Bottle
BTL DISCH	Bottle Discharge (fire extinguisher)
C	
C	Captain or Celsius or Center or Cool
CAA	Civil Aviation Authority
CADC	Central Air Data Computer
CAP	Capture
CAPT	Captain
CB	Circuit Breaker
CDL	Configuration Deviation List
CDU	Control Display Unit

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CFDS	Centralized Fault Display System
CFIT	Controlled Flight Into Terrain
CG	Center of Gravity
CHKL or C/L	Checklist
CHR	Chronograph
CIDS	Cabin Intercommunication Data System
CKD	Checked
CKT	Circuit
CL	Close
CLB	Climb
CLR	Clear
CMD	Command
CO	Company
COMM	Communication
COMPT	Compartment
CON	Continuous
CONFIG	Configuration
CONT	Control or Continuous
COOL	Cooling
CO RTE	Company Route
CPCU	Cabin Pressure Controller Unit
CPDLC	Controller/Pilot DataLink Communications
CRC	Continuous Repetitive Chime
CRM	Crew Resource Management
CRS	Course

CRT	Cathode Ray Tube
CRZ	Cruise
CSM/G	Constant Speed Motor/Generator
CSTR	Constraint
CTL	Control
CTR	Center
CVR	Cockpit Voice Recorder
D	
DA(H)	Decision Altitude (Height)
DC	Direct Current
DCDU	Datalink Control and Display Unit
DDA(H)	Derived Decision Altitude (Height)
DDG	Dispatch Deviations Guide
DDRMI	Digital Distance & Radio Magnetic Indicator
DEL	Delete
DEP	Departure
DEP ARR	Departure Arrival
DEPR	Depressurize
DES	Descent
DEST	Destination
DFDR	Digital Flight Data Recorder
DH	Decision Height
DIFF	Differential
DIR	Direct
DIR TO	Direct To
DISC	Disconnect

DISCH	Discharge
DK	Deck
DMC	Display Management Computer
DME	Distance Measuring Equipment
DN	Down
DSPL	Display
DTG	Distance to Go
DTW	Distance to Waypoint
DU	Display Unit
E	
ECAM	Electronic Centralized Aircraft Monitor
ECON	Economic
EDP	Engine Driven Pump
E/D	End of Descent
E/E	Electrical/Electronic
EEC	Electronic Engine Control
EFB	Electronic Flight Bag
EFIS	Electronic Flight Instrument System
EFOB	Estimated Fuel On Board
EGPWS	Enhanced Ground Proximity Warning System
EGT	Exhaust Gas Temperature
EIS	Electronic Instrument System
EIU	Engine Interface Unit
ELAC	Elevator Aileron Computer

ELEC	Electrical
ELEV	Elevator
EMER	Emergency
ENG	Engine
ENG OUT	Engine Out
ENT	Entry
EO or E/O	Engine Out
EPR	Engine Pressure Ratio
EQPT or EQUIP	Equipment
ETOPS	Extended Range Operation with Twin Engine Airplanes
ETP	Equal Time Point
EVAC	Evacuation
EVMU	Engine Vibration Monitoring Unit
E/WD	Engine/Warning Display
EXT	Extend or External
F	
F	Fahrenheit, First Officer, or Flap Retraction Speed
FAC	Final Approach Course OR Flight Augmentation Computer
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAR	Federal Aviation Regulation
FB	Fleet Bulletin

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FCDC	Flight Control Data Concentrator
FCMC	Fuel Control and Monitoring Computer
FCTL	Flight Control
FCTM	Flight Crew Training Manual
FCU	Flight Control Unit
FD, F/D or FLT DIR	Flight Director
FF	Fuel Flow
FILT	Filter
FIR	Flight Information Region
FLT	Flight
FLT CTRL	Flight Control
FMA	Flight Mode Annunciator
FMC	Flight Management Computer
FMGC	Flight Management Guidance Computer
FMGS	Flight Management Guidance System
FMS	Flight Management System
F/O or FO	First Officer
FOM	Flight Operations Manual
FPA	Flight Path Angle
F-PLN	Flight Plan
FPM	Feet Per Minute
FPV	Flight Path Vector
FREQ	Frequency
FT	Feet

FWC	Flight Warning Computer
FWD	Forward
FX	Fix
G	
GA	Go-Around
GCU	Generator Control Unit
GEN	Generator
GLC	Generator Line Contactor
GMT	Greenwich Mean Time
GND	Ground
GNSS	Global Navigation Satellite System
GP or G/P	Glide Path
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GS	Ground Speed
G/S	Glide Slope
GW	Gross Weight
H	
HAA	Height Above Airport
HAT	Height Above Touchdown
HDG	Heading
HF	High Frequency
HI	High
HLD	Hold
HMU	Hydro-Mechanical Unit
HP	High Pressure
hPa	Hectopascals

HPV	High Pressure Valve
HSI	Horizontal Situation Indicator
HYD	Hydraulic
I	
IAF	Initial Approach Fix
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IDENT	Identification
IDG	Integrated Drive Generator
IFE	In-Flight Entertainment System
IFR	Instrument Flight Rules
IGN	Ignition
ILS	Instrument Landing System
IM	Inner Marker
IMC	Instrument Meteorological Conditions
IN	Inches
INBD	Inboard
IND	Indicator
IND LTS	Indicator Lights
INOP	Inoperative
INIT	Initialization
INSTR	Instrument
INT or INTPH	Interphone
INTC	Intercept
INTC CRS	Intercept Course

IP	Intermediate Pressure or Instructor Pilot
IRS	Inertial Reference System
IRU	Inertial Reference Unit
ISA	International Standard Atmosphere
ISIS	Integrated Standby Instrument System
ISLN	Isolation
J	
JAA	Joint Aviation Authority
K	
K or KTS	Knots
KCAS	Knots Calibrated Airspeed
KGS	Kilograms
KIAS	Knots Indicated Airspeed
L	
L	Left
LAT	Latitude
LAT REV	Lateral Revision
LAV	Lavatory
LBS	Pounds
LCC	Load Control Center
LD	Load
LDA	Localizer-type Directional Aid
LDG	Landing
LDG ALT	Landing Altitude
LE	Leading Edge
LGCIU	Landing Gear Control Interface Unit

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LIM	Limit
LIM SPD	Limit Speed
LKD or LK	Locked
LOC	Localizer
LOC-BC	Localizer Back Course
LOM	Locator Outer Marker
LON or LONG	Longitude
LP	Low Pressure
LRC	Long Range Cruise
LRU	Line Replaceable Unit
LSK	Line Select Key
LT	Light
M	
M	Mach or Meter
MAC	Mean Aerodynamic Chord
MAG	Magnetic
MAHP	Missed Approach Holding Point
MAN	Manual
MAP	Missed Approach Point
MAX	Maximum
MB	Millibar
MCC	Maintenance Control Center
MCDU	Multi-purpose Control and Display Unit
MCO	Maintenance Carry Over
MCT	Maximum Continuous Thrust
MDA	Minimum Descent Altitude

MDA(H)	Minimum Descent Altitude (Height)
MDM	Mechanical Dispatch Manual
MEA	Minimum Enroute Altitude
MEL	Minimum Equipment List
MHZ	Megahertz
MIC	Microphone
MIN	Minimum or Minute
MKR	Marker
MLA	Maneuver Load Alleviation
MLS	Microwave Landing System
MM	Middle Marker
MMO	Maximum Operating Mach
MMR	Multi Mode Receiver
MNPS	Minimum Navigation Performance Specification
MOCA	Minimum Obstruction Clearance Altitude
MOD	Modify
MORA	Minimum Off Route Altitude
MSA	Minimum Safe Altitude
MSG	Message
MSG RCVD	Messages Received
MSL	Mean Sea Level
MTOW	Maximum Take-Off Weight

MTRS	Meters
MZFW	Maximum Zero Fuel Weight
N	
N	Normal
NADP	Noise Abatement Departure Procedures
NAR	North American Route
NAV	Navigation
NAV RAD	Navigation Radio
ND	Navigation Display
NGS	Nitrogen Generation Systems
NDB	Non Directional Beacon
NLT	No Later Than
NM	Nautical Mile(s)
NNC	Non-Normal Checklists
NNM	Non-Normal Maneuvers
NORM	Normal
NWS	Nose Wheel Steering
N1	Low Pressure Rotor Speed
N2	High Pressure Rotor Speed
O	
OAT	Outside Air Temperature
OCC	Operations Control Center
ODM	Operational Data Manual
OFST	Offset
OM	Outer Marker
OP	Open

OPT	Optimum
OVHD	Overhead
OVHT	Overheat
OVRD	Override
OVSPD	Overspeed
OXY or O2	Oxygen
P	
PA	Passenger Address
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
PB	Push-Button
PBE	Protective Breathing Equipment
PDC	Pre-Departure Clearance
PERF	Performance
PERF INIT	Performance Initialization
PES	Passenger Entertainment System
PF	Pilot Flying
PFAF	Precision Final Approach Fix
PFD	Primary Flight Display
PM	Pilot Monitoring
PNL	Panel
POS	Position
PPOS	Present Position
PRES or PRESS	Pressure
PRED	Prediction

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PREV	Previous
PRI	Primary
PRIM	Flight Control Primary Computer
PROC T	Procedure Turn
PROG	Progress
PROX	Proximity
PRV	Pressure Regulating Valve
PSI	Pounds Per Square Inch
PTH	Path
PTT	Push To Talk
PTU	Power Transfer Unit
PWR	Power
PWS	Predictive Windshear System
Q	
Q	Quantity
QFE	Field Elevation Atmosphere Pressure
QNH	Sea Level Atmosphere Pressure
QRH	Quick Reference Handbook
QT	Quart
QTY	Quantity
R	
R	Right
RA	Radio Altitude or Resolution Advisory
RAD	Radio
RAIM	Receiver Autonomous Integrity Monitoring

RAT	Ram Air Temperature or Ram Air Turbine
RCL	Recall
REC or RCDR	Recorder
RECIR or RECIRC	Recirculation
REF	Reference
RET	Retract
REV	Reverse
RF	Radius-to-Fix (RF) Legs or Refill
RMI	Radio Magnetic Indicator
RMP	Radio Management Panel
RNAV	Area Navigation
RNP	Required Navigational Performance
RPM	Revolutions Per Minute
RST	Reset
RSV	Reserves
RSVR	Reservoir
R/T	Receive/Transmit
RTA	Required Time of Arrival
RTE	Route
RTO	Rejected Takeoff
RTOW	Runway Takeoff Weight
RUD	Rudder
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum

S	
SAAAR	Special Aircraft and Aircrew Authorization Required
SAT	Static Air Temperature or Satellite
SB	Service Bulletin
S/B	Speedbrake
SC	Single Chime
S/C	Step Climb
SD	System Display
SDAC	System Data Acquisition Concentrator
SDCU	Smoke Detection Control Unit
SDF	Simplified Directional Facility
SEC	Flight Control Secondary Computer
SEL	Select
SELCAL	Selective Calling
SENS	Sensitivity
SERV	Service
SFCC	Slat/Flap Control Computer
SMGCS	Surface Movement and Guidance Control System
SID	Standard Instrument Departure
SPD	Speed
SPDBRK	Speedbrake
SPLR	Spoiler

SRS	Speed Reference System
STA	Station
STAB	Stabilizer
STAR	Standard Terminal Arrival Route
STAT or STS	Status
STAT INV	Static Inverter
STBY	Standby
STD	Standard
SW	Switch
SWTG	Switching
SYS	System
T	
T or TRU	True
T or TK or TRK	Track (to a NAVAID)
TA	Traffic Advisory
TAA	Terminal Arrival Area
TACAN	Tactical Air Navigation
TAS	True Airspeed
TAT	Total Air Temperature
T/C	Top of Climb
TCA	Terminal Control Area
TCAS	Traffic Alert and Collision Avoidance System
T/D	Top of Descent
TDU	Takeoff Data Uplink
TDZ	Touch Down Zone
TDZE	Touch Down Zone Elevation

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TE	Trailing Edge
TEMP	Temperature
TERR	Terrain
TFC	Traffic
TFR	Transfer
THR	Thrust
THS	Trimmable Horizontal Stabilizer
TLA	Throttle Lever Angle
TMI	Track Message Identifier
TO or T/O	Takeoff
TOC	Top of Climb
TOD	Top of Descent
TOGA	Takeoff/Go-Around
TOGW	Takeoff Gross Weight
T-P	Turn Point
TRK	Track
TRU	Transformer Rectifier Unit
TURB	Turbine or Turbulence
U	
UNLK	Unlocked
UNSHCD or UNSCHED	Unscheduled
U.S.	United States
UTC	Universal Time Coordinated
UTIL	Utility

V	
VA	Design maneuvering speed
VAL	Valve
VANP	Vertical Actual Navigational Performance
VAPP	Approach speed
VASI	Visual Approach Slope Indicator
VDP	Visual Descent Point
VEF	Speed at Engine Failure
VERT	Vertical
VFE	Maximum speed flaps extended
VFR	Visual Flight Rules
VG	Vertical Gyro
VHF	Very High Frequency
VIB	Vibration
VLS	Lowest Selectable speed
VLV	Valve
VMAX	Maximum speed
VMC	Visual Meteorological Conditions
VMCA	Minimum Control Airspeed
VMCG	Minimum Control Speed Ground
VMO	Maximum Operating Speed
VOR	VHF Omnidirectional Range
VR	Rotation Speed
VREF	Reference Speed

VRNP	Vertical Required Navigation Performance
V/S	Vertical Speed
VSI	Vertical Speed Indicator
VTK	Vertical Track
V1	Critical engine failure speed
V1 (MCG)	Minimum V1 for Control on the Ground
V2	Takeoff safety speed
W	
WATRS	Western Atlantic Route System
WDR	Weight Data Record
WGS-84	World Geodetic System of 1984
WHC	Window Heat Computer
WHL	Wheel
WPT	Waypoint
WT	Weight
WTB	Wing Tip Brake
WXR	Weather Radar
X	
X-BLEED	Crossbleed
X-FEED	Crossfeed
XFR	Transfer
XPDR or XPNDR	Transponder
XTK	Cross Track
Z	
ZFCG	Zero Fuel Weight Center of Gravity
ZFW	Zero Fuel Weight

Preface

Revision Record

Chapter P1

Section 4

Revision Notification Transmittal Letter

To: All holders of Delta Air Lines, Inc. Operations Manuals.

Subject: Operations Manual Revision.

This revision reflects the most current information available to Delta Air Lines, Inc. through the subject revision date. The following revision highlights explain changes in this revision. General information below explains the use of revision bars to identify new or revised information.

Revision Record

No.	Revision Date	Date Filed	No.	Revision Date	Date Filed
0	January 1, 2010		1	April 11, 2010	
2	June 14, 2010		3	August 9, 2010	
4	November 1, 2010		5	February 3, 2011	
6	April 1, 2011		7	September 15, 2011	
8	January 5, 2012		9	November 7, 2012	
10	March 26, 2013		11	July 18, 2013	
12	September 10, 2013		13	February 25, 2014	
14	August 12, 2014		15	January 27, 2015	
16	September 8, 2015		17	December 29, 2015	
18	June 3, 2016				

General

Delta Air Lines, Inc. issues operations manual revisions to provide new or revised procedures and information. Formal revisions also incorporate appropriate information from previously issued Fleet Bulletins.

The revision date is the approximate date the revision material is distributed and considered current. The revision should be incorporated on the revision date, but may be incorporated as much as 21 days after the revision date.

Formal revisions include a Transmittal Letter, a new Revision Record, Revision Highlights, and a current List of Effective Pages. Use the information on the new Revision Record and List of Effective Pages to verify the operations manual content.

The Revision Record should be completed by the person incorporating the revision into the manual.

Filing Instructions

This revision is a complete reprint of the Volume 1 as indicated on the List of Effective Pages.

Revision Highlights

This section (P1.4) replaces the existing section P1.4 in your manual.

Pages containing revised technical and non-technical material have revision bars associated with the changed text or illustration.

Repaginated material not containing technical revisions are identified only by a new page date.

Flight Ops Publications is transitioning to the corporate standard of “A319/320/321,” as opposed to “A-319/320.” This change will be made on an attrition basis.

Chapter P1 - Preface

Section 2 - Introduction

P1.2.3 - Added human factors to FCTM description.

Section 3 - Abbreviations

P1.3.4 - Added First Officer to Abbreviation Table.

Chapter L - Limitations

Section 10 - Operating Limitations

Operational and Environmental Limitations

L.10.2 - Revised Delta Special Pages to Company Pages.

Autoflight Approaches

L.10.9 - Added RNAV (RNP)

Automatic Landing

L.10.10 - Revised Maximum wind limitations for A319.

L.10.11 - Removed sentence about performance on snow or icy runways.

Chapter NP - Normal Procedures

Section 12 - Operational Procedures

- NP.12.1 - Incorporated FB 16-01 Automation Policy Changes.
- NP.12.2 - Incorporation of FB 16-01 Automation Policy Changes.
- NP.12.4 - Removed All Approaches Standard Callout table to align with FB 16-01 Automation Policy Changes.
- NP.12.9 - Updated Airway Manual Reference.

Section 20 - Amplified Procedures

- NP.20.14,27,31 - Revised Delta Special Pages to Company Pages.
- NP.20.20 - Added A319/320 effectivity, A321 does not have DDRMI installed.
- NP.20.21 - Revised T.O. CONFIG step to allow for flaps in takeoff position.
- NP.20.21 - Added step to check DCDUs in A321.
- NP.20.22 - Revised to verify matches actual flap position and added caution to coordinate with ground crew.
- NP.20.33 - Reordered transponder and flight deck door items.
- NP.20.37 - Added note for if exhaust fumes enter the cabin.
- NP.20.37 - Revised APU BLEED pb to ON.
- NP.20.45 - Revised statement to specify Pilot Flying.
- NP.20.47 - Added note relating to intersection takeoffs.
- NP.20.48 - Added step for PM to announce MAN FLEX or MAN TOGA after verifying FMA thrust indication.
- NP.20.49 - Added procedure to ensure APU/APU bleed off.
- NP.20.52 - Updated Airway Manual Reference and Revised Delta Special Pages to Company Pages.
- NP.20.56 - Removed callouts to align with FB 16-01 Automation Policy Changes.
- NP.20.61 - Updated First Officer engine shutdown items to align with new FCTM flows.
- NP.20.62 - Revised reference to SP.14, Brake Temperature Considerations.
- NP.20.63 - Removed groundspeed from IRS drift error recording.

Chapter NOI - Normal Operational Information

Section 3 - Approach Guidance

NOI.3.2 - Added step under Correct TO waypoint.

NOI.3.4-9 - Updated Airway Manual Reference.

NOI.3.6,8 - Added (A319) 5 knots tailwind.

NOI.3.10 - Revised to match RNAV (RNP) procedures.

NOI.3.13 - Revised Delta Special Page to Company Pages.

NOI.3.15 - Revised Description under Correct TO waypoint.

NOI.3.17 - Revised Delta Special Pages to Company Pages.

Chapter SP - Supplementary Procedures

Section 2 - Air Systems

APU On for Takeoff

SP.2.2 - Deleted note and added reference to "Packs Off for Takeoff."

Section 5 - Communications

Aircraft Communication Addressing and Reporting System (ACARS)

SP.5.6,12 - Added ACARS 602 Procedures.

Cabin Medical Communication System (Med Comm)

SP.5.37 - Revised Cabin Medical Communication System Section to add A321 information.

Section 7 - Engines, APU

Engine Start - Manual

SP.7.1 - Removed A319/320 effectivity.

SP.7.2 - Reordered manual start items.

Section 9 - Flight Controls

Slat and Flap Retraction at the Gate

SP.9.1 - Added new section, Slat and Flap Retraction at the Gate.

Section 11 - Flight Management, Navigation

ADIRS Full Alignment

SP.11.1 - Revised ADIRS Full Alignment to include A321 procedures.

ADIRS Quick Alignment

SP.11.3 - Revised ADIRS Quick Alignment to include A321 procedures.

ADIRS Status Messages (A319/320)

SP.11.6 - Revised title to ADIRS Status Messages (A319/320).

A321 Backup Navigation (NAV B/UP) Operation

SP.11.9 - Added A321 Backup Navigation (NAV B/UP) Operation section.

Flight Plan Uplink Unavailable Preflight Procedure - Pilot Flying

SP.11.13 - Revised Delta Special Pages to Company Pages.

Takeoff Data Uplink (TDU) Unavailable - Taxi Procedure

SP.11.15 - Revised Takeoff Date Uplink (TDU) Unavailable - Taxi Procedure.

A321 Multiscan Radar Operating Procedures

SP.11.24 - Updated radar panel graphic.

IRS Drift Error Recording

SP.11.28 - Removed groundspeed from IRS Drift Error Recording.

Section 16 - Adverse Weather

Cold Weather Operation

SP.16.5 - Added Engine Ice Clearing Procedure section.

SP.16.6 - Revised to state 70% N1.

SP.16.6 - Added Standing Takeoff Procedure Title.

SP.16.8 - Updated Airway Manual Reference.

Ground De/Anti-Icing Procedure

SP.16.17 - Incorporated APB 15-04.

Remote (Engine(s) Running)

SP.16.27 - Revised Delta Special Pages to Company Pages.

SP.16.27 - Incorporated APB 15-04.

SP.16.31 - Revised to removed engine start as both engines are required.

Hot Weather Operation

SP.16.31 - Added procedures for if outside air temperature is 35°C or higher.

Chapter DF - Differences

Section 11 - A321 Differences

Navigation Backup Mode (NAV B/UP)

DF.11.47 - Added Navigation Backup Mode (NAV B/UP) section.

DF.11.63-64 - Added Procedure if PWS Warning or Caution Occurs.

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Chapter P1

List of Effective Pages - FAA Approved

Section 5

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* Title Page	June 3, 2016
* Copyright	June 3, 2016
* P1.0.1-2	June 3, 2016
* P1.1.1-8	June 3, 2016
* P1.2.1-6	June 3, 2016
* P1.3.1-12	June 3, 2016
* P1.4.1-6	June 3, 2016
* P1.5.1-2	June 3, 2016
Limitations (tab)	
* L.TOC.0.1-2	June 3, 2016
* L.10.1-22	June 3, 2016
Normal Procedures (tab)	
* NP.TOC.0.1-4	June 3, 2016
* NP.10.1-8	June 3, 2016
* NP.11.1-8	June 3, 2016
* NP.12.1-12	June 3, 2016
* NP.20.1-66	June 3, 2016
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* NOI.TOC.0.1-2	June 3, 2016
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* NOI.3.1-20	June 3, 2016
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* SP.5.1-40	June 3, 2016
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* SP.7.1-10	June 3, 2016
* SP.8.1-2	June 3, 2016
* SP.9.1-2	June 3, 2016
* SP.10.1-5	June 3, 2016
* SP.11.1-28	June 3, 2016
* SP.12.1-10	June 3, 2016
* SP.13.1-2	June 3, 2016
* SP.14.1-6	June 3, 2016
* SP.15.1-2	June 3, 2016
* SP.16.1-37	June 3, 2016
Differences (tab)	
* DF.TOC.0.1-2	June 3, 2016
* DF.10.1-4	June 3, 2016
* DF.11.1-92	June 3, 2016
* Index.1.1-6	June 3, 2016

* = Revised, Added, or Deleted

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Limitations

Operating Limitations

Chapter L

Section 10

General

The A319/320/321 aircraft must be operated in compliance with Certificate Limitations of the applicable FAA Approved Airplane Flight Manual (AFM). This chapter contains Airplane Flight Manual (AFM) limitations and manufacturer recommended non-AFM operating limitations.

Limitations that are obvious, shown on displays or placards, or incorporated within an operating procedure or flight plan/performance documents are not published in this chapter.

Those AFM limitations that are incorporated into other chapters of this manual, into the Vol. 2, or into the QRH are identified with an [AFM] tag.

Note: The symbol (#) indicates recall limitations. Recall limitations are those operationally significant that must be committed to memory. Memorization is necessary because there are no placards, display indications, or markings indicating a limitation exists.

Note: A logbook entry is required any time an aircraft limitation is exceeded, e.g., overweight landing, engine exceedance, etc.

Airplane General

Operational and Environmental Limitations

General Aircraft Limitations	
Runway slope	+/- 2%
Minimum runway width	45 meters (148 feet) *30 meters (100 feet)
Note: * Operations on 30 meter runways are approved except in the case of rudder jam, rudder pedal jam, yaw damper fault, or any failure leading to loss of the nose wheel steering.	
Note: Autolands on 30 meter runways are not authorized.	
# Maximum Operating Altitude	39,100 feet pressure altitude

Maximum Takeoff and Landing Altitude	8,000 feet pressure altitude (A320) 9,200 feet pressure altitude (A319/321)
# Delta A319/320/321 crosswind limit for takeoff or landing Note: The crosswind component may be further limited by low visibility approaches, contamination, or runway width. Note: Refer to SP.16, Guidelines for Contaminated Runways.	38 kts (including gusts)
# Maximum Takeoff and Landing Tailwind Component	10 knots, or as permitted by the Company Pages.
Maximum wind for passenger door operation	65 kts
Maximum wind for cargo door operation	40 kts
Maximum wind with passenger or cargo door open	65 kts

Maneuver Limit Load Factors

Clean configurations (flaps and slats retracted): -1.0 g to +2.5 g

Slats extended and flaps retracted: -1.0 g to +2.5 g

Slats extended and flaps extended: 0.0 to +2.0 g

Weight Limitations

A319

Weights	Pounds
Maximum Taxi Weight	155,205
Maximum Takeoff Weight	154,323
Note: Maximum taxi and takeoff weights may be less if limited by CG.	
Maximum Landing Weight	134,481
Maximum Zero Fuel Weights:	125,663

A320

Weights	Pounds
Maximum Taxi Weight	167,330
Maximum Takeoff Weight	166,448
Maximum Landing Weight	142,198
Maximum Zero Fuel Weights:	
• Ships 3209-3250	133,379
• Ships 3251-3278	134,481

A321

Weights	Pounds
Maximum Taxi Weight	197,093
Maximum Takeoff Weight	196,211
Maximum Landing Weight	171,519
Maximum Zero Fuel Weights:	162,701

Note: Under emergency or non-normal conditions where the flight cannot continue to its destination, an immediate landing is permitted provided the Overweight Landing procedure (QRH Miscellaneous section) is followed.

Oxygen

Minimum Flight Crew Oxygen Pressure

The following table shows the minimum allowable bottle pressure (in PSI) for the crew oxygen system.

Reference Temperature (°F)	20	30	40	50	60	70	80	90	100	110	120
2 Crew Members	480	490	500	510	520	530	540	550	560	570	580
2 Crew Members +1 Observer	620	635	645	660	670	680	695	710	720	730	745
2 Crew Members +2 Observers	770	790	810	820	835	850	870	885	900	915	940

Note: On the ground, the average of the OAT and flight deck temperature should be used as the reference temperature; in flight use the flight deck temperature minus 18°F.

Note: The minimum oxygen pressure provides enough oxygen to supply the flight deck crew for at least two hours at 10,000 feet MSL if oxygen is required for abnormal conditions. This limitation does NOT restrict the dispatch of normal flights in excess of two hours.

Portable Oxygen Bottle Requirements for First Aid Use

Passenger portable oxygen bottles must indicate within the full range. If a bottle is missing or the pressure is below the FULL range, contact Dispatch for possible MDM relief.

Speed Limitations

A319/320/321 Maximum Operating speed Vmo/Mmo:

- Vmo - 350 kts
- Mmo -.82 Mach

Maximum operating limit speed (Vmo/Mmo) may not be deliberately exceeded in any regime of flight.

Configuration	A320 VMCG (CFM56-5-A1)	A320 VMCG (CFM56-5-A3)	A319 VMCG (CFM56-5-A5)	A321 VMCG (CFM56-5B)
Flaps 1+F	105 kts	109 kts	107 kts	110 kts
Flaps 2	104 kts	107 kts	107 kts	110 kts
Flaps 3	103 kts	106 kts	107 kts	109 kts

Flap Operating Speeds

Placarded Flaps/Slats Extended Speed:					
Flaps	1	1+F	2	3	Full
A319/320 VFE	230 kts	215 kts	200 kts	185 kts	177 kts
A321 VFE	235 kts	225 kts	215 kts	195 kts	190 kts

Note: A logbook write-up is required if the above VFE speeds are exceeded.

Flaps/Slats Extension Speed (DELTA):					
Flaps	1	1+F	2	3	Full
A319/320 VFE-10	220 kts	205 kts	190 kts	175 kts	167 kts
A321 VFE-10	225 kts	215 kts	205 kts	185 kts	180 kts

Note: Do not exceed Delta limit speeds for flap extension (except as directed by a non-normal procedure or during flap retraction). At high gross weights, use the higher of either VFE - 10 or lowest allowable speed for the configuration.

Landing Gear Maximum Operating Speeds

The maximum operating speed with landing gear down is 280 KIAS or .67 Mach.

The Delta Air Lines limit for operating speed during landing gear extension is 240 KIAS. The placarded maximum operating speed during landing gear extension is 250 KIAS.

The maximum operating speed for landing gear retraction is 220 KIAS.

Landing Gear Tire Speed

The landing gear tires are limited to a ground speed of 195 kts.

Flight Deck Window Speed

The maximum speed with the flight deck window open is 200 kts.

Windshield Wiper Speed

The maximum speed for operating windshield wipers is 230 kts.

Turbulent Air Penetration Speed

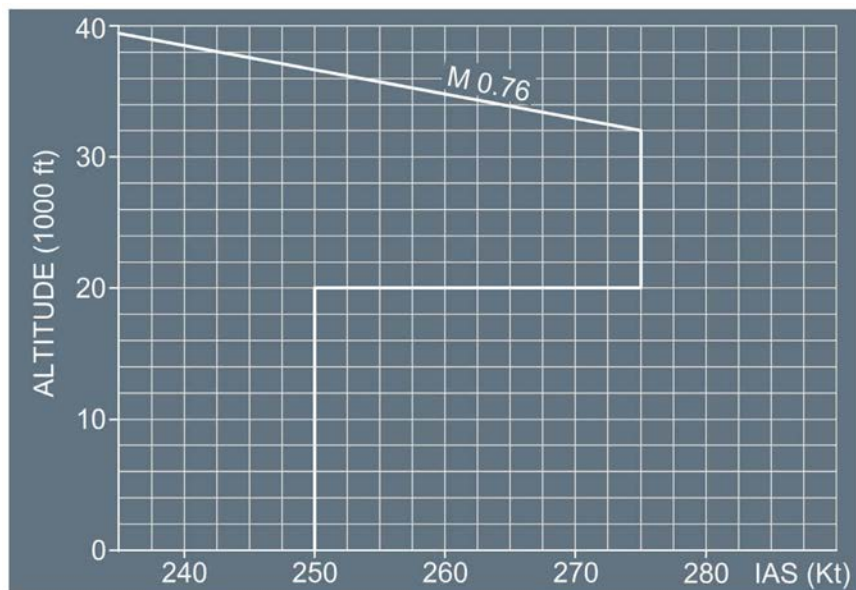
Below 20,000 feet, maintain 250 kts (A321 270 kts).

At or above 20,000 feet, maintain 275 kts (A321 300 kts) until intercepting 0.76 mach.

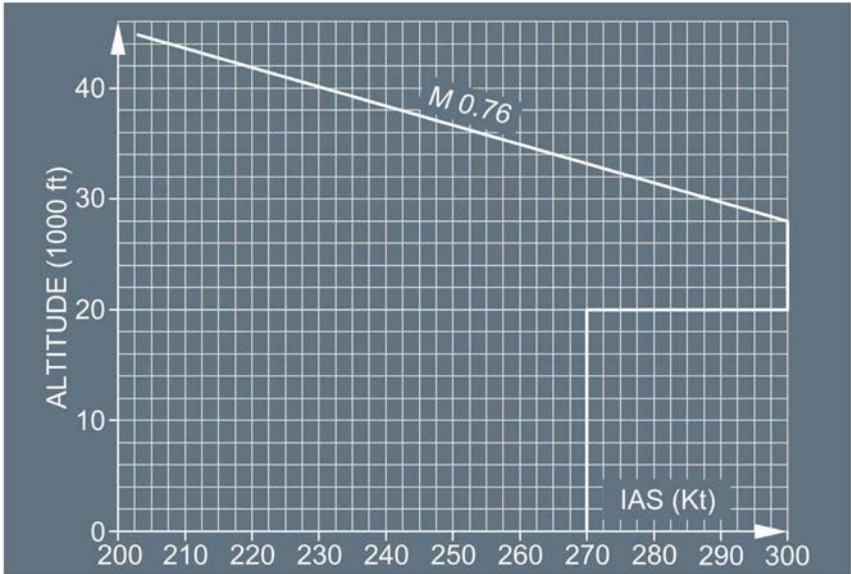
Note: The charts below identify target speeds that will provide a 0.5g buffet margin. The target speed is the recommended speed to prevent structural damage. Flight close to this speed will give the best protection against loss of control.

Target Speed

Turbulent Air Penetration Speed Chart (A319/320)



Turbulent Air Penetration Speed Chart (A321)



Emergency Equipment

With passengers on board, the escape slides must be armed (verified on ECAM) before moving the aircraft away from the gate and must remain armed until the aircraft returns to the gate.

Air Systems

Air Conditioning and Cabin Pressurization

Maximum differential pressure (relief valves)	8.6 psi
Maximum negative differential pressure	-1.0 psi

Note: The values above approximate the pressure at which the safety valves will open. Acceptable tolerance on the safety valves is +/- 0.1 PSI

Ram Air

The ram air inlet must not be opened unless the differential pressure is less than 1.0 PSI.

Ground Air

Do not use low pressure ground conditioned air simultaneously with the air from the aircraft air conditioning packs.

Do not use HP ground (starting) air simultaneously with APU air.

The use of external high pressure air to operate the packs on the ground is acceptable, provided the equipment is owned or controlled by Delta Air Lines.

Avionics Ventilation

When the OAT is above 49°C/120°F, do not power the avionics for more than two hours unless the avionics ventilation system is operating normally.

Anti-Ice

Engine Anti-Ice

Engine anti-ice must be ON during all ground and flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40° C SAT. Engine anti-ice must be on prior to and during descent in icing conditions, including temperatures below -40° C SAT.

Note: Do not rely on airframe visual cues to turn engine anti-ice on. Delaying the use of engine anti-ice until ice build-up is visible from the flight deck may result in severe engine damage and/or flameout.

Wing Anti-Ice

Wing anti-ice may be used to either prevent ice formation or to remove ice accumulations from the wing leading edges. The flight crew should turn wing anti-ice ON whenever there is an indication the airframe is accumulating ice. The indication may be observed on the visual ice indicator between the windshields or on the wipers.

Avoid extended flight in icing conditions with the slats extended.

If significant ice accumulates on non deiced structures, increase the target approach speed by 5 knots (Flaps FULL) or 10 knots (Flaps 3 or less) and multiply the landing distance by 1.1.

Autoflight

Minimum Altitude For Use of Autopilot(s)

The minimum altitude for autopilot engagement during takeoff and manual go-around is 100 feet AGL and at least 5 seconds after liftoff.

The minimum altitude for autopilot engagement during approach:

- ILS approach guidance with CAT 3 DUAL or CAT 3 SINGLE displayed on the FMA:

The autopilot is certified to remain engaged to an autoland/rollout or automatic go-around.

- ILS approach guidance without CAT 3 DUAL or CAT 3 SINGLE displayed on the FMA:

Disconnect the autopilot no lower than 50 feet below the DA or 112 feet AGL, whichever is higher.

- Non-ILS approaches:

Disconnect the autopilot no lower than the MDA/DDA.

- Visual approaches without approach guidance:

Disconnect the autopilot no lower than 500 feet (A321 900 feet) HAA.

Autoflight Approaches

The use of the autopilot or the flight director in the OP DES or DES mode is prohibited below 1,000 feet AGL in VMC, or below the FAF, or glideslope intercept altitude in IMC. (DAL)

Precision Approaches

The use of the autopilot and flight director with the APPR pb is approved for LDA with glideslope, CAT I ILS, CAT II ILS, and CAT III ILS approaches.

Autopilot or flight director guidance is required for CAT I approaches when the RVR is less than 4000 or visibility is less than 3/4 mile until visual contact with runway or arrival at DA.

Non-ILS Approaches

The use of the autopilot and flight director with the LOC pb is approved for localizer and LDA without glideslope approaches. The V/S or FPA mode must be used inside the OM/FAF to descend down to MDA.

The use of the autopilot and flight director in FINAL APP mode is approved for RNAV (GPS), RNAV (RNP), VOR, and NDB approaches.

Note: Raw data from the specified approach navaid must be displayed on the PFD or ND and monitored during all approaches.

DAL does not require demonstrated proficiency for hand flown non-ILS approaches in the Airbus. Therefore, when the weather is below VFR minimums (1,000/3), all non-ILS approaches will be flown utilizing the autopilot. (DAL)

Automatic Landing

Autolands may be accomplished on CAT I, II, or III runways.

Autolands are not permitted at Anchorage (PANC) or Fairbanks (PAFA) with aircraft 3209-3270 due to ADIRS magnetic variation tables.

The maximum glideslope angle is 3.15°.

The minimum glideslope angle is 2.5°.

Maximum ground reported wind conditions for automatic landing:

	A319	A320/321
Headwind	20 kts 15 knots (single engine)	30 knots
Crosswind	20 knots 10 knots (single engine)	20 knots
	Note: When operating below CAT I minimums, the crosswind is limited to 15 knots. (DELTA)	
Tailwind	5 knots	10 knots

Autoland Landing Rollout

Automatic rollout performance has been approved on dry and wet runways.

A321:

During automatic rollout with one engine inop or one thrust reverser inop, the flight crew can use the remaining thrust reverser, provided:

- Only IDLE reverse thrust is used, and
- The crosswind does not exceed 15 kts.

Note: This limitation does not apply if the AP is selected OFF following touchdown.

Category I Operations

- Automatic landings can be made using flaps 3 or flaps FULL (dual or single engine).

Category II Operations

- At least one autopilot must be engaged in APPR mode.
- CAT 3 SINGLE or CAT 3 DUAL must be displayed on the FMA from the outer marker until touchdown.
- Approach must terminate with an autoland or missed approach.

A319/321 Single Engine

- Automatic landings can be made using flaps 3 or flaps FULL.

A320 Single Engine

- Automatic landings require flaps FULL only.

Category III Operations

- Both autopilots must be engaged in APPR mode.
- CAT 3 DUAL must be displayed on the FMA from the FAF to the Alert Height.
- Approach must terminate with an autoland or missed approach.
- Single engine automatic landings are not authorized.

Electrical

The maximum continuous load for each generator is 90 KVA (100% of rated capacity).

The maximum continuous load for each TR is 200 amps.

Do not reset a tripped circuit breaker in flight. Resetting a tripped circuit breaker on the ground is only permitted if coordinated with maintenance and the cause of the circuit breaker tripping is identified. Never reset a tripped fuel pump circuit breaker.

Communications

Aircraft Communications Addressing and Reporting System (ACARS)

The datalink from the COMPANY format is limited to the transmission and receipt of messages, which will not create an unsafe condition if the message is improperly received, such as the following conditions:

- the message or parts of the message are delayed or not received,
- the message is delivered to the wrong recipient, or
- the message content may be frequently corrupted.

However, Pre-Departure Clearance, Digital Automatic Terminal Information Service, Oceanic Clearances, Weight & Balance, and Takeoff Data messages can be transmitted and received via the COMPANY format if they are verified per approved operational procedures.

HF Radio Operation

Do not operate HF radios during refueling operations.

Engines and APU

Starter Limits

There can be a maximum of four consecutive cycles of the engine starter within a 9 minute period. Each cycle can last up to two minutes (maximum) then it must be followed by a 20 second rest. After the fourth cycle, a period of 15 minutes must be allowed for cooling.

The starter must not be allowed to engage when the engine N2 RPM is above 20%.

RPM Limits

The maximum operational limits are:

N1 - Low Pressure Compressor Rotor - 102% (A321 104%).

Note: The N1 limit value is dependent on ambient conditions and bleed configuration. These may limit the N1 to a value lower than the one given above.

N2 - High Pressure Compressor Rotor - 105%

Thrust Settings/ Engine EGT Limits

Operating Condition	Temperature Limit		Time Limit
	A319/320	A321	
Starting	725°C	725°C	
Takeoff or Go Around	890°C	950°C	Normal - 5 minutes Eng Out - 10 minutes
Maximum Continuous	855°C	915°C	Unlimited

Reduced Thrust Takeoff

The use of the FLEX T/O procedure is allowed only if the aircraft meets all applicable performance requirements at the planned takeoff weight with the engines operating at the thrust available for the FLEX temperature.

The maximum FLEX temperature must not exceed the following to prevent a reduction of more than 25% of full rated takeoff thrust:

- A319-114 (-5A5 engines): ISA + 44°C
- A320-211 (-5A1 engines): ISA + 41°C
- A320-212 (-5A3 engines): ISA + 45°C
- A321-211 (-5B 3/3 engines): ISA + 43°C

Note: Delta performance products ensure that the above limitation is not exceeded.

The assumed temperature used for the FLEX T/O procedure must not be less than the actual ambient temperature.

Takeoff using the FLEX T/O procedure is not allowed when any unaccounted issues that affect performance is present (e.g., MDM item).

The use of FLEX T/O is not allowed on runways that are contaminated.

Engine Limit Display Markings

Maximum and minimum permissible limits are red.

Caution limits are amber.

The engine limit display markings on ECAM must be used to determine compliance with the maximum and minimum limits and precautionary ranges.

If ECAM markings show more conservative limits than those specified above, the limit markings shown on the ECAM must be observed.

Engine Ignition

The engine ignition must be on while operating in:

- moderate (or greater) rain
- moderate (or greater) turbulence
- volcanic dust
- standing water or slush exists on the runway

Engine Oil System

Minimum oil quantity (ECAM indicating) before engine Start Note: At idle, oil quantity indications can decrease as much as 6 quarts.	9.5 quarts + est. consumption (.5 qts/hr.)
Minimum starting temperature	-40°C
Minimum takeoff temperature	-10°C
Maximum oil temperature, continuous operation	140°C
Maximum transient oil temperature (15 minutes)	155°C
Minimum oil pressure	13 PSI

Oil temperature must be greater than -40°C for engine start and -10°C before advancing thrust levers to takeoff power.

Reverse Thrust

Ground use only.

Backing the airplane with use of reverse thrust is prohibited.

Under normal conditions, do not use maximum reverse thrust below 70 kts.

APU

APU Start Limitations

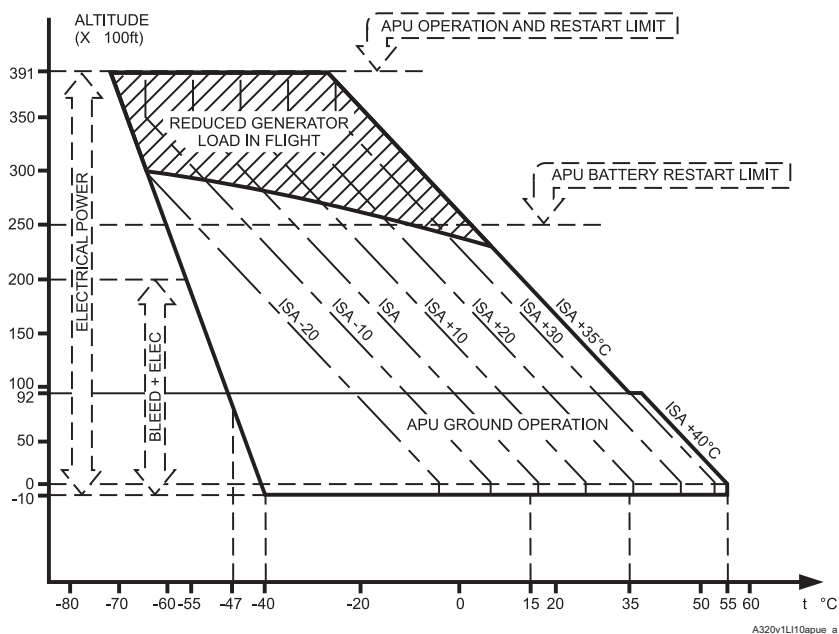
If the message LOW OIL LEVEL appears on the APU ECAM page, contact Maintenance Control before starting the APU.

The APU starter motor duty cycle is three consecutive starts or attempts with a one minute cooling period between attempts. After the third start attempt, a 60 minute cooling period must be allowed.

The maximum EGT for start is denoted by the bottom of the red arc on the Upper ECAM Engine/Warning Display.

Operating Envelope

Note: After approximately 1.5 hours of flight, an APU start above 8,000 feet cannot be assured



The maximum operating EGT is denoted by the bottom of the red arc on the APU systems page.

The Maximum N speed is 107%

Air bleed extraction for wing anti-ice is not permitted.

Flight Controls

#Do not extend the flaps/slats above FL200.

Takeoff in normal law only.

Full application of pitch, roll, or yaw controls should be confined to speeds below the maneuvering speed.

Avoid rapid and large alternating control inputs, especially in combination with large changes in pitch, roll, or yaw (e.g., large side slip angles) as they may result in structural failure at any speed, including below VA.

RVSM Operations

Altimeter (RVSM Altimeter Cross Check Limits)

Prior to takeoff the maximum allowable difference between Captain's or First Officer's altitude display and field elevation is 75 feet.

The standby altimeter must be within 300 feet of field elevation. Standby altimeters do not meet altimeter accuracy requirements for RVSM airspace.

Flight Management, Navigation

The Managed NAV function of the FMGS is approved for en route navigation and for terminal area/approach navigation.

Inertial Reference System (IRS)

Ground alignment of the IRS has been demonstrated up to 73° latitude.

In NAV mode the IRS will not provide valid magnetic heading:

- For latitude greater than 73° North
- For latitude greater than 60° South

Flight outside of the above limits is not permitted.

Weather Radar

Do not operate the weather radar in a hangar or within 50 feet of any personnel or fuel spill.

Integrated Standby Instrument System (ISIS) (A321)

When both PFDs are lost, the ISIS bugs function must not be used.

Fuel System

Minimum Fuel

Minimum fuel quantity for dispatch is 8,000 pounds and the WING TK LO LVL warning must not be displayed on the ECAM. (DAL)

Usable Fuel

Maximum fuel weight varies with specific fuel gravity. The weights in the following table are based upon 6.676 pounds per gallon. The following weights are approximate and are not limitations.

	Total	Wings	Center
A319/320	42,072 lbs	27,525 lbs	14,547 lbs
A321	41,612 lbs	27,422 lbs	14,190 lbs

Fuel Balance

All Aircraft for Dispatch

The WDR is inhibited when the total wing tank lateral imbalance exceeds 815 lbs (post re-fueling). If this occurs contact the OCC for guidance.

A319/320 Outer Tanks for Takeoff (Inner Tanks Balanced)

Maximum allowable imbalance between outer tanks is 815 lbs.

A319/320 Inner Wing Tanks for Takeoff (Outer Tanks Balanced)

Tank Fuel Quantity (Heavier Tank)	Max Allowable Imbalance
Full	1,102 lbs
6,613 lbs	2,314lbs
3,196 lbs	3,196 lbs

Note: Use linear interpolation between fuel values provided.

A321 Wing Tanks for Takeoff.

Tank Fuel Quantity (Heavier Tank)	Max Allowable Imbalance
Full	882 lbs
6,613 lbs	882 lbs
1,543 lbs	1,543 lbs

A319/320 Wing Tanks In-Flight and Landing

Tank Fuel Quantity (Heavier Tank)	Max Allowable Imbalance*
Full	3,306 lbs
9,479 lbs	3,527 lbs
4,960 lbs	4,960 lbs

* The maximum fuel imbalance shown is between inner wing tanks. (DAL). For the A319/320, an outer wing tank imbalance of 1,550 pounds (one tank empty/one tank full) is allowed provided the total fuel (outer + inner) in each wing is approximately equal.

Note: In exceptional conditions (e.g., in the case of fuel system failures) the above mentioned maximum imbalance values may be exceeded without significantly affecting aircraft handling qualities. The aircraft will remain fully controllable in all phases of the flight.

A321 Wing Tanks In-Flight and Landing

Tank Fuel Quantity (Heavier Tank)	Max Allowable Imbalance
Full	2,910 lbs
8,818 lbs	3,196 lbs
5,180 lbs	5,180 lbs

Note: In exceptional conditions (e.g., in the case of fuel system failures) the above mentioned maximum imbalance values may be exceeded without significantly affecting aircraft handling qualities. The aircraft will remain fully controllable in all phases of the flight.

Restrictions

When using JP-4 or Jet B: If wing fuel temperature exceeds 30 degrees C at engine start, limit cruise altitude to FL250 until center tank is empty.

Fuel Management

The center tank fuel must be emptied before the wing tanks are emptied unless the center tank fuel is treated as ballast.

Takeoff using center tank fuel is prohibited.

Fuel Pump Circuit Breakers

The reset of any tripped fuel pump circuit breaker is prohibited.

Engine Fuel System

The fuel and engine systems have been certified to use Jet A, Jet A1, Jet B, JP-4, JP-5, and JP-8.

In flight, the indicated fuel temperature of the fuel feeding the engines must be maintained at least 3°C above the freezing point of the fuel type being used. In no case may the tank temperature of the fuel feeding the engines exceed the following limits:

Fuel Type	Minimum Temp	Maximum Temp
Jet A	-36°C (-33°F)*	54°C (129°F)
Jet A1/JP-8	-43°C (-45°F)	54°C (129°F)
Jet B	-46°C (-51°F)	49°C (120°F)
JP-4	-54°C (-60°F)	49°C (120°F)
JP-5	-42°C (-44°F)	54°C (129°F)

* Domestic stations refueling using Jet A may provide the actual fuel freeze point of the fuel load on the fuel slip. In this case ensure the fuel temperature remains at least 3° C above the actual freeze point.

If the TAT reaches -34° C when using Jet A, the ECAM fuel page must be monitored to ensure that the fuel temperature remains above -36° C in the tanks feeding the engines.

Landing Gear

The maximum brake temperature for takeoff is 275°C (DAL)(brake fans OFF or not installed) and 150°C (brake fans ON).

The use of the autobrake system does not relieve the pilot of the responsibility to achieve a safe stop within the available runway length by using the brake pedals.

Do not apply thrust on both engines in excess of 75% N1 with the parking brake on.

Do not extend the landing gear above FL 250.

Hydraulic Power

The normal hydraulic operating pressure is 3,000 PSI plus or minus 200 PSI.

Warning Systems

Enhanced Ground Proximity Warning System (EGPWS)

Aircraft navigation is not to be predicated on the use of the terrain display.

The terrain display is only intended as a situational awareness tool, and may not provide the accuracy on which to solely base terrain avoidance maneuvers.

Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with an EGPWS warning.

The Terrain Awareness Alerting and Display must be inhibited by selecting the TERR switch of the GPWS panel to OFF if within 15 NM of landing at an airport for which any of the following conditions apply:

- The airport has no approved instrument approach procedure
- The longest runway is less than 3,500 feet in length
- The airport has incomplete runway data
- The airport/approach has the potential to produce a false terrain alert even though the FMS meets normal navigation accuracy requirements.

TCAS

Pilots are authorized to deviate from their current ATC clearance to the extent necessary to comply with a TCAS resolution advisory.

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Normal Procedures

Chapter NP

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Normal Procedures

Philosophy and Assumptions

Chapter NP

Section 10

General

A procedure, as used in this manual, is a series of tasks that are required during a particular phase of flight. Normal procedures are routinely performed on most flights and are outlined in Section 20 of this chapter. The procedures are arranged in chronological order.

Normal procedures assume:

- All aircraft systems are operating normally
- The flight deck configuration is correct before the procedure commences
- The pilot is employing the use of autoflight systems
- The pilot has knowledge and understanding of aircraft systems and limitations

The above assumptions allow normal procedures to be written to the appropriate level of detail. For additional details including recommendations and techniques, refer to the Flight Crew Training Manual (FCTM).

Philosophy and Compliance with Normal Procedures

Normal procedures provide Delta pilots with the fundamental guidance to operate a flight safely and efficiently. As such, pilots are expected to:

- have a sound knowledge and understanding of normal procedures
- routinely use and comply with the procedures on every flight

Procedures are written considering a normal operating environment. The captain may authorize a deviation from normal procedures when considered in the best interest of safety and/or in the event of a non-normal operating environment.

Normal Procedures and CRM/TEM

Normal procedures are designed to embrace the principles of Delta Air Lines' Crew Resource Management (CRM) and Threat and Error Management (TEM) strategies. For example, embedded in normal procedures are the requirements to provide briefings at key times during the flight. It is not practical, however, to include all aspects of CRM/TEM into normal procedures. Pilots must have a comprehensive understanding of Delta's CRM/TEM philosophy and use it in conjunction with normal procedures.

Terminology

May - The word "may" is used in a permissive sense to state authority or permission. Compliance is not mandatory.

Should - The word "should" is used to indicate that compliance is expected. Deviations are permitted only where an operational requirement exists.

Will, Shall, and Must - The words "will", "shall", and "must" are used in an imperative sense to state the requirement to accomplish the act prescribed. Compliance is mandatory unless an emergency situation exists where compliance would not be in the interest of safety.

Guide - A "guide" is a document that assists the pilot in conducting a normal procedure. The use of a guide is not mandatory.

Crew Duties and Responsibilities

The captain retains final authority for all actions directed and performed.

Crew duties are divided between the pilot flying (PF), pilot monitoring (PM), captain (C), and first officer (F).

The captain's general responsibilities during ground operations include:

- calling for checklists, and
- taxiing.

The first officer's general responsibilities during ground operations include:

- monitoring taxi,
- checklist reading,
- communications, and
- tasks requested by the captain.

The captain is responsible for assigning the PF role. Normally the PF/PM roles remain unchanged throughout the flight but the captain may change the assignments at any time due to operational needs.

The PF's general responsibilities during flight are:

- flight path management and airspeed control,
- aircraft configuration,
- navigation, and
- calling for checklists.

The PM's general responsibilities during flight are:

- monitoring flight path, airspeed, aircraft configuration, and navigation;
- checklist reading;
- communications; and
- tasks requested by the PF.

Tasks Excluded from Normal Procedures

The following procedures are not addressed in NP.20:

- flight deck lighting,
- crew comfort tasks,
- exterior lighting (Refer to NP.12, Exterior Lights Usage), and
- communication procedures.

Aircraft Configuration Changes During Normal Procedures

Prior to taxi, the flaps will be selected to the takeoff or default position.

During flight, the PF will call for any gear or flap change; the PM will verify that the airspeed is appropriate before accomplishing the change. If operational necessity requires an immediate configuration change and the PM is occupied with other duties, the PF may announce the change and move the appropriate control. This should be understood as the exception and not the rule.

After landing, no configuration changes shall be made until clear of the active runway, or until the aircraft has reached taxi speed when a 180° turn is required.

Sequence, Flow and Responsibility for Tasks

The specific tasks within a procedure are arranged in a logical order. The sequence of the tasks within a procedure may be changed as necessary.

Tasks are accomplished from memory (with the exception of the Secure procedure). This sequence is referred to as a flow pattern. Flow pattern guides assist in learning the sequence and are located in the Flight Crew Training Manual (FCTM).

Tasks are assigned to and normally performed by a specific pilot. The other pilot may perform the task.

Use of Triggers

A “trigger,” is an event that initiates a procedure or task. Procedures start with a trigger statement. For example, the trigger used to commence the Pushback procedure is:

When all exterior doors are closed and the cabin is ready for pushback:

Triggers are also used within a procedure to define when a task or a series of tasks are normally accomplished.

Operational flexibility may dictate adjusting a particular trigger.

Aircraft Limitations in Normal Procedures

Aircraft limitations are generally found in the Limitations chapter of this manual and are not normally repeated in normal procedures. There are procedures, however, that are defined ideally when in context with a limitation. In these cases, the limitation will be referred to or embedded in the normal procedure. Pilots need to be aware that normal procedures do not always refer to limitations when they are applicable. Pilots must have a fundamental knowledge and understanding of aircraft limitations.

AFM limitations incorporated into a normal or supplementary procedure in the Volume 1, any section of the Volume 2, or any section of the QRH are identified with an [AFM] tag.

Relationship Between Procedures and Checklists

A normal checklist usually follows the completion of a normal procedure. The name of the checklist is either identical to the procedure that precedes it or is preceded with “After.” For example:

- After completing the Taxi procedure, the captain calls for the Taxi checklist.
- After completing the Takeoff procedure, the PF calls for the After Takeoff checklist.

Not all tasks within a procedure appear on the checklist that follows. Delta uses criteria that include input from human factor experts, FAA requirements, and fleet standardization to determine what tasks rise to the level that requires inclusion on a normal checklist.

Normal Procedures Construction

Table Header

Except for inspections and preflight procedures that are assigned to one crewmember, normal procedures are shown in a two-column table format. The column header indicates the crewmember responsible for each task. The pilot normally assigned the task is identified in the table header as follows:

- Pilot Flying,
- Pilot Monitoring,
- Captain,
- First Officer,
- Any Crewmember (Secure procedure only).

Table Cells

Each cell represents either:

- a single task;
- multiple related tasks;
- a warning, caution, or note;
- clarifying information; or
- a trigger.

When the cell only appears in one column, the task is assigned to that pilot. When the table cell spans both columns, the task is applicable to both pilots. Due to space limitations and/or complexity, a task can span both columns but will be assigned to one pilot.

The following conventions are used to assign a task within a cell:

- (C) - captain
- (F) - first officer
- (PF) - pilot flying
- (PM) - pilot monitoring

Cell Content

Triggers appear across both columns in bold text and do not have a bullet.

A task is identified with a bullet (●). When the task requires a control to be positioned, the name of the control device appears followed by the position in which it is to be placed. When either the control or position is labeled on the flight deck, the terms are capitalized. For example:

- **EMERGENCY LIGHTS** switch - OFF

Warnings and cautions appear before the task they affect. Notes will appear after the task they affect.

References

When it is deemed to be beneficial to refer the reader to another informational source, the notation “Refer to ____” is used.

Separate Tables within a Procedure

On some procedures a separate shaded table is used. The separate table contains tasks that are not part of the associated procedure and have one of the following characteristics:

- The tasks does not fit within the time-ordered flow of the procedure (e.g., transition altitude).
- The tasks is not required on every flight (e.g., runway change procedure).

System Discrepancies during Ground Operations

It is the crewmember's responsibility to verify correct system response.

Before engine start, if there is a discrepancy noted:

- Verify that the system controls are set correctly.
- Check the respective circuit breaker as required.
- Test the respective system light as required.
- Refer to computer reset procedures if necessary.
- Check the Mechanical Dispatch Manual (MDM) to decide if the condition has a dispatch effect.
- Decide if maintenance is needed.
- For Class II messages, check the MDM. Most Class II messages allow dispatch as long as dispatch is contacted and a logbook write-up is made en route.

Note: After initial aircraft power-up or after engine shutdown, spurious Class II messages often clear themselves within several minutes.

During or after engine start, if there is a discrepancy noted:

- Complete the associated ECAM procedure.
- Complete the respective non-normal checklist (NNC).
- On the ground, check the MDM.

After engine start, the MASTER CAUTION system and ECAM messages are the primary means of alerting the flight crew to non-normal conditions or incorrect configurations.

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Normal Procedures

Chapter NP

Normal Checklist Instructions

Section 11

General

The primary purpose of the normal checklists is to ensure that the crew has properly configured the aircraft and to verify essential and critical items have been accomplished.

The explanation of each checklist is found in NP.20, Amplified Procedures section of this chapter.

Checklist Content

The checklist has the minimum items needed to operate the airplane safely.

Normal checklist items meet one or more of the following criteria:

- items essential to safety of flight that are not monitored by an alerting system;
- items essential to safety of flight that are monitored by an alerting system but if not accomplished, would likely result in a catastrophic event;
- items needed to meet regulatory requirements;
- items needed to maintain fleet commonality;
- items that enhance safety of flight and are not monitored by an alerting system;
- items that could result in injury to personnel or damage to equipment if not accomplished.

Normal Checklist Use Policy

The crew will use the checklist on every flight and for every phase of flight for which a checklist has been established.

Normal Checklist Instructions

In the event such as taxi delays where all engines are shut down while off the gate, all procedures and checklist will be performed again starting with the Pushback checklist.

Procedure versus Checklist

Before accomplishing the checklist, each crewmember will configure all controls and systems in accordance with the associated normal procedure. The checklist is then used to verify essential procedural tasks.

Additionally, when a checklist includes a challenge and response for a briefing, the associated briefing should be completed prior to calling for the checklist that contains the briefing. The checklist functions as a “check” list, not a “do” list.

The Secure checklist is the only exception to this verification philosophy. Since these items are not performed on every flight, the Secure checklist may be accomplished as a “read and do” checklist.

Procedural Errors or Omissions

If during the execution of a checklist the airplane configuration does not agree with the needed configuration:

- Stop the checklist.
- Complete the respective procedural steps.
- Continue the checklist.

If it becomes apparent that an entire procedure was not accomplished:

- Stop the checklist.
- Complete the entire procedure.
- Accomplish the entire checklist from the start.

Checklist Initiation and Completion

On the ground, the captain calls for the checklists and the first officer reads the checklists. In flight, the PF calls for the checklists and the PM reads the checklists. If a checklist is required but has not been called for, the other pilot should query the pilot responsible for calling for the checklist.

Whenever possible, accomplish checklists before or after high workload times.

Normally checklists are not called for until all associated procedural items are complete and there is an expectation that the checklist can be completed without interruption. The Preflight checklist, however, may be initiated before the completion of the logbook and/or fuel required tasks. If either or both of these tasks are not complete, the checklist will be read up to the last completed task. When the remaining task(s) has been completed, the checklist will be continued. Additionally, when the transition level is below 10,000 feet, the Approach checklist should be started, but will not be considered complete until the local altimeter is read.

Crewmembers may need to suspend a checklist for a short time to accomplish other tasks. The checklist should not be stowed prior to completion. If the interruption is short, continue the checklist with the next step. If a crewmember is not sure where the checklist was interrupted or the interruption is for an extended period of time, re-accomplish the checklist from the beginning.

After resuming the checklist, all checklist challenges and responses must be made by the designated pilot(s) before calling the checklist complete and stowing the checklist.

When all items of the checklist have been completed satisfactorily, the pilot reading the checklist shall announce “___ CHECKLIST COMPLETE” and may stow the checklist.

If all pilots vacate the flight deck after accomplishing the Preflight checklist, the checklist must be re-accomplished.

Shutdown Reminders

The Normal Checklist (hardcard) includes first-flight-of-the-day and shutdown reminders. They are on the hardcard as a convenient means to recall tasks that may have to be performed.

Checklist Response Designators

Located on the right side of specific checklist response items are designators indicating which crewmembers must verbalize a response. Items that do not have designators are to be accomplished silently.

The following designators are used:

- C - captain,
- F - first officer,
- C&F - captain and first officer,
- PM - pilot monitoring,
- All - all flight deck crewmembers.

If a checklist item is identified with a C&F, a dual response is required. The first response will be made by the pilot being challenged, the challenger will then respond.

Checklist Challenges

Checklist challenges identify the control or task to be checked. The pilot reading the checklist shall read the specific challenge as written.

When a checklist challenge does not end with “switch” or “lever”, the challenge refers to system status. For example, “Landing Gear...”, refers to the status of the landing gear, not just the position of the lever.

When a checklist challenge ends with “switch” or “lever”, the challenge refers to the position of the switch or lever. For example, “Engine start levers...” refers to the position of the levers.

Checklist Responses

Checklist responses are spoken as written although some items may use abbreviations due to hardcard space limitations.

When a checklist response is shown in all capital letters it refers to switch or lever position. For example, “Engine start levers...CUTOFF.”

When a checklist response is written in lower case it refers to the status of the associated system. For example, “Landing gear...down.”

Tailored responses are included where appropriate.

When a checklist response does not allow the use of a specific switch position, the following terms are used as a response:

- A blank line “____” requires a unique response and is used when the response is a variable value; such as takeoff thrust, altimeters, bugs, flaps, slats, or stabilizer trim settings.
- **as reqd** means alternatives are available. Respond with the actual position of the control. For example, “Autobrakes....LO”.
- **ckd** means that controls or other systems have been evaluated/tested for proper system operation.
- **complete** indicates the associated procedure and/or procedural task in its entirety has been completed.
- **deferred** indicates this item will be accomplished on a subsequent checklist due to system requirements.
- **entered** indicates information, values or selections associated with the procedure have been correctly loaded in the appropriate location.
- **set** indicates panel switches, knobs, or bugs are verified to be in the correct position or the correct value has been entered.
- **verified** indicates the challenged items are correctly entered, annunciated, or have otherwise been confirmed to be correctly displayed.
- **xckd** indicates the associated value or setting has been confirmed to have been entered correctly at all locations, as specified.

An explanation of the checklist response appears in the Amplified Procedures section of this chapter when the response:

- is not obvious on how the procedure is verified and/or what needs to be verbalized,
- is not addressed at all in the procedure, or
- has a blank line “____.”

Verification of Checklist Items

When performing a checklist requiring verbalization, the crew will progress to the next item only after the response is confirmed by the crewmember being challenged.

The crewmember responding to a checklist challenge must confirm the task or procedure was completed by:

- visually verifying the checklist item, or
- observing the item was completed, or
- confirming completion with the crewmember who accomplished the procedure.

When responding to a checklist item, a visual verification must be accomplished, when possible.

Runway, Intersection, Departure, Performance Data, or Approach Changes, or Go-Around

A ■ indicates items that should be considered for re-accomplishment in the event of a runway, intersection, departure, performance data, or approach change, or go-around.

Takeoff

In the event a runway, intersection, departure, or performance data change occurs after completing a checklist the captain should call for the runway/departure change items. After the necessary procedural steps are accomplished, the first officer will verbalize each change item by stating the challenge to the item. The designated crewmember(s) will respond with either:

- “NO CHANGE” for an item, or
- the appropriate checklist response for the item that changed.

Landing

In the event a runway or approach change occurs after completing a checklist the pilot flying (PF) should call for the runway/approach change items. After the necessary procedural steps are accomplished, the pilot monitoring (PM) will verbalize each change item (if not previously briefed) by stating the challenge to the item. The designated crewmember(s) will respond with either:

- “NO CHANGE” for an item, or
- the appropriate checklist response for the item that changed.

Note: If the landing runway assignment is changed and the captain determines the runway change can be accomplished visually, the captain may choose to waive the runway change items.

Intentionally
Blank

Normal Procedures

Operational Procedures

Chapter NP

Section 12

Multi-purpose Control Display Unit (MCDU)

Before taxi, the Captain or First Officer may make MCDU entries. The other pilot must verify the entries.

Make MCDU entries before taxi or when stopped, when possible. If MCDU entries must be made during taxi, the First Officer makes the entries. The Captain must verify the entries.

In flight, MCDU entries will normally be made by the PF. When the autopilot is off, or when operating in a high workload environment, the PF should direct the PM to make MCDU entries. Both pilots should verify MCDU entries affecting lateral or vertical flight path.

Automation Guidelines

The automation policy is described in the FOM. The following guidelines are used to achieve these policies:

- Briefing should include any uncommon levels of automation and related monitoring expectations.
- Managed Climb/Descent should be used when available and appropriate during climb and descent.
- Both pilots are responsible for comparing the performance of the autoflight system with the desired flight path of the aircraft.
- All pilot-induced lateral, vertical, and speed mode changes should be verbalized by the PF and, after referencing the FMA, the PM will verbally confirm the appropriate FMA status.
- Both pilots are responsible for monitoring the FMA and/or PFD whenever any component of the autoflight system is engaged and a flight mode change occurs.

Autopilot Guidelines

The PF will verbalize when the autopilot is engaged or disengaged.

When an autopilot is engaged:

- the PF should operate the FCU and
- the PM should verbalize that the proper selections have been set.

When an autopilot is not engaged:

- the PM should operate the FCU as directed by the PF and
- the PF should verbalize that the proper selections have been set.

Flight Director Guidelines

Both pilots should turn the flight directors off when manually flying the aircraft without reference to the flight directors.

When selecting/deselecting flight directors, select either both flight directors to ON or both flight directors to OFF to prevent undesirable or unanticipated autothrust response to pitch commands.

Normal VHF Radio Management

VHF radios should normally be operated as follows:

- VHF 1 should be used for communications with ATC.
- VHF 2 should be used for communications with ramp control, station operations, and other company communications. When VHF 2 is not used for ramp or company communications, a listening watch on 121.5 should be maintained as conditions permit.
- VHF 3 should be used for ACARS datalink.

The first officer should clearly communicate to the captain the radio being used to receive taxi instructions.

Stabilized Approach

Delta defines a stabilized approach as maintaining a stable speed, descent rate, and lateral flight path while in the landing configuration.

WARNING: At any altitude, if the following stabilized approach criteria cannot be established and maintained, initiate a go-around. Do not attempt to land from an unstable approach.

No lower than 1000 feet AFE:

- Be fully configured for landing (gear and landing flaps extended).
- Maintain a stabilized descent rate not to exceed 1,000 fpm.
- Be aligned with the intended landing runway.

No lower than 500 feet AFE:

- Be on target airspeed.
- The engines are stabilized at the thrust setting required to maintain the desired airspeed and rate of descent.

Crossing the Runway Threshold:

- Positioned to make a normal landing in the touchdown zone.

Planned Deviations

- A circling maneuver and some published approaches (such as the River Visual at DCA) may require a planned deviation to the lateral stabilized approach criteria. Some published approaches require higher than standard descent rates. Verbalize all planned deviations during the approach briefing.

Unplanned Descent Rate Exceedance

- In the event of a momentary descent rate exceedance, crews may proceed as long as the descent rate exceedance is verbally acknowledged and corrective action is immediately initiated.

Standard Callouts

The following callouts will be verbalized by the appropriate crewmember. Crews should focus on the aircraft state during level-off period.

Some callouts are made automatically by aircraft aural systems. When a required callout is made automatically, it may be omitted by the appropriate crewmember.

On any approach, when the pilot flying (PF) can maintain visual contact with the runway, the “HUNDRED ABOVE” and “MINIMUMS” callouts are not required.

Note: If the Radio Altimeter is inoperative, reference the barometric altimeter for the “1,000” and “500” callouts.

TAKEOFF		
Condition	Crew Member	Callout
At 80 KIAS	PM	“80 KNOTS, THRUST NORMAL”
At V1	PM	“V1”
At VR	PM	“ROTATE”
At positive rate of climb	PM	“POSITIVE RATE”

CLIMB		
Condition	Crew Member	Callout
Approximately 1,000 feet below each assigned altitude	PM	“OUT OF __ FOR __”
Approaching transition altitude (if other than 18,000 feet)	PM	“TRANSITION ALTITUDE”

I

DESCENT		
Condition	Crew Member	Callout
Approximately 1,000 feet above each assigned altitude	PM	“OUT OF __ FOR __”
Approaching transition level (if other than FL 180)	PM	“TRANSITION LEVEL”

ALL APPROACHES		
Condition	Crew Member	Callout
Any significant deviation from planned flight path, airspeed, or descent rate	PM	“SPEED +/- __” or “SINK __”, etc.
At approximately 1,000 AGL, after confirming ECAM Landing Memo is green	PM	“1,000, CLEARED TO LAND, ALL GREEN” or “1,000, NO LANDING CLEARANCE, ALL GREEN”
Below 1,000 AGL: Any descent exceeding 1,000 feet per minute	PM	“SINK __”
At approximately 500 AGL	PM	“500”
Prior to descending below 100 feet above TDZE/Rwy Threshold Elevation: • With runway in sight (if not already called) • With runway not in sight	CA	“RUNWAY IN SIGHT” (F must acknowledge) Note: This call not required on CAT III and visual approaches. “GO AROUND” (F must acknowledge)

Non-ILS, CAT I, & CAT II APPROACHES		
Condition	Crew Member	Callout
Approximately 100 feet above minimums	PM	“HUNDRED ABOVE”
At or before minimums	CA	“APPROACH LIGHTS IN SIGHT”, or “RUNWAY IN SIGHT” or “GO AROUND” (F must acknowledge)
At minimums	PM	“MINIMUMS”

CAT III APPROACHES		
Condition	Crew Member	Callout
Approximately 100 feet above alert height (AH)	PM	“HUNDRED ABOVE”
At alert height (AH)	PM	“MINIMUMS”
	CA	“LAND” or “GO AROUND”

GO-AROUND ALL APPROACHES		
Condition	Crew Member	Callout
When a Go-Around is warranted	PF	“GO AROUND”
After proper FMA mode annunciation, announce pitch mode	PM	“SRS VERIFIED”
	PF	“FLAPS ____”
At positive rate of climb	PM	“POSITIVE RATE”
	PF	“GEAR UP”

AFTER ALL LANDINGS		
Condition	Crew Member	Callout
Verify spoilers are up	PM	“SPOILERS UP”
If spoilers are not up	PM	“NO SPOILERS”
At 80 knots	PM	“80 KNOTS”

Clearance Verification Procedures

The pilot flying (PF) and pilot monitoring (PM) should monitor and confirm all issued ATC clearances, unless operational constraints (e.g., PAs, PM leaves flight deck) prohibit. If any pilot is unsure of the stated clearance, contact ATC to verify.

Note: If a clearance, departure procedure, or route is changed, reaccomplish the clearance verification procedure.

Clearance Type	Action	
	PF	PM
Pre-Departure Clearance (PDC)/Departure Clearance (DCL) via ACARS, CPDLC, or voice On voice clearances, both pilots should monitor and at least one pilot must write down the ATC clearance.		Referencing the Departure Clearance, verbalize the departure, route of flight, altitude, and any speed restriction to the PF.
	Referencing the FMS and FCU, verbalize the departure, route of flight, altitude, and any speed restriction to the PM.	
Taxi	The captain should repeat the taxi clearance after the first officer has read the clearance back to ATC. When issued complex and/or extensive taxi instructions, at least one pilot should write down, or enter into the FMS scratchpad, the taxi clearance.	
Takeoff	Acknowledge clearance items different than previously briefed.	
Altitude	Both pilots should verify the altitude specified by either an ATC clearance or a procedure has been set correctly by stating the altitude and pointing at the altitude displayed on the PFD. Ensure the proper altimeter reference - QNH, QNE, or QFE - is set.	

Clearance Type	Action	
	PF	PM
Crossing Restrictions, Headings, and Airspeeds	Acknowledge the clearance received by repeating the new clearance.	
Class I or II Airspace	Refer to Airway Manual, Airspace & Enroute Navigation, CDRC.	

Lights Usage

Exterior Lights Usage

Exterior lights should be used in accordance with the following:

Phase of Flight	Lights Usage
Aircraft is powered	Navigation/Position lights illuminated continuously. • NAV & LOGO - 1 or 2 (or NAV - ON) • STROBE - AUTO
Engines running/aircraft moving	Anti-collision lights (beacons) illuminated immediately prior to aircraft movement or engine start, whichever occurs first. • BEACON - ON
Taxiing	Taxi light illuminated when moving or intending to move. • NOSE light - TAXI
Crossing a runway	All exterior lights illuminated. Note: Avoid using LAND and NOSE (T.O.) and STROBE lights if they will adversely affect the vision of other pilots. • NOSE light - T.O. • RWY TURN OFF lights - ON • LAND lights - ON • WING lights - ON • STROBE lights - ON
Line up and wait	All exterior lights illuminated, except the landing lights. Note: Avoid using STROBE lights if they will adversely affect the vision of other pilots. • NOSE Light - TAXI • RWY TURN OFF lights - ON • WING light - ON • STROBE lights - ON
Takeoff	All exterior lights illuminated. • NOSE light - T.O. • LAND lights - ON
In flight (at 10,000 feet)	Consider retracting the LAND lights as the aircraft accelerates above 250 knots, due to vibration.

Phase of Flight	Lights Usage
In flight (above 18,000 feet)	Exterior lights extinguished, except the anti-collision (beacon), navigation/position, and strobe lights. • NOSE light - OFF • RWY TURN OFF lights - OFF • LAND lights - OFF • WING light - OFF • STROBE lights - AUTO
In flight (below 18,000 feet)	All exterior lights illuminated. Note: Consider delaying extension of the LAND lights until the aircraft slows to 250 knots, due to vibration. Note: The NOSE and RWY TURN OFF lights may remain OFF until landing clearance has been received. • NOSE light - T.O. • RWY TURN OFF lights - ON • LAND lights - ON • WING light - ON

Note: LAND lights may be retracted if necessary to reduce airframe vibration.

Emergency Lights Usage

Emergency lights must be armed for taxi, takeoff, and landing. They are not required to be armed during either the boarding or deplaning process.

Intentionally
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Normal Procedures
Amplified Procedures

Chapter NP
Section 20

Interior Inspection - First Officer

Normally the first officer accomplishes this procedure. However, it does not preclude the captain from completing all or part of the procedure if time and conditions dictate.

It is the responsibility of the flight leader/purser to verify the cabin emergency equipment inspection is completed. For flights without flight attendants on board, refer to SP.1, Cabin Inspection-Flights without Flight Attendants.

The Interior Inspection procedure assumes that the Electrical Power Up procedure is complete. Refer to SP.6, Electrical Power Up, if required.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

Flight deck security search Complete
Refer to FOM, chapter 4, Sensitive Security Information, for information and timing requirements.

Logbook Check
All crewmembers must review the logbook to become familiar with the history and maintenance status of the aircraft.

If there is doubt concerning the status of the logbook, contact MCC via the dispatcher.

- Ensure the logbook matches the aircraft ship number.
- Ensure the Airworthiness Release has been signed by maintenance.

Note: Airworthiness Release sign-off is not required at a Delta non-maintenance station when aircraft airworthiness discrepancies do not exist.

- Review any EP-19s for special equipment and/or operating instructions.
- Consult the MDM for any operating limitations or crew operating procedures as a result of existing MELs/CDLs.

Potable water and waste tanks Check

- Confirm the potable water supply is sufficient.
- Verify the waste quantity is at an acceptable level.

STATUS page Check

Verify that only acceptable messages are shown.

Quantities Check

Check the following are sufficient for flight:

- minimum oxygen pressure 1,000 psi;

Note: If crew oxygen pressure is below 1,000 psi, check
Limitations (L.10) to determine if oxygen pressure is
adequate for flight.

- hydraulic quantities: Verify within normal range;
- engine oil quantities: 9.5 plus 0.5 quart per hour.

Required documents Check

- Aircraft Logbook
- Normal Checklists (2)
- Jeppesen Airside Flight Kits
- Quick Reference Handbook (QRH) (2)
- Mechanical Dispatch Manual
- Quick Reference Card.

EFB Mounts Check

Verify 3 EFB mounts on board.

Circuit breakers Check

Verify circuit breakers are in or collared in compliance with dispatch requirements.

Flight deck emergency equipment Check

- Fire extinguisher - Check and stowed;
 - trigger safety pin in place,
 - seal intact,
 - pressure in green band,
 - properly stowed.
- Crash ax - stowed;
- PBE - check;
 - Verify the PBE is in its stowage bracket and both plastic seals are intact.

- Escape ropes - stowed;
- Life vests - stowed;
- Gear pin storage box - closed.

A319/320

ELTArmed

Verify properly stowed and mode switch in the ARMED position.

A321

ELTSet

Verify the ELT Switch is in the Armed/Guard down position and the ON light is extinguished.

Jumpseat(s) Secure

Ensure jumpseat(s) that will be unoccupied for the flight are secured and shoulder harnesses are retracted or secured. Lap belts should be fastened in non-folding jumpseats.

Crew luggage Secure

Printer paper Check

Verify printer paper quantity, including spare rolls, is sufficient for the duration of the flight.

CKPT DOOR CONT Panel Check

Verify the CHAN 1 and 2 lights are not illuminated.
 Verify the three STRIKE lights are not illuminated.

A321

Backup CKPT DOOR CONT Panel Check

Verify the CHAN 1 and 2 lights are not illuminated.
 Verify the three STRIKE lights are not illuminated.

OVERHEAD MX Panel Check

Verify all lights are extinguished.

AUDIO SWITCHINGNORM

Exterior Inspection - Captain or First Officer

Before each flight the captain must verify the airplane is in satisfactory condition for flight. Make a complete exterior inspection, and report any discrepancies to the captain and to maintenance as soon as possible. Emphasis should be placed on tire wear, airframe or control damage, and leaking fluids.

Be aware of security issues. Refer to FOM, chapter 4, Sensitive Security Information.

Following the route below, complete the preflight at the point where the inspection began, ensuring a complete circuit around the aircraft.

Items at each location may be checked in any sequence.

Ensure that:

- surfaces and structures are clear, undamaged, not missing parts, and there are no fluid leaks;

Note: Assessing the condition of the upper wing surfaces may require viewing from inside the aircraft.

- hydraulic lines and electrical wires are secure and undamaged.
- installed placards are readable;
- gear struts are not fully compressed;
- gear pins have been removed;
- engine inlets and tailpipes are clear, cowlings are secured and undamaged, and the reversers are stowed;
- doors and access panels that are not in use are latched;
- probes, sensors, ports, vents, and drains are unobstructed, clear, and undamaged;
- skin area adjacent to the pitot probes and static ports is not wrinkled;
- antennas are not damaged;
- light lenses are clean and not damaged;
- exterior lights are illuminated in accordance with NP.12, Lights Usage.

Notify maintenance if any:

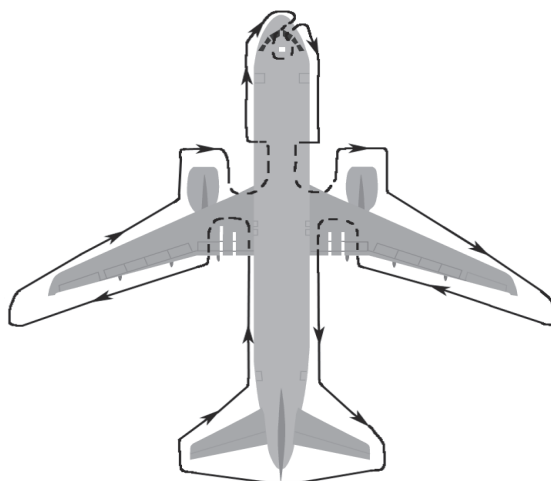
- tread groove is worn completely around the tire;
- tires are worn beyond limits, damaged, or tread is separating;
- layer of cord is showing;
- questionable cut exists;

- tire shows appearance of improper inflation;
- wheel through-bolt or nut is missing or damaged.

For Cold Weather Operation, refer to SP.16, Cold Weather Operation.

Check the following specific items during the exterior inspection:

Inspection Route



Left Forward Fuselage

Doors and access panels (not in use) Latched

Probes, sensors, ports, vents, and drains (as applicable) Check

Oxygen pressure relief green disc Check

Exterior lights Check

Nose

Radome Check

A319/320

Diverter strips - Secure

Doors and access panels (not in use) Latched

Probes, sensors, ports, vents and drains (as applicable) Check

Wipers and windshield Check

Nose Landing Gear and Wheel Well

Tires and wheels	Check
Gear doors	Check
Gear strut and nose wheel steering assembly	Check
Hydraulic lines and electrical wires	Check
Exterior lights	Check
Gear pin	Removed
APU ground control fire panel	Check
N/WS towing lever	As required
If towbar is attached, towing lever position set to towing, pin installed.	
Parking brake light indication	Check
Press to test, if not illuminated.	

Right Forward Fuselage

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Exterior lights	Check

Right Inboard Wing and Lower Fuselage

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Exterior lights	Check
Pack inlet	Check
Leading edge slat	Check
Fuel sticks	Check

Number 2 Engine

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Fan blades and spinner	Check
Thrust reverser	Stowed
Exhaust area and tailcone	Check
Pylon	Check
Engine strake	Check
Note: A319/321 inboard and outboard. A320 inboard only.	

Right Wing and Leading Edge

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Leading edge slats	Check
Fuel sticks	Check
Fuel ventilation overpressure disks (2)	Check
Ensure white marking is visible.	

Right Wing Tip and Trailing Edge

Exterior lights	Check
Static discharge wicks	Check
Control surfaces	Check
Flaps and fairings	Check
A321	
Sharklet	Check

Right Landing Gear and Wheel Well

Tires, brakes and wheels	Check
Gear strut, actuators, and doors	Check
Hydraulic lines and electrical wires	Check

Gear pin Removed

Right Aft Fuselage

Doors and access panels (not in use)..... Latched
Probes, sensors, ports, vents, and drains (as applicable)..... Check
Outflow valve Check

Tail

Doors and access panels (not in use)..... Latched
Probes, sensors, ports, vents, and drains (as applicable)..... Check
Vertical stabilizer and rudder Check
Horizontal stabilizer and elevator Check
 The horizontal stabilizer should be set at the 0 index mark.
Static discharge wicks Check
Exterior lights Check
Lower aft fuselage surface Check
 Check for evidence of tail strike damage.

Left Aft Fuselage

Doors and access panels (not in use)..... Latched
Probes, sensors, ports, vents, and drains (as applicable)..... Check
APU fire extinguisher pressure relief red disc Check

Left Landing Gear and Wheel Well

Gear strut, actuators, and doors Check
Hydraulic lines and electrical wires Check
Tires, brakes and wheels Check
Gear pin Removed

Left Wing Tip and Trailing Edge

Exterior lights	Check
Static discharge wicks	Check
Flaps and fairings	Check
Control surfaces	Check
A321	
Sharklet	Check

Left Wing and Leading Edge

Probes, sensors, ports, vents, and drains (as applicable)	Check
Doors and access panels (not in use)	Latched
Fuel sticks	Check
Leading edge slats	Check
Fuel ventilation overpressure disks (2)	Check
Ensure white marking is visible.	

Number 1 Engine

Doors and access panels (not in use)	Latched
Probes, sensors, ports, vents, and drains (as applicable)	Check
Fan blades and spinner	Check
Exhaust area and tailcone	Check
Pylon	Check
Thrust reverser	Stowed
Engine strake	Check
Note: A319/321 inboard and outboard. A320 inboard only.	

Left Inboard Wing and Lower Fuselage

Doors and access panels (not in use).....	Latched
Probes, sensors, ports, vents, and drains (as applicable).....	Check
RAM air turbine (RAT)	Stowed
Exterior lights	Check
Fuel sticks	Check
Pack inlet	Check
Leading edge slat.....	Check

Left Forward Fuselage

Doors and access panels (not in use).....	Latched
Probes, sensors, ports, vents, and drains (as applicable).....	Check
Oxygen pressure relief green disc	Check

Preflight Procedure - Pilot Flying

Normally the pilot flying (PF) accomplishes this procedure. However, it does not preclude another crewmember from completing all or part of the procedure if time and conditions dictate. In all cases both the pilot flying (PF) and pilot monitoring (PM) must confirm the FMS preflight entries.

After completing this procedure, the pilot flying (PF) should accomplish a visual scan to ensure the pilot monitoring (PM) has accomplished the flight deck set-up.

The following procedure assumes the flight plan is uplinked. If uplink is unavailable, refer to SP.11, Flight Management, Navigation section for manual flight plan entry procedures.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

ADIRS panelSet
Refer to the SP.11 Flight Management, Navigation section for ADIRS alignment instructions.

MCDUON
Verify no amber annunciator lights are illuminated.

FMSSet
A/C STATUS page Check

Select the DATA key, then select A/C STATUS on DATA INDEX page 1.

Verify the model number is A319-1XX, A320-2XX, or A321-2XX.

CAUTION: Changing the database erases the flight plan as well as the stored data.

Select other database and re-select current database to verify that all stored data has been erased.

Verify that the current database is active based upon the local date of departure. Verify that the database code begins with DAL2.

INIT A page Set

Select the INIT key on the MCDU.

Select the INIT REQUEST* prompt at 2R.

Note: Do not enter any information prior to pressing the INIT REQUEST prompt.

Note: If the FROM/TO field on the INIT A page has been populated, the INIT REQUEST* prompt will not be available. Cycling the database on the A/C STATUS page will clear this field and allow for an INIT REQUEST.

Note: FMS fuel predictions will be inaccurate until ADIRS are aligned. When alignment is complete, fuel computation should normalize.

Verify the uplinked FLT NBR field matches the flight number as it appears on the flight release.

Note: On all A319s, A321s, and newer A320s equipped with the ATSU ACARS system, the flight number can only be entered on the INIT-A page. Confirm the flight number on the ACARS FLIGHT DATA page.

Verify the uplinked COST INDEX.

Verify the uplinked CRZ FL/CRZ TEMP value.

Verify uplinked FROM and TO airports.

IRS INIT page Set

Select the IRS INIT prompt (LSK 3R) on INIT A page.

Verify the airport reference point is displayed in the LAT and LONG fields then press the ALIGN ON REF prompt.

A321 Only: With GPS Available, aircraft aligns to GPS coordinates automatically.

Note: When GPS inoperative, enter the gate coordinates, then press the ALIGN ON REF prompt.

Note: During full alignment, ALIGN ON REF prompt may not immediately be available.

Note: This step must be accomplished within 15 minutes after selecting the ADIRS Mode selectors to NAV or excessive IRS drift may occur.

Select the RETURN prompt (LSK6L).

Select WIND prompt (LSK4R).

Verify wind data received.

Note: See SP 11 Flight Management, Navigation for manual wind entry if uplink does not work.

Insert HISTORY WINDS if desired.

Note: Inserting winds from a flight that blocked in over 2 hours prior can have a negative affect on climb predictions.

INIT B PageSet

Use the arrow key to access INIT B page.

Verify the uplinked TAXI fuel (1L).

Enter the alternate fuel value from the dispatch release in the ALTN field if applicable.

Enter the reserve fuel from the dispatch release in FINAL.

Verify planned ZFW.

Verify planned BLOCK fuel.

PERF TAKE OFF page Check

Select the PERF key on the MCDU.

Consider modifying the THR RED/ACC altitudes in the event TDU is not available. Use NADP1 (1000/3000' AFE), NADP2 (1000/1000' AFE), or specific Company Pages values as appropriate.

PERF DESC page Set

Select the NEXT PHASE prompt twice; the DES page displays.

For arrivals in high demand airports enter /300 in the MANAGED field.

F-PLN page Set

Confirm routing matches flight release and ATC Predeparture Clearance (PDC).

If uplink is unavailable refer to SP.11, Flight Management, Navigation.

Enter Departure/Arrival procedures, if known.

Note: If Place/Bearing/Distance waypoints (i.e. MTU248040) appear in the Air Route Traffic Control (ARTC) routing text, enter their corresponding LAT/LONG from the flight plan into the MCDU. If an alpha/numeric waypoint (i.e. ABC12) is part of an airway in the flight plan, enter the alpha numeric waypoint. Verify the correct LAT/LONG of all alpha numeric waypoints against the flight plan. If doubt exists as to the correct LAT/LONG for a waypoint, refer to the LAT/LONG in the flight plan, the Jeppesen chart, or contact Dispatch.

Enter the planned step climb/descent altitude(s) using the STEP ALTS prompt from any vertical revision page.

Confirm the DIST at the bottom of the F-PLN agrees with the Flight Dispatch Release Acknowledgement.

SEC F-PLN page Set

Select the SEC F-PLN key then the COPY ACTIVE prompt (1L).

Enter changes to the secondary flight plan as desired.

Departure briefingComplete

Refer to FOM, chapter 3, Briefings.

Preflight Procedure - Pilot Monitoring

Normally the pilot monitoring (PM) accomplishes this procedure. However, this does not preclude another crewmember from completing all or part of the procedure if time and conditions dictate. In all cases the pilot monitoring (PM) must confirm that the Preflight Procedure – Pilot Monitoring, has been completed.

WARNING: If a red A/C OUT-OF-SERVICE tag is installed, personnel are not to activate any system, control, switch, or circuit breaker without obtaining verbal approval of maintenance personnel (preferably the mechanic performing the repairs).

First-flight-of-the-day items (if required) Check
 These checks or tests need only be accomplished prior to the first departure of the calendar day as noted in the aircraft logbook. These system tests are covered in the Supplementary Procedures chapter of this manual.

Procedure	Location
Observer Oxygen Mask(s) Test	SP.1
Flight Deck Access System Test	SP.1
APU Fire Warning System Test	SP.8
Engine Fire Warning Test	SP.8
Cargo Smoke Warning System Test	SP.8

FLT CTL panelSet

Verify all lights are extinguished.

EMER ELEC PWR panelSet

Verify all lights are extinguished and all guarded covers are closed.

GPWS panelSet

Verify all lights extinguished.

RCDR panelSet

RCDR GND CTL pb - ON

CVR TEST - Accomplish

OXYGEN panel Set

Place the CREW SUPPLY pb to on (lights out).

CALLS panel Set

Verify ATTND ADV and EMER CALL pbs are off (lights out).

WIPER panel Set

Captain's WIPER switch - OFF.

EXT LT panel Set

STROBE switch - AUTO

BEACON switch - OFF

WING switch - OFF

NAV & LOGO switch: (1 or 2) or ON

RWY TURN OFF switch - OFF

LAND switch - RETRACT

NOSE switch - OFF

SIGNS panel Set

SEAT BELTS switch - ON

NO SMOKING switch - AUTO

EMER EXIT LT switch - ARM

Verify light extinguished

INT LT panel Set

DOME switches - As desired

STBY COMPASS switch - OFF

OVHD INTEG LT knob - As desired

CABIN PRESS Panel Set

Verify the lights are extinguished and the guarded cover is closed.

LDG ELEV selector - AUTO

ANTI ICE panelSet

Verify all lights are extinguished.

AIR COND panelSet

ENG 1 and ENG 2 BLEED pbs - on (lights out).

RAM AIR pb - off (lights out) and guarded.

X BLEED selector - Rotate AUTO.

PACK 1 and PACK 2 pbs - on (lights out).

Note: PACK FAULT lights will be illuminated if no bleed air is available.

HOT AIR pb - on (lights out).

COCKPIT and CABIN zone selectors - As desired.

A319/320: PACK FLOW selector - NORM (LO if FA+Pax <= 114)

A321: ECON FLOW pb - OFF (ON if FA+Pax <= 140)

ELEC panelSet

GEN 1 and GEN 2 pbs - on (lights out).

Note: The GEN FAULT lights will be illuminated.

IDG 1 and IDG 2 pbs - on (lights out and guarded).

APU GEN pb - on (lights out).

BUS TIE pb - AUTO (lights out).

GALLEY pb - AUTO (lights out).

AC ESS FEED pb - Normal (lights out).

Preflight Battery Check - Accomplish

Refer to SP.6, Electrical.

FUEL panel	Set
Verify that all TK PUMP pbs are OFF.	
Verify the MODE SEL and X FEED pbs (A321 - CTR TK L (R) XFR pbs) for a lights out condition.	
CAUTION: (A321) If the FUEL MODE SEL pb is left in the MAN position on the ground, when the CTR TK L (R) XFR pbs are not in the OFF position, a fuel spill may result. In this configuration, the center tank fuel transfer will not stop when the wing tanks are full.	
HYD panel	Set
Verify all lights are extinguished and all guarded covers are closed.	
FIRE panel	Check
Verify all lights are extinguished and all guarded covers are closed.	
ACP 3	Set
Select the PA reception knob to up and adjust the volume to the twelve o'clock position.	
A321	
CKPT DOOR BK UP panel (A321)	Check
LKG SYS switch - NORM Verify lights extinguished.	
IN SEAT POWER SEAT SUPPLY panel	Set
(If Installed)	
PAX SYS pb - (lights out)	
FLT CTL panel	Set
Verify all lights are extinguished.	
CARGO HEAT panel	Set
AFT ISOL VALVE pb - on (lights out)	
HOT AIR pb - on (lights out)	
AFT temp selector - As desired	

CARGO SMOKE panel Check

Verify the lights are extinguished and the guarded covers are closed.

VENTILATION panelSet

BLOWER pb - AUTO (lights out).

EXTRACT pb - AUTO (lights out)

CAB FANS pb - on (lights out)

ENG panelSet

Verify all lights are extinguished and the guarded covers are closed.

WIPER panelSet

First officer's WIPER switch - OFF

Flight Control Unit (FCU) panelSet

HDG V/S - TRK FPA selection - HDG V/S

Set field elevation (or initial clearance altitude) in ALT window.

A319/320

Standby InstrumentsSet

Set local altimeter setting. Verify the standby altimeter altitude is within 300 feet of field elevation.

Verify the flight instrument indications are correct and no red flags are displayed.

A321

ISISSet

Adjust brightness, check IAS, altimeter readings and attitude display.

Check no flags - reset attitude if necessary.

Note: Use of the ISIS bugs function is not recommended.

Captain's TERR ON ND pb off (lights out)

A319/320

DDRMI Check

VOR, ADF, and compass card flags will be displayed until ADIRU 1 supplies heading information to the DDRMI.

ECAM E/WD (Engine/Warning Display) Check

Verify the Slat/Flap indications are displayed in green.

Check the engine indications (if available):

- N1 indications at zero and no reverse.
- N2 indications at zero.
- Fuel flow at zero.

Note: If the FADEC is not powered, amber XXs are displayed, do not cycle the ENG MODE selector to IGN/START at this time. Check for the above indications after selecting IGN/START during engine start.

LDG GEAR panel Check

Verify the three green lights are illuminated.

AUTO BRK panel Check

Verify all lights are extinguished.

A/SKID & NW STRG switch ON

First Officer's TERR ON ND pb Off (lights out)

Landing Gear Lever DOWN

ACCU PRESS gauge Check

WARNING: Prior to engine start, do not pressurize a hydraulic system without ground crew clearance.

Verify ACCU PRESS is near the green band. If required, use the YELLOW ELEC PUMP to recharge the brake accumulator.

Verify the alternate brake pressure (BRAKES indicators) is at or above the green band with the parking brake set.

Alternate brakes Check

Accomplish the alternate brake check. Refer to SP.14, Preflight Brake Check.

CLOCK Check

Ensure time and date are correct.

A321

Ensure UTC Selector in “GPS” position.

Note: FMS parameters and predictions may be incorrect if clock is mis-set.

ECAM SWITCHING panelSet

Verify that all selectors are in NORM.

T.O. CONFIG Check

Verify continuous repetitive chime sounds, SLATS NOT T.O. CONFIG, FLAPS NOT T.O. CONFIG displays and the Master Warning lights illuminate.

Note: If flaps/slats are in the takeoff configuration the above warnings are not triggered. No further action is required.

A321

Captain’s and FO’s DCDUs Check

The DCDUs should either be blank or display NO ACTIVE ATC.

ECAM SD (Systems Display) Check

Display the ENG page and verify oil quantity indicates adequate quantity for the flight.

Select the HYD page and verify the quantities are in the normal range.

Note: Hydraulic fluid volume can change with fluid temperature and hydraulic system activation. Even with a properly serviced hydraulic reservoir, minor hydraulic indications above the normal range are possible.

Display the STS page and check that status messages agree with the logbook/MDM.

Note: If MAINTENANCE (Class II) messages are displayed and not already addressed in the logbook, contact Dispatch for the proper MDM action or direction to make an enroute write-up.

Select the RCL pb for 3 secs to recall any previously cleared messages.

Select DOOR/OXY page and verify the crew oxygen pressure is adequate for flight.

Note: If crew oxygen pressure is below 1,000 psi, check Limitations (L.10) to determine if oxygen pressure is adequate for flight.

THRUST LEVERS IDLE

ENG MASTER 1 and 2 OFF

Verify Fire/Fault lights are extinguished.

ENG MODE selector NORM

FLOOD LT PED Set

A319/320

ATC Transponder / TCAS panel Set

TRAFFIC selector - AUTO or ON

TCAS Mode selector - STBY

ALT RPT - ON

XPDR switch - 1 or 2 (set to corresponding Pilot Flying)

Set the Transponder code for the flight.

A321

ATC Transponder / TCAS panel Set

Transponder switch (upper left) - STBY

ATC switch - 1 or 2 (set to corresponding Pilot Flying)

ALT RPTG - ON

TCAS Mode selector (upper right) - TA/RA

TCAS Traffic selector (lower right) - ALL (or ABV)

FLAPS lever Verify matches actual flap position

CAUTION: Do not move the flaps without prior coordination with the ground crew.

PARK BRK ON

LDG GEAR GRVITY EXTN	Stowed
Verify Safety Wire is intact.	
COCKPIT DOOR panel	Set
COCKPIT DOOR selector - NORM (FAULT light out)	
Verify OPEN light is illuminated with cockpit door open	
SPEED BRAKE lever	RET
RADAR panel	Set
A319/320	
SYS switch - OFF	
GAIN selector - CAL	
MODE selector - WX+T	
A321	
SYS switch - OFF	
PWS switch- AUTO	
GAIN selector - CAL	
MODE selector - WX+T	
FLOOD LT MAIN PNL and INTEG LT	Set
FMS entries	Verify

Preflight Procedure - Captain

Logbook Check

All crewmembers must review the logbook to become familiar with the history and maintenance status of the aircraft.

If there is doubt concerning the status of the logbook, contact MCC via the dispatcher.

- Ensure the logbook matches the aircraft ship number.
- Ensure the Airworthiness Release has been signed by Maintenance.

Note: Airworthiness Release sign-off is not required at a Delta non-maintenance station when airworthiness discrepancies do not exist.

- Review any EP-19s for special equipment and/or operating instructions.
- Consult the MDM for any operating limitations or crew operating procedures as a result of existing MELs/CDLs.

Flight attendant briefing Complete

Accomplish a flight attendant briefing. Refer to FOM, chapter 3, Communications.

EFIS control panel Set

FD pb - On (light illuminated)

(I)LS pb - Off (light out)

ADF-VOR 1 - Select ADF then VOR and check that ADF and VOR are not displayed in red on the lower left corner of the ND.

ADF-VOR 2- Select ADF then VOR and check that ADF and VOR are not displayed in red on the lower right corner of the ND.

Note: A321 does not have an ADF receiver installed.

ND Range selector-Set as desired.

AltimeterSet

Set the local altimeter setting.

Verify RVSM and altimeter crosscheck are within limits. Refer to L.10, Limitations, Flight Controls, RVSM Operations.

Verify no flag displayed.

AUTOLAND, MASTER WARN, MASTER CAUT and SIDE STICK
 PRIORITY lightsOff (lights out)

Flight & nav instruments Check

Note: Verify the IRS alignment is complete prior to checking the flight instruments.

PFD - check

- Verify flight instrument indications are correct
- No red flags on the PFD (SPD SEL will be displayed above airspeed tape until V2 is set)
- FMA column 5, line 2 - 1FD2

ND - check

- No red flags on the ND
- Verify route is displayed and correct

Radio management panel.....Set

Ensure STBY NAV tuning is Off.

Audio control panelSet

Window Close and lock

Ensure that the side window is closed, the handle is fully outboard, and red is visible.

Electronic Flight BagSet

Prior to the Pushback checklist, turn Airplane mode ON to ensure WiFi and Bluetooth® are turned off. The EFB must be operated in Airplane mode with WiFi disabled from the start of the Preflight checklist through the completion of the Shutdown checklist. Enabling Airplane mode with Bluetooth® off will also conserve battery life.

To turn Airplane mode ON, accomplish the following steps:

- Select SETTINGS
- Select Network icon
- Slide the Airplane mode ON/OFF switch to ON.

JEPPESEN application - Configure

The following steps are mandatory:

- Select the Jepp FliteDeck PRO tile
- Select the route icon.
- Select the down arrow to expand the route drawer
- Select New Flight, if necessary
 - In pop-up window, select OK
- Enter ORIGIN and DESTINATION airports

The following steps are optional:

- Enter ALTERNATE airport as desired
- Enter Navaids, Airways, and/or Waypoints, as desired
- Select SID
 - Select applicable departure procedure
- Select STAR
 - Select applicable arrival procedure
- Select Terminal Charts View (airplane) icon
- Select REF
 - Select applicable reference documents, e.g., local ramp procedures
- Select CO
 - Select applicable Company Pages, e.g., Engine Out Departure Procedure
- Select TAXI
 - Select applicable taxi charts
- Select enroute icon
 - Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale

Airwatch Secure Content Locker (SCL) - Configure

- Select the DELTA CONTENT LOCKER (Airwatch SCL) tile
- Open the appropriate documents/operating manuals as desired

Oxygen mask Check

Refer to SP.1, Airplane General for test procedure.

Seat Adjust

Adjust the seat for optimum eye reference.

Whenever the seat is adjusted, verify a positive horizontal (fore and aft) seat lock by pushing against the seat.

Adjust the outboard armrest for optimum arm position.

Rudder pedals Adjust

Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement.

Seat belt and shoulder harness Adjust

Fuel required Verify

Compare flight plan block fuel and actual fuel on board.

If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.

ATC clearance Verify

Refer to NP.12, Clearance Verification procedures.

Call for the Preflight checklist.

Preflight Procedure - First Officer

Logbook Check

Refer to Interior Inspection - First Officer.

EFIS control panel Set

FD pb - On (light illuminated)

(I)LS pb - Off (light out)

ADF-VOR 1 - Select ADF then VOR and check that ADF and VOR are not displayed in red on the lower left corner of the ND.

ADF-VOR 2- Select ADF then VOR and check that ADF and VOR are not displayed in red on the lower right corner of the ND.

Note: A321 does not have an ADF receiver installed.

ND Range selector-Set as desired.

Altimeter Set

Set the local altimeter setting.

Verify RVSM and altimeter crosscheck are within limits. Refer to L.10, Limitations, Flight Controls, RVSM Operations.

Verify no flag displayed.

AUTOLAND, MASTER WARN, MASTER CAUT and SIDE STICK PRIORITY lights Off (lights out)

Flight & nav instruments Check

Note: Verify the IRS alignment is complete prior to checking the flight instruments.

PFD - check

- Verify flight instrument indications are correct
- No red flags on the PFD (SPD SEL will be displayed above airspeed tape until V2 is set)
- FMA column 5, line 2 - 1FD2

ND - check

- No red flags on the ND
- Verify route is displayed and correct

Radio management panel.....Set

 Ensure STBY NAV tuning is Off.

Audio control panelSet

WindowClose and Lock

 Ensure that the side window is closed, the handle is fully outboard, and red is visible.

Electronic Flight BagSet

 Prior to the Pushback checklist, turn Airplane mode ON to ensure WiFi and Bluetooth® are turned off. The EFB must be operated in Airplane mode with WiFi disabled from the start of the Preflight checklist through the completion of the Shutdown checklist. Enabling Airplane mode with Bluetooth® off will also conserve battery life.

 To turn Airplane mode ON, accomplish the following steps:

- Select SETTINGS
- Select Network icon
- Slide the Airplane mode ON/OFF switch to ON.

JEPPESEN application - Configure

 The following steps are mandatory:

- Select the Jepp FliteDeck PRO tile
- Select the route icon.
- Select the down arrow to expand the route drawer
- Select New Flight, if necessary
 - In pop-up window, select OK
- Enter ORIGIN and DESTINATION airports

 The following steps are optional:

- Enter ALTERNATE airport as desired
- Enter Navaids, Airways, and/or Waypoints, as desired
- Select SID
 - Select applicable departure procedure
- Select STAR
 - Select applicable arrival procedure
- Select Terminal Charts View (airplane) icon
- Select REF
 - Select applicable reference documents, e.g., local ramp procedures

- Select CO
 - Select applicable Company Pages, e.g., Engine Out Departure Procedure
- Select TAXI
 - Select applicable taxi charts
- Select enroute icon
 - Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale

Airwatch Secure Content Locker (SCL) - Configure

- Select the DELTA CONTENT LOCKER (Airwatch SCL) tile
- Open the appropriate documents/operating manuals as desired

Oxygen mask Check
Refer to SP.1, Airplane General for test procedure.

Seat Adjust
Adjust the seat for optimum eye reference.
Whenever the seat is adjusted, verify a positive horizontal (fore and aft) seat lock by pushing against the seat.
Adjust the outboard armrest for optimum arm position.

Rudder pedals Adjust
Adjust the rudder pedals to allow for full rudder pedal and brake pedal movement.

Seat belt and shoulder harness Adjust

Fuel required Verify
Compare flight plan block fuel and actual fuel on board.
If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.

ACARS Set
Complete ACARS initialization. Refer to SP.5.

ATIS Obtain

ATC clearance Obtain

After receiving the clearance:

- Set the FCU as required
- Set the transponder code
- Verify ATC clearance. Refer to NP.12, Clearance Verification procedures.

Read the Preflight checklist when requested.

Preflight Checklist

Interior & exterior inspection complete C

Captain ensures the interior and exterior inspections are complete.

Circuit breakers ckd C

Recorder ON C

Passenger signs ON & AUTO C

Emergency lights ARM C

Altimeters ___, xckd C&F

Confirm the captain's, first officer's, and standby altimeter/ISIS barometric settings and barometric reference (IN or HPA) are correctly set.

Verbalize the altimeter setting.

Flight & nav instruments ckd C&F

Ensure no abnormal flags on the PFD and ND, and 1FD2 appears on the FMA.

ECAM status ckd C

Takeoff warning ckd C

Captain ensures the T.O. CONFIG Warning has been accomplished.

Radar OFF C

Parking brake set C

■ Radios & transponder set C

Ensure the communication radios are set as appropriate.

Ensure the transponder code is set as appropriate and the Transponder mode select switch is set to STBY.

Windows	closed & locked	C&F
Oxygen mask	ckd	All
Ensure the oxygen mask, regulator, and interphone test has been accomplished. Refer to SP.1.		
Flight attendant briefing	complete	C
■ Departure briefing	complete	C
Logbook and QRHs	onboard	C
Ensure the logbook is on board and the logbook review is complete.		
Ensure that each QRH is on board.		
Fuel required	___ onboard ___	C&F
Compare and verbalize flight plan block fuel and actual fuel on board.		
If actual fuel onboard is less than flight plan block fuel, ensure MIN FUEL FOR T/O plus flight plan TAXI FUEL is on board. Refer to FOM, chapter 5.		

Pushback Procedure

Captain	First Officer
Operate the APU in accordance with FOM chapter 3, Aircraft Operational Policy.	
When all exterior doors are closed and the cabin is ready for pushback:	
CAUTION: If the NW STRG DISC memo is not displayed, do not pushback or power the YELLOW hydraulic system.	
• Verify exterior doors - closed and slides armed • NW STRG DISC memo - displayed • Verify “CABIN IS READY FOR PUSHBACK” advisory has been received.	• Fuel panel - Set • Fuel pumps - on • MODE SEL - AUTO • APU BLEED - ON • Transponder - ON, (A321 AUTO), or as required by local airport operating procedures. • Flight deck door - Closed and locked.
Call “PUSHBACK CHECKLIST.”	Accomplish the Pushback checklist.
Note: The Pushback checklist must be completed prior to aircraft movement.	
When advised the ground crew is ready for pushback:	
Direct the first officer to call for pushback or engine start clearance as appropriate.	When requested by the captain, call for pushback or engine start clearance.
When pushback clearance has been received:	
• BEACON - ON • Parking Brake - OFF Note: Do not turn the beacon on or release brakes until cleared for pushback or engine start.	
Call “BEACON ON, BRAKES RELEASED, CLEARED TO PUSH.”	
CAUTION: Do not use the brakes to stop the airplane during pushback or towing. This can damage the nose gear or the tow bar.	

Captain	First Officer
With initial aircraft movement:	
If not immediately cleared for engine start, ask: “ARE WE CLEAR TO START ENGINE(S)?”	Plan engine start to be prepared to taxi upon ground crew salute.

Pushback Checklist

Fuel panel	set	F
Doors	closed	F
Ensure all doors closed and slides armed on the DOOR/OXY page.		
Flight deck door	closed & locked	F
Ensure the OPEN/FAULT light is extinguished on the COCKPIT DOOR panel.		
Transponder	ON or AUTO	F

Engine Start Procedure

Captain	First Officer
The normal engine start sequence is engine one, then engine two. Single engine taxi unless an operational necessity dictates otherwise. The captain should determine engine taxi configuration after considering aircraft weight, ramp conditions, taxiway, and maneuvering requirements. Single engine taxi out using number 1 engine is the normal procedure, conditions permitting. Single engine taxi out using number 2 engine is permitted, but must be coordinated with the ground crew. The tug driver will advise the captain when it is clear to start engine(s).	
Note: One pilot will accomplish the engine start procedure while the other will monitor the pushback. Normally the first officer accomplishes the engine start procedure.	
When cleared and ready to start:	
Announce the engine(s) to be started.	
	• ENG START selector - IGN/START Note: Wait until the engine parameters show all green before proceeding with the start. • ENG 1 MASTER switch - ON • Verify N1 and N2 rotation, oil pressure, fuel flow, and EGT indication • Monitor N1, N2, EGT, fuel flow, and oil pressure for normal indications as engine accelerates and stabilizes at idle.
	• Repeat procedure to start remaining engine, unless a single-engine taxi is planned.

Captain	First Officer
	After engine is stabilized at idle: • Start ENG 2 unless a single-engine taxi is planned
The FADEC monitors automatic starts on the ground and will abort a start when needed. Allow the FADEC to monitor and control engine starts. To reject the start, place the ENG MASTER switch to OFF. An automatic start should be aborted in the following circumstances: • when directed by the ECAM • when directed by the pushback coordinator • in case of a tailpipe fire • in case of hung start Make a logbook entry for the following: • A start attempt fails and is accompanied by a related ECAM message. • The crew has to manually abort an automatic start attempt. • A manual start attempt fails. Note: A logbook entry is not required if the FADEC aborts a start and subsequent attempts to restart are successful.	

After Start Procedure

Captain	First Officer
After starting engine(s):	
Note: If APU BLEED is used for cabin temperature management, be aware that exhaust fumes may enter the cabin. If cabin fumes are experienced, select APU BLEED OFF and X BLEED selector to OPEN.	
	In preparation for single-engine taxi:
	• ENG MODE selector - NORM • Y ELEC PUMP pb - ON • APU BLEED pb - ON • ENG ANTI ICE - As required • Refer to SP.16, Engine Anti-ice Operation - On the Ground • ECAM Status page - Check
	In preparation for two-engine taxi:
	• ENG MODE selector - NORM • APU BLEED pb - As required • ENG ANTI ICE - As required • Refer to SP.16 • APU MASTER SW pb - As required • ECAM Status page - Check if STS displayed
Call "AFTER START CHECKLIST."	Accomplish the After Start checklist.

Captain	First Officer
Receive and return receipt of the marshalling agent's taxi salute.	

Captain	First Officer
Prior to aircraft movement:	
Call, "SALUTE RECEIVED, FLAPS____."	Select flaps as directed.
Note: If the WDR is not available, select flaps to the default setting of flaps 1.	

After Start Checklist

- Yellow electric pumpas reqd F
The yellow electric pump should be OFF for two engine taxi or ON for single engine taxi.
- Engine anti-iceas reqd C
Ensure the anti-ice pb(s) are in the correct position for the current environmental conditions.
- ECAM status ckd F
If STS is displayed on the E/WD, ensure only expected Status messages are shown.

Taxi Procedure

Captain	First Officer
• Taxi Brake Check - Accomplish • Refer to SP.14, Taxi Brake Check.	
• EFBs - Set • Select JeppFD-Pro and display the 10-9 as appropriate • Select the planned assigned SID prior to Departure as desired.	
After WDR has been received:	
Performance data may be loaded into the FMS at any point after receipt of the WDR but should not interfere with other critical crew duties and responsibilities. The captain's analysis of the WDR shall not be completed while the captain is taxiing the aircraft. The balance of the Taxi procedure and the reading of the Taxi checklist should be completed during low workload times.	
• Verify the header block for the correct: • flight number • ship number • date • release number. • Verify the performance data is available for the FMS entered takeoff runway/position. • Perform a complete analysis of the following WDR blocks: • FMS • weather • performance • notes. Refer to FOM, chapter 5, Weight Data Record (WDR).	
For APU ON for takeoff, refer to SP.2, APU Bleed Takeoff.	
Referencing the WDR and Takeoff Data Uplink data:	
	• FMS F-PLN - Select • Verify correct T/O runway

Captain	First Officer
	If prior to engine start: • FMS INIT B page - Select • ZFW - Verify • ZFWCG - Verify • Block fuel - Enter actual FOB If after engine start: • FMS FUEL PRED page - Select • ZFW - Enter • ZFWCG - Enter
Direct the first officer to insert the appropriate data set (MAX TO or FLX TO).	
	• FMS PERF (TAKE OFF) page - Select • UPLINK TO DATA prompt - Select • RECEIVED TO DATA prompt - Select • NEXT PAGE - Select page with runway matching F-PLN runway • MAX/FLX TO data - Select as directed • INSERT UPLINK* prompt (for desired data) - Select
	• FMS PERF (TAKE OFF) page - Select • MAX TO or FLX TO • TEMP (if selected) - Verify • V1, VR, and V2 - Verify • THR RED/ACC - Verify
Note: Manual takeoff performance data entries are permitted when takeoff data uplinks are unavailable or the INSERT UPLINK* prompt is not displayed at LSK 6R. Refer to SP.11, Takeoff Data Uplink (TDU) Unavailable.	

Captain	First Officer
	After engine start: • Pitch Trim - Set • position THS trim wheel to WDR STAB value. • RUD TRIM RESET - Push • May be 0.0 to 0.3
When workload and conditions permit:	
Aileron and elevator - Check • Deflect sidestick for a sufficient time (minimum 1 second) and observe full travel and correct deflection on the ECAM F/CTL page. • Verify correct spoiler movement and ensure spoilers are retracted when sidestick is neutral. Note: Inboard spoilers will not deflect. Note: Both engines must be running to check flight controls. If both engines are not running, item will be deferred to the Delayed Start Procedure.	
Rudder - Check Note: Depress the PEDALS DISC pb during the rudder check to prevent nose wheel movement. Radar - Test Refer to SP.11, Flight Management Navigation, Weather Radar (WR) Test	
Flight instruments - Check • Verify proper indications.	
Call "TAXI CHECKLIST."	Accomplish the Taxi checklist.

For extended ground time:

Consider shutting down one or both engines. When departing from ramp areas where taxiing is restricted to both engines, consider shutdown of engine 2 after exiting the restricted area.

Taxi Checklist

- Flaps ____, ____, ____ C&F
Ensure the FMS and WDR flap values agree.
Confirm and verbalize:
- FLAP lever position
 - flap value from the FMS
 - indicated flap position
- Takeoff speeds ____, ____, ____ C&F
Ensure the WDR, FMS, and PFD values agree. Confirm and verbalize V1, VR, and V2 speeds.
- Thrust TOGA / FLEX ____ C&F
Ensure the WDR, FMS, and E/WD values agree. Confirm and verbalize TOGA or the FLEX temperature as displayed on the E/WD.
- Trim ____, 0 C&F
Both crew members will state the percent MAC displayed on the pitch trim wheel.
Ensure the THS pitch trim setting and the WDR TOCG values are proximate.
Rudder trim tolerance 0.0-0.3.
- Flight controls deferred/ ckd C&F
Respond with “DEFERRED” when only one engine is operating.

Delayed Start Procedure

Captain	First Officer
Initiate the Delayed Start procedure to ensure proper engine warm up.	
When ready to start:	
Announce engine start.	
	• Y ELEC PUMP pb - OFF • X BLEED selector - AUTO • APU BLEED pb - ON • ENG MODE selector - IGN/START
	• Engine Start procedure - Accomplish
After engine start:	
	• ENG MODE Selector - NORM • APU BLEED pb - As required • Refer to SP.2, APU On for Takeoff • ENG ANTI ICE - As required • Refer to SP.16, Engine Anti-ice Operation - On the Ground • APU MASTER SW pb - As required • ECAM Status - Checked
Aileron and elevator - Check • Deflect sidestick for a sufficient time (minimum 1 second) and observe full travel and correct deflection on the ECAM F/CTL page. • Verify correct spoiler movement and ensure spoilers are retracted when sidestick is neutral. Note: Inboard spoilers will not deflect.	
Rudder - Check Note: Depress the PEDALS DISC pb during the rudder check to prevent nose wheel movement.	
Call "DELAYED AFTER START CHECKLIST."	Accomplish the Delayed After Start checklist.

Engine anti-ice	as reqd	C
Ensure the anti-ice pbs are in the correct position for the current environmental conditions.		
ECAM status	ckd	F
If STS is displayed on the E/WD, ensure only expected Status messages are shown.		
Flight controls	ckd	C&F

Before Takeoff Procedure

Captain	First Officer
When a runway, intersection, departure, or performance change occurs prior to takeoff:	
- FMS data must be modified using the most recent WDR information. Refer to the Taxi Procedure for specifics. - After updating/verifying any changed items, complete the runway change boxed items and any associated procedural steps for all previously completed checklists. Note: Performance data for an intersection departure is also valid for all other takeoff positions on that runway that afford additional runway length.	

Captain	First Officer
Operate the engines for a minimum of 2 minutes before applying takeoff thrust (5 minutes for first flight of the day).	
When in proximity to the departure runway:	
	Notify the flight attendants to finalize preparations for takeoff with the following PA, “FLIGHT ATTENDANTS, PLEASE PREPARE THE CABIN FOR DEPARTURE.”
	Receive “THE CABIN IS READY FOR TAKEOFF” report from the flight leader/purser via the interphone. Refer to FOM chapter 3.
Takeoff Briefing - Complete The Pilot Flying (PF) will verify and verbalize. - runway - outside reference and ND/FMS runway - departure - first fix - H: heading mode - A: altitude constraints - A: speed constraints	

Captain	First Officer
Spoilers - ARM	- Autobrakes - MAX - T.O. CONFIG pb. - Push - Transponder RA/TA or AUTO
Fuel - Check Fuel quantity is equal to or greater than MIN FUEL FOR T/O	
Brake temperatures - Check - Delay takeoff if brake temperature exceeds 275°C (brake fans OFF or not installed) or 150°C (brake fans ON). - Brake fans (A321) -OFF prior to takeoff.	
Call "BEFORE TAKEOFF CHECKLIST."	Accomplish the Before Takeoff checklist.
Manage the radar and terrain display as required.	
WARNING: Prior to crossing a runway hold short line to either take off from or cross a runway, both crewmembers should confirm their position by comparing taxiway and runway identification signs to the taxi chart.	

Before Takeoff Checklist

- Runway position __, __ C&F

Verify and verbalize:

- the uplinked (or inserted) runway/intersection displayed in the MCDU, and
- the actual runway takeoff position observed.

Note: For intersection takeoffs, the runway intersection is not displayed on the PERF TAKE OFF page. Therefore, pilots should verify a value in the TO SHIFT field as evidence that takeoff performance data for an intersection has been uplinked.

- Flaps __, __ C&F

Confirm and verbalize:

- the uplinked (or inserted) flap position displayed in the MCDU, and
- indicated flap position

- Takeoff memoall green C&F

The takeoff configuration test and a green takeoff memo confirms that the flaps, spoilers, autobrakes, and cabin signs are in a correct position for takeoff.

- Brake tempckd F

- Takeoff briefingcomplete C

Ensure the takeoff briefing has been completed by the PF.

- Transponder RA/TA or AUTO F

- Flight attendantsnotified & acknowledged F

Re-accomplish ■ items for rwy/performance change.

Takeoff Procedure

Pilot Flying	Pilot Monitoring
When cleared for takeoff:	
Confirm alignment with the intended departure runway by reference to the ND.	
Verify brakes are released. Advance thrust levers to approximately: 50% N1. Allow the engines to stabilize momentarily then promptly advance the thrust levers to takeoff thrust. Advance the thrust levers so that TOGA/FLEX thrust is set by 40 KIAS and achieved by 60 knots.	
Verify TOGA or FLX ____ annunciated in column 1 of the FMA.	
	Announce “MAN FLEX” or “MAN TOGA” after verifying FMA thrust indication.
	Monitor engine instruments throughout the takeoff.
After takeoff thrust is set, the captain's hand must be on the thrust levers until V1.	
Monitor airspeed.	
At 80 knots:	
Verify 80 knots.	Announce, “80 KNOTS, THRUST NORMAL.”
At V1:	
Verify V1 speed.	Announce, “V1.”
At VR:	
Rotate to the takeoff pitch attitude. (SRS)	Announce, “ROTATE.”
	Monitor airspeed and vertical speed.

Pilot Flying	Pilot Monitoring
Verify a positive rate of climb on the altimeter. Call "GEAR UP."	Verify a positive rate of climb and announce "POSITIVE RATE." Position the landing gear lever to UP.
Above 400 feet AGL:	
Verify NAV or call "SELECT HEADING" as required.	Verify NAV or select HDG as directed.
At thrust reduction altitude:	
Retard the thrust levers to the CL detent.	
At the acceleration altitude:	
Reduce pitch attitude and begin acceleration. Verify acceleration. Call "FLAPS___" according to the flap retraction schedule.	Set the FLAPS as directed.
After flaps are selected up:	
	• Spoilers - Disarm. • WING Anti-ice - As required. • ENGINE Anti-ice - As required. • Select or verify APU/APU bleed - off.
Call "AFTER TAKEOFF CHECKLIST."	Accomplish the After Takeoff checklist.

After Takeoff Checklist

Flapsup

Ensure flaps up and indications normal.

Landing gear up

Ensure landing gear lever UP and landing gear up indications normal.

APU off

Climb Procedure

Pilot Flying	Pilot Monitoring
Approaching transition altitude:	
	If other than 18,000 feet, Call “TRANSITION ALTITUDE.”
• Altimeters - Set	

Pilot Flying	Pilot Monitoring
• Anti-Ice - As required	
After climbing through approximately 10,000 feet AFE, signal the end of sterile cockpit environment by:	
• (C) SEAT BELTS switch - Cycle OFF-ON to sound cabin chime twice. OR, if conditions permit: • (C) SEAT BELTS sign - OFF • (C) Ensure PA is made advising passengers to keep seat belts fastened while seated.	
After passing 18,000 feet:	
Call “CLIMB CHECKLIST.”	Accomplish the Climb checklist.

Climb Checklist

AltimetersSTD, xckd C&F
Ensure the captain, first officer, and standby altimeters/ISIS are correctly set.

Cruise Procedure

Pilot Flying	Pilot Monitoring
• Anti-ice - As required	
After reaching top of climb:	
Enroute:	
• Apply Tactical Cost Index procedures as necessary. • Monitor fuel trend. • Send turbulence report as necessary. • Send position reports as necessary. • EFB - Manage: • Select enroute icon. • Select appropriate HIGH/LOW portion of enroute charts and set an appropriate chart scale. • Monitor the battery power indicator and connect the powered keyboard when necessary. Note: An electrical outlet in the flight deck is not an approved power source. If possible, charge EFBs on rest break in the cabin or crew rest facility. • Connect the powered keyboard when the EFB battery power indicator displays 20% or less. • Conserve battery power as much as possible. During extended cruise, consider shutting down an EFB to preserve battery life. Note: All EFBs may not be off simultaneously. Maintain at least one EFB in sleep or ON mode to provide ready access to data when operational needs dictate.	

Pilot Flying	Pilot Monitoring
When approach procedure is known:	
- FMS F-PLN page - Select - Insert/modify the ARRIVAL, APPROACH, TRANS, and VIA procedure as necessary - FMS RAD NAV page - Select - Manually tune radios as necessary - FMS PERF APPR page - Select - Insert approach minimums - Insert landing environmental data - For FLAPS 3 landing: - GPWS LDG FLAP 3 pb - ON - FMS PERF APPR page - Select CONF 3 Note: Refer to NOI.3, Approach Selection Table.	
To ensure adequate obstacle clearance in conditions of extreme cold weather (-10°C or lower, or as specified in the Company Pages), refer to Airway Manual Weather, Altimeter Corrections.	
After FMS data has been entered:	
	FMS data - Verify
Approach briefing - Accomplish. Refer to FOM, chapter 3.	AUTO BRK pb - Select as briefed

Descent Procedure

Pilot Flying	Pilot Monitoring
• Anti-Ice - As required	
At top of descent or approximately 20 minutes prior to landing:	
Notify the flight attendants with a PA that includes “FLIGHT ATTENDANTS PLEASE PREPARE THE CABIN FOR ARRIVAL.” • (C) SEAT BELTS sign - ON.	
	• ECAM Status - Check if STS displayed.
Approaching transition level:	
	If other than FL 180, Call “TRANSITION LEVEL.”
• Altimeters - Set local altimeter setting	
At FL 180 or reaching top-of-descent, whichever occurs later:	
Call “DESCENT CHECKLIST.”	Accomplish the Descent checklist.

Descent Checklist

- Altimeters__, xckd C&F
 Ensure the captain, first officer, and standby altimeter/ISIS barometric settings and barometric reference (IN or HPA) are correctly set. Verbalize the altimeter setting (local or STD).
- Minimums__, ____ C&F
 Ensure the captain's and first officer's PFD minimums are set to the approach chart value.
 Verbalize “RADIO” or “BARO” and the numeric value.
- Landing Data__, ____ C&F
 Verbalize the displayed landing flap and VAPP speed.
- Approach briefingcomplete PM
 Ensure the Approach Briefing has been completed by the PF.
- Autobrakesas reqd PM
 Autobrakes should be used, if operable.
- Seat belts signON PM

Approach Procedure

Pilot Flying	Pilot Monitoring
Approaching transition level:	
	If other than FL 180, Call “TRANSITION LEVEL.”
Altimeters - Set local altimeter setting	

Pilot Flying	Pilot Monitoring
When arrival, approach, or runway changes prior to landing:	
- FMS data must be modified. - After updating/verifying any changed items, complete the Runway Change boxed items for the Descent and Approach checklists and their associated procedures. Note: If the landing runway assignment is changed and the captain determines the runway change can be accomplished visually, the captain may choose to waive the “runway change” items.	

Pilot Flying	Pilot Monitoring
Anti-Ice - As required	
Before descending through approximately 10,000 feet AFE:	
- Flight and navigation instruments - Set - Verify correct arrival and approach selected in FMS.	
At approximately 10,000 feet AFE:	
(C) SEAT BELTS switch - Cycle OFF-ON to sound cabin chime twice.	
FMS flight phase - Activate APPR PHASE, as desired.	
Note: This action may be delayed if the use of managed speed is desired to comply with speed constraints on the arrival.	
Call “APPROACH CHECKLIST.”	Accomplish the Approach checklist.

Approach Checklist

- Flight & nav instruments verified C&F
 Ensure correct arrival and approach procedures are entered.
- Cabin notification complete C
 Ensure that the cabin chime signal has been sounded twice.
- FMS flight phase APPR/DES PM
 Ensure the desired FMS flight phase is active on the PERF page.
- Altimeters ___, xckd C&F
 Ensure the captain, first officer, and standby altimeter/ISIS
 barometric settings and barometric reference (IN or HPA) are
 correctly set. Verbalize the local altimeter setting.

Landing Procedure

Pilot Flying	Pilot Monitoring
When ready to configure the aircraft for landing:	
Call “FLAPS ____” according to the flap extension schedule.	Set the FLAP lever as directed.
When cleared for the approach:	
Manage the approach in accordance with the appropriate Approach Guide and Automation Guidelines.	
Call “GEAR DOWN, FLAPS 3.”	Set the landing gear lever to DOWN. Set the FLAP lever as directed.
Arm the spoiler handle.	
At vertical path capture:	
Call “FLAPS ____” as needed for landing.	Set the FLAP lever as directed.
Call “LANDING CHECKLIST.”	Accomplish the Landing checklist.

Pilot Flying	Pilot Monitoring
No later than 1,000 feet AFE:	
	Verify the LDG MEMO is all green.
Verify missed approach altitude is set.	
Note: Provided stabilized approach criteria are observed, the timing of the configuration may be modified as necessary for a more fuel-efficient operation.	

Landing Checklist

Landing geardown C&F

Flaps ____, ____ C&F

Confirm and verbalize:

- FLAP lever position, and
- indicated flap position from the E/WD.

Spoilers ARMED PM

Ensure that SPLRS ARM appears in the LDG memo or GND
SPLRS ARMED message appears in the memo section of the
ECAM.

Go-Around Procedure

Pilot Flying	Pilot Monitoring
When a go-around requiring TOGA is warranted:	
Select TOGA thrust and announce “GO AROUND”.	Verify FMA vertical, lateral, and A/THR modes. Announce pitch mode “SRS VERIFIED”
Call “FLAPS 3(2).”	Set FLAP lever as directed.
Verify: • Rotation to SRS pitch command • Thrust setting • Proper FMA mode annunciation	
	Monitor rotation pitch and vertical speed. Verify a positive rate of climb and announce “POSITIVE RATE.”
Confirm a positive rate of climb on the altimeter.	
Call “GEAR UP.”	Position the landing gear lever to UP.
	Verify missed approach altitude is set.
Above 400 feet RA:	
Verify or call for the appropriate lateral mode.	Select or verify lateral mode.
When LVR CLB appears in column 1 of the FMA:	
• Select CL thrust detent.	
At acceleration altitude:	
Call “FLAPS ___” according to flap retraction schedule.	Set FLAP lever as directed.
If another approach is warranted at the destination airport:	
Select flaps to maintain desired maneuvering speed.	

Pilot Flying	Pilot Monitoring
When at the planned flap configuration:	
Call “AFTER TAKEOFF CHECKLIST.”	Accomplish the After Takeoff checklist. Note: Refer to NP.20, Takeoff procedure for expanded After Takeoff Checklist.

Landing Roll Procedure

Pilot Flying	Pilot Monitoring
At main gear touchdown:	
Verify thrust levers at idle.	
	Check that the spoilers show fully deployed on the ECAM WHEEL page. Call “SPOILERS UP.” Verify autobrake operation.
WARNING: After reverse thrust is initiated, a full stop must be made.	
Without delay, select reverse thrust and apply reverse thrust as required.	Verify normal reverse thrust operation.
By 80 KIAS initiate movement of reverse thrust levers to reach reverse idle detent prior to taxi speed.	At 80 KIAS call “80 KNOTS.”
Prior to taxi speed: - Position the levers in forward IDLE thrust after engines have decelerated to reverse idle. - Autobrakes - Disengage	

After Landing Procedure

Captain	First Officer
When clear of the active runway and workload permits:	
Note: Engine may be shutdown after cool down recommendations have been met.	
Spoilers - Disarm	- TCAS selector - ON - FLAP lever - UP - Weather Radar - OFF - Anti-Ice - As required (refer to SP.16, Engine Anti-ice Operation - On the Ground) - APU - As required (refer to FOM 3.4, APU Policy)
Call “AFTER LANDING CHECKLIST.”	Accomplish the After Landing checklist.

After Landing Checklist

Flaps up
Spoilers retracted
Radar OFF

Shutdown Procedure

Captain	First Officer
Engine cool down recommendations: • Run the engines for at least 3 minutes. • Shutdown may be accomplished earlier for gate arrival.	
After engine cool down recommendations have been met and single engine taxi is desired:	
Call for engine shutdown. Note: Normally ENG 2 is shut down.	When APU generator power available: • Y ELEC PUMP pb- ON • APU BLEED pb - ON • ENG 2 BLEED pb - OFF • ENG 2 MASTER switch - OFF
Approximately one aircraft length from the gate:	
	• APU BLEED - ON • ENG BLEED(s) - OFF • BRAKE FANS (A321) - as req'd
After stopping at the gate:	
• PARK BRK - ON • Call for seat belts sign off. • Call for engine shutdown. • Doors - Verify Disarmed	• SEAT BELTS switch - OFF, as directed • APU AVAIL- Verify • Engine anti-ice - off • ENG MASTER switch (es) - OFF • Yellow ELEC PUMP pb - OFF • Fuel pump pbs - OFF • BEACON - OFF • Transponder - SBY

Captain	First Officer
When engines are shut down:	
• PARK BRK - As required After the chocks are inserted, the brakes should be released for cooling. Refer to SP.14, Brake Temperature Considerations. Refer to FOM, 6.1, Parking, Brake Release.	
Call “SHUTDOWN CHECKLIST.”	Accomplish the Shutdown checklist.

Shutdown Checklist

Seat belts sign	OFF	C
Beacon	OFF	C
Engine anti-ice	OFF	C
Fuel pumps	OFF	C
Yellow electric pump	OFF	C
Engine master switches	OFF	C
Transponder	STBY	C
Parking brake	as reqd	C

Captain	First Officer
After the Shutdown Checklist is complete:	
When external power is available:	
• EXT PWR - Push • APU BLEED - off • APU MASTER SW - off • BRAKE FANS (A321) - as req'd • Configure aircraft for ground air conditioning use. Refer to SP.2, Air Systems.	
• ACARS information - Enter • Complete ACARS Postflight procedures. Refer to SP.5, Aircraft Communications Addressing and Reporting System (ACARS). • Status Messages - Check • Record appropriate messages in the aircraft logbook. • Engine oil, oxygen, and hydraulic quantities - Check • If quantities are less than the following values, make a logbook entry and notify maintenance as soon as possible. • Engine oil: 13 quarts. • Non-maintenance stations: 10 quarts • Oxygen: 1,000 psi. • Hydraulic fluid: Reservoir pointer is below the green box. • If the aircraft operated in Class II airspace for more than one hour: • IRS drift error rates - Check • Referencing the FMS: • DATA INDEX page - Select IRS MONITOR • IRS MONITOR page - Select IRS 1 (2/3) • Make a logbook entry if any IRS drift is greater than 2 nm per hour. • Logbook - Make required entries for maintenance discrepancies. • Flight deck lights and electronic displays - Set as required.	

After shutdown reminders:

- Enter appropriate ACARS information.
- Check oxygen, engine oil, and hydraulic quantities.
- Check status messages.
- Make appropriate logbook entries.
- Shutdown the APU, unless required for environmental reasons.

Secure Procedure

Captain	Any Crewmember
After coordination with local maintenance or operations:	
Accomplish the Secure checklist only when the aircraft is to remain for two hours or more. The captain will designate a crewmember to accomplish the Secure checklist. When operating the last flight of any day into a limited or non-maintenance station, accomplish the following: • If a maintenance discrepancy is noted and entered in the logbook, the MCC must be contacted through the dispatcher as soon as possible to facilitate corrective action and avoid delays. If a flight crew placard is applicable, it should be installed prior to departing the aircraft. • Perform a complete exterior inspection, in accordance with the Exterior Inspection - Captain or First Officer. If the aircraft will layover in cold weather, ensure it is configured as described in SP.16, Cold Weather Operations.	
When ready to secure the aircraft:	
Call “SECURE CHECKLIST.”	Accomplish the Secure Checklist as a “read and do” checklist
• EMERGENCY LIGHT switch - OFF • ADIRS mode selectors - OFF • OXYGEN pb - OFF • NO SMOKING switch - OFF • APU BLEED pb - OFF • Refer to SP.16 Cold Weather Operation Secure Procedure if required • APU and External power - Set as required Note: Allow the APU automatic cool down cycle to complete and the flap to close prior to removing battery power. This process takes approximately two minutes. • If only ground service power is required: • EXT PWR - AVAIL or ON light illuminated • MAINT BUS switch (located overhead in the forward entrance area) - Latched ON • EXT PWR pb - Deselect (AVAIL light illuminated) • APU MASTER SW pb - Off • BAT 1 and 2 pbs - OFF • If electrical power is not required: • APU MASTER SW pb and EXT PWR pbs - OFF • BAT 1 and 2 pbs - OFF	

Secure Checklist

Emergency lights OFF

ADIRS OFF

Oxygen OFF

No smoking sign OFF

APU bleed OFF

APU & external power as reqd

BAT 1, BAT 2 as reqd

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Normal Operational Information
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Normal Operational Information

Chapter NOI

Normal Ops Info

Section 1

Normal Ops Info

The Normal Ops Info section includes the Approach Guidance. This section provides quick reference tools for the experienced crew member. For more detailed information, refer to the Airway Manual, the FCTM, the ODM, and the FOM.

Approach Guidance

The approach guidance section begins with the Approach Selection Table. The table lists the approach type, any qualifiers for the approach, and the FCU selection(s). A page number will then direct the pilot to the recommended approach guide to be used.

Following the Approach Selection Table are the Approach Guides. The guides have been developed for each type of authorized approach and are intended to help the pilot prepare for, brief, and conduct the approach procedure. The use of an approach guide is recommended, but not required.

Following the Approach Guides is the RADIO/BARO Minimums Chart. The chart contains the landing minimum settings for all approaches.

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Normal Operational Information
Reserved

Chapter NOI
Section 2

Reserved for future use.

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Normal Operational Information

Approach Guidance

Chapter NOI

Section 3

Approach Selection Table

Approach Type	Qualifier	FCU Selection(s) Page
ILS	For PRM considerations also see pg NOI.3.3	APPR CAT I pg NOI.3.4 CAT II pg NOI.3.6 SA CAT II pg NOI.3.6 CAT III pg NOI.3.8
LDA with GS	For PRM considerations also see pg NOI.3.3	APPR pg NOI.3.4
RNAV (RNP)	GPS Required	APPR pg NOI.3.10
RNAV (GPS) RNAV (GNSS) GPS	GPS Required	APPR pg NOI.3.13
LOC (BACK CRS)		NOT AUTHORIZED
ILS GS OTS LOC LDA (no GS)		LOC FPA pg NOI.3.15
NDB VOR	Procedure in FMS Database with GP	APPR pg NOI.3.13
	NO Procedure in FMS Database	NOT AUTHORIZED
Charted Visual Flight Procedures	Procedure in FMS Database	APPR pg NOI.3.17
	NO Procedure in FMS Database	Fly using visual references
Circling Maneuver		pg NOI.3.18

Using Managed DES to Meet Altitude Constraints Prior to the Published FAF/PFAF

If above the published FAF/PFAF and unsure all altitude constraints will be complied with, and:

- Established on a published segment of the approach, or
- Vectored to a final approach course intercept heading and at or above the next waypoint altitude, or
- Cleared direct to an approach waypoint and at or above that waypoint altitude:

Correct “TO” waypoint and crossing altitude Verify

If TO waypoint sequences (becomes FROM waypoint) consider using “DIR TO RADIAL IN” to retain crossing constraint.

Note: Consider use of “DIR TO” radial inbound to retain crossing constraint.

LOC or NAVSelect or verify FMA

FCU AltitudeSet as follows:

ILS Set FAF Altitude

Non-ILSSet DA/DDA/MDA rounded up to next 100’

When LOC or NAV is captured:

Managed DESInitiate

Approaching final approach segment and sure constraints will be met.

APPR pb or charted FPA Select

ILS Precision Runway Monitor (PRM) Considerations

PRM procedureBrief Jeppesen 11-XX Pages

Primary and Monitor Frequencies - Briefed

Breakout procedureBriefed

“Breakout” Procedure

Note: All "Breakouts" must be hand flown.

Pilot Flying	Pilot Monitoring
If ATC calls “Traffic Alert” during a PRM approach:	
A/P - Disengage	F/D (both) - OFF
Maneuver as directed by ATC Note: If ATC "breakout" instructions coincide with a TCAS RA, follow the vertical guidance of the RA and the lateral guidance directed by ATC. Note: If descending, vertical speed should not exceed 1,000 FPM.	Communicate with ATC as required.
	When established on the “breakout” heading: • F/D (both) - ON
When "breakout" is complete, reset automation to appropriate level.	

ILS CAT I, LDA with GS - Approach Guide APPR Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs Takeoff Minima.

For ILS Precision Runway Monitor (PRM) Approach, refer to the ILS Precision Runway Monitor (PRM) Considerations.

Note: Approach may continue to DA(H) if established on the final segment and the controlling visibility decreases below the authorized minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual Ops Specs, Takeoff Minima.

Airport diagram Review

Autopilot As required

If operable, both the Autopilot and Flight Director will be utilized for all ILS GLS approaches when the reported weather is below 4,000 feet RVR or 3/4 mile.

EFIS (I) LS Select

FMS approach procedure Select and verify

Minimums Enter DA

When cleared for the approach:

APPR pb Push

Select when established on a published inbound segment of the approach or when on a final approach course intercept heading. Adhere to all published step down fix altitudes located outside the final approach segment.

No later than 1,000 feet AGL:

Missed approach altitudeSet

Set lowest initial level off altitude on missed approach
procedure.

Execute a Missed Approach for any of the following:

- Criteria listed in the Airway Manual, Ops Specs Takeoff Minima or
- An automatic landing cannot be safely accomplished within the touchdown zone.
- An automatic landing is being accomplished and the HW component exceeds 30 knots, tailwind component exceeds 10 knots, or the crosswind component for the landing runway is greater than 20 knots.
- Any condition which, in the judgment of the captain, jeopardizes the safe continuation of the approach.

ILS CAT II or SA ILS CAT II - Approach Guide APPR Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs, Approach Minima.

Note: Approach may continue to DA(H) if established on the final segment and the controlling RVR goes below minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual, Ops Specs Takeoff Minima.

Approaches must be flown using autoland procedures.

Maximum reported wind component to initiate approach and land:

- (A320/321) 30 knots headwind, 15 knots crosswind, 10 knots tailwind.
- (A319) 20 knots headwind, 15 knots crosswind, 5 knots tailwind.

EFIS (I) LS Select
FMS approach procedure Select and verify
MinimumsEnter

RA Authorized:

- Enter minimums in RADIO field. Minimums are determined by first officer’s radio altimeter.

RA Not Authorized:

- Enter minimums in BARO field. Minimums are determined by the first officer’s barometric altimeter or the inner marker, whichever occurs first.

Marker beacon audio (RA Not Authorized) ON

Airport diagram and SMGCS chart Review

Callouts Review

- No LAND on FMA below 400 feet - “GO AROUND.”
- No FLARE on FMA at 50 feet - “GO AROUND.”
- No ROLL OUT on FMA at touchdown - “NO ROLL OUT.”

 DELTA
A319/320/321 Operations Manual

FMA Review

FMA must display CAT 3 DUAL or CAT 3 SINGLE from the outer marker to touchdown.

When cleared for the approach:

APPR pb Select

Select when established on a published inbound segment of the approach or when on a final approach course intercept heading. Adhere to all published step down fix altitudes located outside the final approach segment.

Second Autopilot Select

No later than 1000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Execute a Missed Approach for any of the following:

- Criteria listed in the Airway Manual, Ops Specs Takeoff Minima, or
- Any of the required elements of the RVR, airborne, or ground system become inoperative.
- The FMA does not display CAT 3 DUAL or CAT 3 SINGLE from the outer marker to touchdown.
- Deviations from the glideslope or localizer in excess of 1/3 dot inside the outer marker.
- Any failure indication on the PFD or ND.
- Any failure indication on the flight instruments.
- No LAND annunciation below 400 feet.
- An autoland warning light.
- At the DA/RA: Visual reference with the approach light system has not been established.
- At the inner marker or 100 feet above the TDZE/
Rwy Threshold Elevation: Visual reference with the runway threshold environment has not been established.
- An automatic landing cannot be safely accomplished within the touchdown zone.
- No FLARE annunciation at 50 feet.
- Any condition which, in the judgment of the captain, jeopardizes the safe continuation of the approach.

- No FLARE annunciation at 50 feet.
- Any condition which, in the judgment of the captain, jeopardizes the safe continuation of the approach.

ILS CAT III - Approach Guide
APPR Mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

For any inoperative ground based equipment, refer to the Airway Manual, Ops Specs Takeoff Minima.

Note: Approach may continue to AH if established on the final segment and the controlling RVR goes below minimums. Specific foreign country exceptions may apply. For further information, refer to the Airway Manual, Ops Specs Takeoff Minima.

Approaches must be flown using autoland procedures.

Maximum reported wind component to initiate approach and land:

- (A320/321) 30 knots headwind, 15 knots crosswind, 10 knots tailwind.
- (A319) 20 knots headwind, 15 knots crosswind, 5 knots tailwind.

Airport diagram and SMGCS chart Review
EFIS (I) LS Select
FMS approach procedure Select and verify
Minimums Enter

RA Altimeter:

- Enter 100 in RADIO field. Entering in 100 allows for ‘MINIMUMS’ auto callout at 100 feet to determine Alert Height (AH).

Autobrakes Required

Callouts Review

- No LAND on FMA below 400 feet - “GO AROUND.”
- No FLARE on FMA at 50 feet - “GO AROUND.”
- No ROLL OUT on FMA at touchdown - “NO ROLL OUT.”

When cleared for the approach:

APPR pb Select

Select when established on a published inbound segment of the approach or when on a final approach course intercept heading. Adhere to all published step down fix altitudes located outside the final approach segment.

Second Autopilot Select

No later than 1000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

Execute a Missed Approach for any of the following:

- Criteria listed in the Airway Manual, Ops Specs Takeoff Minima, or
- Any of the required elements of the RVR, airborne, or ground system become inoperative.
- The FMA does not display CAT 3 DUAL from the outer marker to Alert Height (AH).
- Deviations from the glideslope or localizer in excess of 1/3 dot inside the outer marker.
- Any failure indication on the PFD or ND.
- Any failure indication on the flight instruments.
- When reported braking action is less than FAIR.
- No LAND annunciation below 400 feet.
- An autoland warning light.
- An automatic landing cannot be safely accomplished within the touchdown zone.
- No FLARE annunciation at 50 feet.
- Any condition which, in the judgment of the captain, jeopardizes the safe continuation of the approach.

RNAV (RNP) Approach Guide

APPR Mode

For approaches with inoperative equipment refer to QRH, Non-Normal Ops Info tab, RNAV Approach Equipment Requirements.

Airport temperature Confirm within limits

Autopilot Required

Use of autopilot is required to DA unless aligned with the runway and in visual conditions. Autopilot is required on all RF leg segments of the approach prior to the DA.

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

Minimums Set DA

Use Category D minimums.

Altimeters Check within 75 feet

CSTR pb Select

EFIS (I)LS pb Off

PROG page Select

RNP value (min 0.30) Enter in REQUIRED field (6L)

GPS PRIMARY Verify (5R)

DATA page Select

GPS MONITOR (3L) Select

GPS 1+2 MODE/SAT Verify green 'NAV' (3R+6R)

DATA page Select

POSITION MONITOR (1L) Select

SEL NAVAIDS (6R) Select

RADIONAV SELECTED (5L) DESELECT

Brief missed approach plan if approach is discontinued prior to DA or due to loss of navigation capability.

When cleared for the approach:

CAUTION: Do not accept a clearance direct to a waypoint that begins an RF leg.

APPR pb Select
The blue descent arrow indicates FINAL will engage when the descending leg of the vertical profile ("brick") is intercepted.

Note: When APPR armed prior to DECEL point the descent arrow will be white and a pilot-initiated descent is necessary.

Correct TO waypoint and crossing altitude Verify

XTK Monitor
At least one pilot must be in 10 NM range ARC mode.

A321

LDEV error Monitor
Monitor on PFD. PM calls out deviation if 1 dot (0.1 NM) is reached.

When approaching the FAF:

FINAL APP displayed on FMA Verify
FINAL APP must be displayed on the FMA from the FAF inbound.
Max speed is 165 KTS from FAF to DA if on an RF leg.

VDEV error Monitor after FINAL APP
Monitor on PFD and/or PROG page. PM calls out "1/2 dot" if a half dot deviation (50') is reached from FAF to DA.

No later than 1,000 feet AGL:

Missed approach altitude Set
Set lowest initial level off altitude on missed approach procedure.

No lower than DA:

Autopilot Disengage
Autopilot may remain engaged during go-around from DA.

Conducting a missed approach:

WARNING: Maintaining lateral track is paramount to avoiding terrain or airspace conflicts, especially when on an RF leg.

If flaps are UP:

Missed approach altitude Set

FCU climb Initiate

NAV Verify

Verify NAV is engaged or reselect NAV. Verify proper TO waypoint. Continue to fly approach track to the MAP.

If flaps are 1 or greater:

TOGA Select

NAV Verify

Verify NAV is engaged or reselect NAV. Verify proper TO waypoint. Continue to fly approach track to the MAP.

Missed approach altitude Set

Execute a missed approach unless in visual contact (and aligned with) the landing runway if any of the following occur:

- FMS1/FMS2 POS DIFF appears on MCDU
- GPS PRIMARY LOST appears on ND or MCDU
- MAP NOT AVAIL appears on an ND (a momentary indication is permissible as long as there are no other failure indications)
- NAV ACCUR DOWNGRAD appears on ND or MCDU
- NAV FM/GPS POS DISAGREE appears on the ECAM
- NAV GPS 1 (2) FAULT appears on the ECAM
- Vertical deviation approaches +/- 3/4 dot (+/- 75 feet)
- 0.2 NM XTK error displayed on ND, or
- A321 lateral deviation approaches 2 dots

Post-flight send ACARS information per Vol. 1, SP.5, ACARS Data Collection.

RNAV(GPS or GNSS), VOR, or NDB Approach Guide APPR Mode

If the ground based navaid is out of service or compatible avionics is either not installed or not operational, the NDB, NDB/DME, VOR, or VOR/DME approach may be flown using RNAV procedures as long as one GPS is operational and the approach is authorized on the Company Page or flight plan remark.

For RNAV approaches with inoperative equipment refer to QRH, Non-Normal Ops Info tab, RNAV Approach Equipment Requirements.

Airport temperature RNAV (GPS or GNSS) Confirm within limits

Autopilot Required in IMC

FMS approach procedure Select

Verify waypoints, altitude constraints, and descent angle.

Minimums Set DA/MDA/DDA

- LP or LPV minimums are not authorized.
- For RNAV approaches, If LNAV/VNAV minimums are published, they must be used.

Note: If field temperature is outside the temperature range or local altimeter unavailable, use LNAV minimums.

- If only LNAV minimums are published, use the LNAV minimums.
- If flying VOR, NDB, or RNAV approach outside the United States or its associated territories, set a DDA (DA/MDA + 50 feet).

CSTR pb Select

EFIS (I)LS pb Off (light out)

Raw data (if available) Monitor on ND

FMS PROG page Verify GPS PRIMARY

For VOR or NDB approaches if GPS PRIMARY is lost, approach may continue as long as HIGH ACCUR is displayed on the MCDU PROG page.

When cleared for the approach:

APPR pb Select

When approaching the FAF:

The blue descent arrow indicates FINAL will engage when the descending leg of the vertical profile ("brick") is intercepted.

Correct TO waypoint and crossing altitude Verify

Consider use of "DIR TO" radial inbound to retain crossing constraint.

A321

LDEV error Monitor (RNAV approach only)

No later than 1,000 feet AGL:

Missed approach altitude Set

Set lowest initial level off altitude on missed approach procedure.

No later than the MDA/DDA:

Autopilot Disengage

Autopilot may remain engaged during go-around from MDA/DDA.

Execute a missed approach after the FAF with the approach lights or runway environment not in sight if any of the following occur:

- criteria listed in the Airway Manual, Ops Specs,
- RNAV approaches only:
 - GPS PRIMARY LOST message
 - NAV ACCUR DOWNGRAD message
 - FM/GPS POS DISAGREE message
 - FM1/FM2 POS DIFF message
 - A321 lateral deviation approaches full scale.
- VOR, NDB approaches only:
 - NAV ACCUR DOWNGRAD message

ILS (GS out), LOC, LDA (no GS) Approach Guide LOC & FPA mode

For inoperative equipment, refer to the QRH, Non-Normal Ops Info tab, ILS Approach Equipment Requirements.

GPS PRIMARY or HIGH ACCUR on PROG page Required

Autopilot Required in IMC

FMS approach procedure Select and verify

Descent angle Confirm

- Reference the published descent angle from the approach chart
- If not published, refer to the MCDU F-PLN page descent angle
- If neither available use 3.3 degrees

Minimums Set DA/DDA into BARO field

- Set approach chart MDA and use as a DA
- Set a DDA (MDA + 50 feet) if flying an approach outside the United States and its associated territories

CSTR pb Select

EFIS (I)LS pb Select

GPWS G/S MODE pb OFF

When cleared for the approach:

LOC pb Select

TRK-FPA pb Select

Correct TO waypoint and crossing altitude Verify

If TO waypoint sequences (becomes FROM waypoint) consider using “DIR TO RADIAL IN” to retain crossing constraint.

FCU ALT window Set rounded up DA/DDA

Initially set rounded up DA/DDA to prevent an altitude capture when leaving the FAF crossing altitude.

When approaching the descent point:

FCUPreselect charted FPA

When approximately 0.2 nm from the descent point:

FPA Select

Pull the FCU FPA selector approximately 0.2 miles prior to the
FAF/desired descent point to track the descent path indicator.

No later than 1,000 feet AGL or initial missed approach altitude
(whichever is lower):

Missed approach altitude Set

Set lowest initial level off altitude on missed approach
procedure.

No later than the MDA/DDA:

Autopilot Disengage

Execute a missed approach after the FAF with the approach lights or
runway environment not in sight if any of the following criteria occur:

- criteria listed in the Airway Manual, Ops Specs,
- NAV ACCUR DOWNGRAD is displayed on the MCDU
scratchpad or ND, or
- loss of raw data.

Charted Visual Approach Guide (Procedure in FMS Database)

APPR Mode

The following guidance supplements visual approach preparations. FMS guidance is an aid to promote more precise ground track and altitude control. Do not sacrifice outside visual vigilance while using FMS capabilities.

Company Page and
 Attention All Users pageReference as applicable

AutopilotAs desired

FMS approach procedure..... Select and verify

RNAV Visuals are normally coded in the FMS database as RNV
 RWYXX-V

Charted Visual Approaches may include waypoints or reference
 points that differ by name from FMS coded waypoints.

RNV RWY-V glidepath angles may exceed 3.0 degrees.

CSTR pb Select

EFIS (I)LS pb De-select

When cleared for the approach:

APPR pb Select

Note: With RNV Approach procedure selected from the Nav
 Database, LOC-G/S modes will not arm regardless of ILS
 tuning status.

When approaching the descent point:

The blue descent arrow indicates FINAL will engage when the
 descending leg of the vertical profile ("brick") is intercepted.

Correct TO waypoint Verify

No later than 1,000 feet AGL:

Missed approach altitudeSet as desired

No later than 500 feet HAA:

Autopilot Disengage

Additional information:

If missed approach instructions are not published, straight-out guidance may be inserted into the approach for crew convenience.

Circling Maneuver

The following guidance supplements normal approach preparations and procedures for the type of approach to be flown.

Weather requirements Check

- Visibility - 3 miles (4800m) or published visibility for the highest circling speed category, whichever is higher.
- Ceiling - 1000 feet (300m) or the published HAA (height above airport) for the highest circling speed category, whichever is higher.

Minimums Set MDA

Set published MDA or airport elevation plus 1000 feet (300m), whichever is higher.

In preparation for the approach:

- Insert Instrument Approach to be flown in the Active F-PLN
- Complete PERF App Page
- Copy Active F-PLN to SEC
- In SEC F-PLN enter landing runway and modify as necessary, insert the missed approach for the approach to be flown.

At configuration point:

Landing gear and landing flaps Set

Aircraft should be fully configured for landing prior to FAF.
Conduct the circling maneuver at VAPP speed.

Approaching the MDA, push the V/S knob so as to level off at the MDA.

After descending below the missed approach altitude, set the missed approach altitude in the FCU.

When circling maneuver is initiated:

SEC F-PLN Activate
 Runway should be the TO (Active) waypoint to provide vertical path information.

Note: Turn OFF the Flight Directors if not being followed.

Execute a missed approach if visual contact with the airport is lost.

Conducting a missed approach:

Use normal missed approach procedures except:

- Make the initial climbing turn towards the landing runway to reach the missed approach heading. Turn may be more than 180 degrees and not in the shortest direction.
- Fly the published missed approach corresponding to the instrument approach procedure just flown until alternate instructions are received.

Radio/Baro Minimums Chart

Radio/Baro Minimums Chart		
APPROACH TYPE	BARO MIN REF	RADIO MIN REF
CAT I or CAT II RA N/A	Published DA	N/A
CAT II	N/A	Published RA
CAT III	N/A	100'(DH)
STRAIGHT-IN (NON-ILS)	US - Published MDA or International - MDA + 50'	N/A
CIRCLE TO LAND	Higher of: Published MDA or FIELD ELEV + 1000'	N/A
RNAV VISUAL	N/A	N/A
VISUAL	Approach Minimums (1)	N/A
(1) Set the approach minimums for the instrument approach used to back up the visual approach. If no instrument approach is available, set the TDZE/Rwy Elevation or airport elevation, whichever is higher.		

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Supplementary Procedures
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Supplementary Procedures

Introduction

Chapter SP

Section 05

General

This chapter contains procedures that are organized by system and covers:

- Procedures (adverse weather operation, etc.) that are accomplished as required rather than routinely performed on each flight,
- Any first-flight-of-the-day test or other systems test,
- Guidance on lengthy operating procedures, and
- Adverse weather procedures and guidance.

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Supplementary Procedures

Chapter SP

Airplane General, Emer. Equip., Doors, Windows Section 1

Pre-Flight Cabin Inspection - Flights without Flight Attendants

For a flight without a flight attendant staff (ferry flight, test flight, delivery flight, training flight, etc.) the pilots must secure the cabin.

- Doors - Secured and at least the 1L and 1R doors armed.
- Galley (coffee pots, doors, and drawers, etc.) - Secured.
- Beverage carts - Stowed and locked in position.
- Overhead bins - Closed.
- Closets - Closed and locked.
- Lavatories - Inspect for general security; doors locked.

After block-in, pilots must DISARM all doors and pass a thumbs up to the gate agent when the main entry door is ready to be opened.

Flight Deck Access System Test

The following procedure is to be accomplished prior to the first flight of the day.

With the flight deck door open:

Verify all lights extinguished on CKPT DOOR Panel.

(A321) Verify all lights extinguished on CKPT DOOR BK Panel
and LKG SYS toggle is in the NORM position.

COCKPIT DOOR toggle switchNORM

Access code Enter

Code must be followed with #

Verify alert sounds

Verify green light on keypad flashes

Verify amber OPEN light flashes

COCKPIT DOOR toggle switchLOCK

Verify OPEN light illuminates steady

Verify steady red light on keypad panel

COCKPIT DOOR toggle switchUNLOCK

Verify red light on keypad extinguishes

COCKPIT DOOR toggle switchNORM

Oxygen Mask Check

ACP, Captain (CA-FO)- Place the INT reception knob to up/on. Place the INT/RAD switch to INT (for hot interphone to check the mask microphone).

Adjust the loudspeaker volume as desired.

Press and hold the TEST/RESET button. Verify that the blinker turns yellow momentarily then goes black.

Release the TEST/RESET button.

Simultaneously press the TEST/RESET button and the EMERGENCY knob while observing the OXY pressure on the DOOR/OXY ECAM page. If the oxygen pressure drops significantly, contact Maintenance. Check that the blinker turns yellow and remains yellow while the emergency knob is pressed and listen for the flow of oxygen through the loudspeakers.

Release the TEST/RESET button and EMERGENCY knob.

Press the EMERGENCY pb again; check that the blinker does not turn yellow.

Ensure the OXY ON flag is retracted.

Ensure the mask mode selector is in 100%.

Reset the ACP as desired.

Check the REGUL LO PR message is NOT displayed on the ECAM DOOR OXY page.

Doors

Entry/Service Door Closing

Gust lock latch Release

Door Close
Manually position the door aft and inboard to cover the entry.

Door handle Down
Rotate the handle down to the closed position. The door lowers into position, latches, and locks. Observe the LOCKED indication.

Door arming lever ARM
Remove the pin and move the lever to ARM position.

Entry/Service Door Opening

WARNING: Do not open a door if the red CABIN PRESSURE light is illuminated.

Door arming lever (interior only) DISARM

Move the lever to the DISARM position and insert the pin.

Note: Escape slide/raft and pneumatic assist door opening is disarmed automatically when the door is opened from outside.

Door handle Up

Rotate the handle up to the OPEN position.

Door Open

Manually position the door outboard and forward to open. The gust lock latch automatically engages and locks door in the open position.

Emergency Oxygen Use

Emergency oxygen provides positive pressure in the full face mask to prevent or evacuate contaminants. When positive pressure is not required, but contamination of flight deck air exists, use 100% oxygen. If prolonged use is required and the situation permits, oxygen availability can be extended by selecting normal flow. When oxygen use is no longer required, stow the mask and push the RESET/TEST switch to restore normal boom microphone operation.

Annunciator Light Test

The annunciator lights may be tested by placing the annunciator light (ANN LT) switch on the overhead INT LT panel to the TEST position.

During a test of the annunciator lights, the LCD characters appear as “8”s. The full appearance of each “8” indicates that each LCD segment is functional. The LCD window on the ADIRS panel uses a “snowflake” pattern during the annunciator light test.

If the annunciator only contains one light, the other half of that annunciator will show two small pins.

Note: Testing the annunciator lights also illuminates all of the failure symbols on the PFD and ND.

Airframe Vibration Reporting

Maintenance must determine the origin of the vibration in accordance with the Troubleshooting Manual. The following information should be communicated to Maintenance Control who will use the information to complete the Airbus Vibration Reporting Sheet (VRS) which then directs specific maintenance action.

Attempt to note the following data if an airframe vibration event occurs:

- Flight conditions at time of vibration event:
 - Gross Weight
 - Altitude
 - Speed
 - Engine Vibration indications
 - Flight phase
 - Turbulence
 - Landing gear
 - Flap/slat configuration
- Observations at time of vibration event:
 - Was flight control oscillations observed on F/CTL page?
 - If yes to above, which F/CTL surface?
 - Which specific portion of aircraft was affected?
 - Describe any audible noise/rumbling
 - Classify the vibration as light/moderate/strong
 - Describe whether vibration was lateral or vertical in nature
- Changes noted with AP ON:
 - Was vibration affected by change in thrust?
 - Was vibration affected by change in altitude?
 - Was vibration affected by a turn (bank angle)?
 - Was vibration affected by change in speedbrake deflection?
- Changes noted with AP OFF:
 - Was vibration affected by pitch inputs?
 - Was vibration affected by yaw inputs?
 - Was vibration affected by roll inputs?
- Other observations.

Passenger Convenience Information

The following information is intended to provide techniques that will improve dispatch reliability and/or passenger comfort. This information should not be considered as “performing maintenance” but rather a collection of approved solutions to known anomalies.

CAUTION: Do not reset a tripped circuit breaker in flight. On the ground, with the concurrence of maintenance, one reset of a tripped circuit breaker is authorized, provided the cause of the tripping is known. If the failed system is restored, make an INFO ONLY logbook write-up documenting the circuit breaker reset.

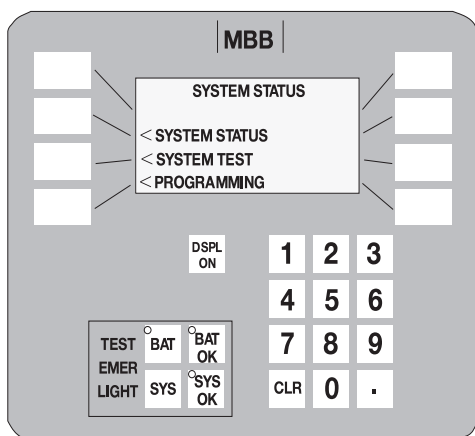
Cabin Intercommunications Data System (CIDS) Reset

The CIDS controls the cabin lighting, the passenger address system, and the cabin signs. If any of this equipment is not operating normally, see CIDS reset (QRH, Non-Normal Ops. Info. section) and/or attempt the following reset procedure to correct the problem. Use the following procedure on the ground only, engines shut down.

Open the CIDS test door located on the forward flight attendant control panel.

Press the DSPL ON pb (figure 1).

Select SYSTEM TEST (figure 1).



FG25007B

Figure 1

Select RESET on the SYSTEM TEST page. The reset will take at least 90 seconds to complete (figure 2).

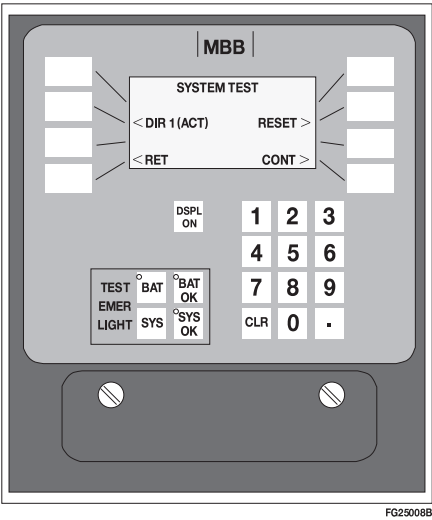


Figure 2

After the reset, the SYSTEM STATUS page will return. Press RET to return to the original CIDS page (figure 3).

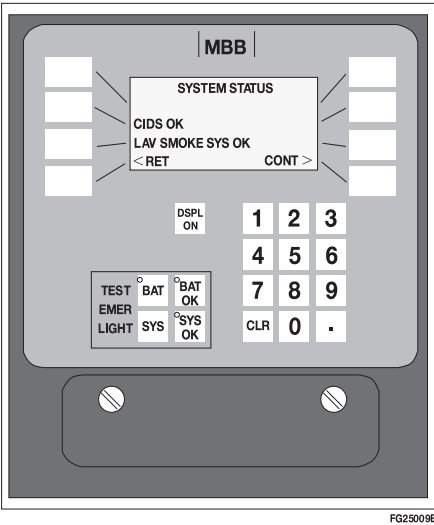


Figure 3

Lavatory Flushing

If the lavatories will not flush while the aircraft is on the ground, refer to the MDM. Flushing may be possible above 16,000 feet.

If an individual lavatory will not flush:

- Pull the circuit breaker for the affected lavatory, e.g., AFT LH on the circuit breaker panel located overhead the aft galley. Reset the circuit breaker after ten seconds.

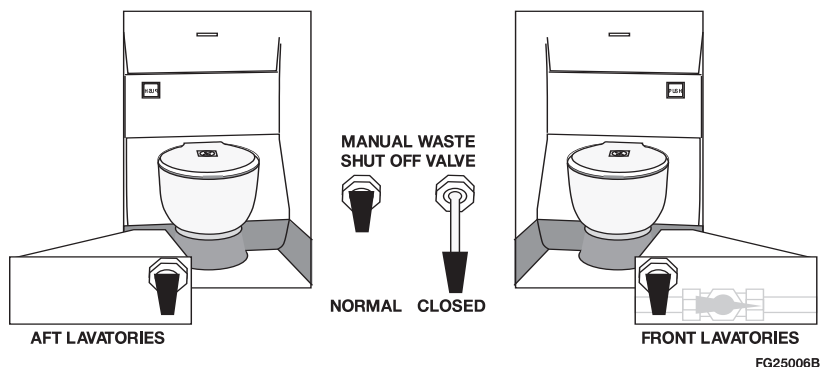
If all lavatories are inoperative in flight above 16,000 feet:

- Pull the VACUUM SYS circuit breaker located overhead the aft galley and reset after 30 seconds. This action resets the erroneous waste tank full signal which prevents lavatory flushing. If the reset is unsuccessful, pull the VACUUM SYS circuit breaker and make a logbook write-up. The lavatory waste quantity indicator is inoperative. With the circuit breaker out, the system should operate on differential pressure above 16,000 feet. Service at the next stop.

If a lavatory is continuously flushing, accomplish the following steps until the flushing stops:

- Attempt to free the flush button if it is stuck.
- Close the water system supply valve found behind the small door at the base of the toilet (A320s 3209-3258) or the shutoff lever near the bottom corner of the waste compartment, under the sink (A320s 3259-32XX and all A319/321s).
- Pull the circuit breaker for the affected lavatory, e.g., AFT LH on the circuit breaker panel located overhead the aft galley.
- If air suction still occurs, pull down the manual waste shutoff handle (figure below) located behind the small door at the base of the toilet (if installed). On aircraft without the manual waste shutoff handle, place a blanket or pillow in the toilet to shut off the air suction.

Since the lavatory will be inoperative until maintenance is performed, it must be placarded as inoperative.



Potable Water System

Water quantity can be checked at the forward flight attendant station if the outside service panel is closed. Potable water is supplied to specific locations through lines controlled by local shutoff valves. These valves may be used to stop either a leak or continuously running water in an area. Conversely, if water supply to a specific location is desired but not available, check these valves to ensure that they are on. The location of the water shutoff valves follows:

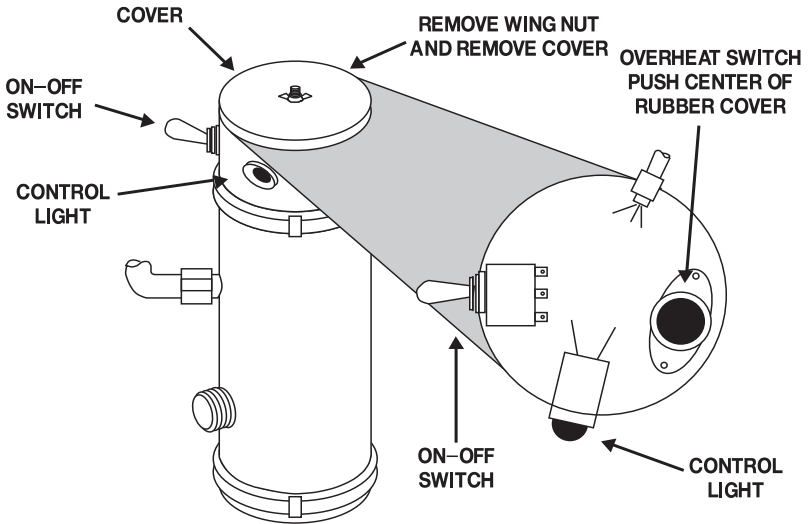
- Forward Galley - This valve is located on the lower outboard side of the galley, forward of the service door.
- Aft Galley - This valve is located on the outboard side of the galley on the aircraft left side (new interiors and A321s) or the lower aft galley wall behind the meal cart in position 5-15. A chain is provided in this latter location to unclog the galley drain.
- Lavatory - The water system supply valve is found behind the small door at the base of the toilet (A320s 3209-3258) or near the bottom corner of the waste compartment, under the sink (A320s 3259-32XX and all A319/321s). Closing this valve makes the lavatory inoperative.

Note: On A320s (3251-32XX) and all A319/321s, there is a WTR SYSTEM DEPRE pb in the lower right corner of the forward flight attendant panel. If the light on this pb is illuminated, the potable water system will not pressurize.

Water Heater Reset

If the water heater is inoperative in a particular lavatory, the following reset procedure may be attempted once, either on the ground or in flight:

- Open the cabinet under the wash basin.
- Locate the water heater (figure below) and place the ON/OFF switch to OFF (down).
- Remove the wing nut from the top of the heater and remove the cover
- Press the orange reset button on top of the heater unit.
- Replace the cover and place the ON/OFF switch to ON.

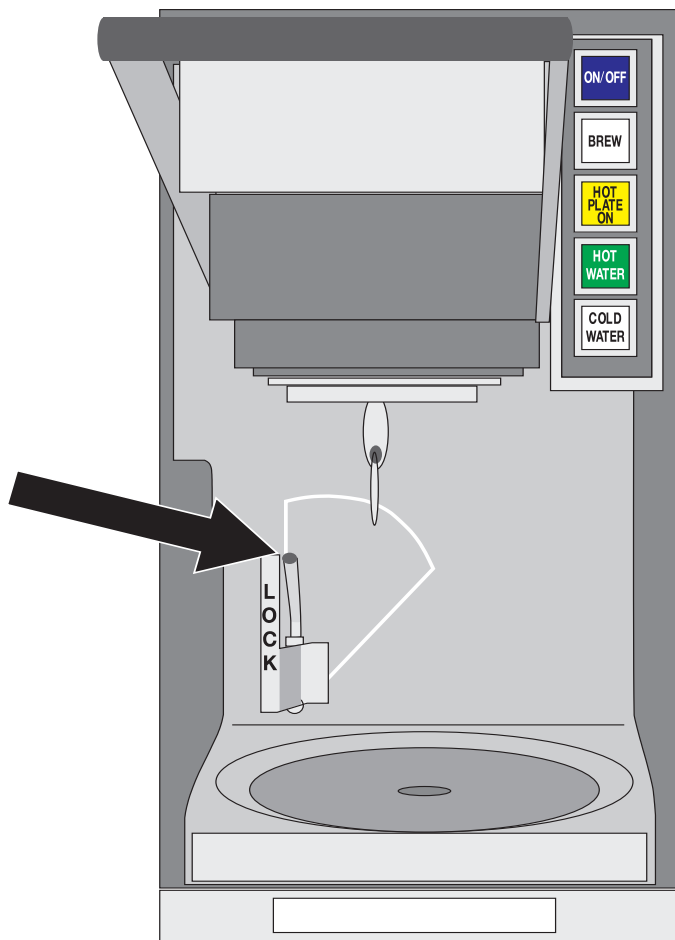


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Coffee Maker Drain

If water is continuously running or spilling from the coffee maker, use the following procedure in an attempt to close the coffee maker drain valve.

- Rotate the lever (figure below) from the 12 o'clock to the 2 o'clock position



FG25004B

Emergency Cabin Exit Light System Reset

If all or part of the cabin exit lights are not illuminated on the ground, with normal electrical power available and the EMER EXIT LT switch in ARM, the following procedure may be used to reset the system.

- Cycle the NO SMOKING SIGNS switch on the flight deck overhead panel to OFF and back to AUTO.

If emergency exit lights are not illuminated, attempt a CIDS reset (QRH, Non-Normal Ops. Info. section).

If the exit lights still do not illuminate, contact Maintenance.

Electronic Flight Bag (EFB) Mount

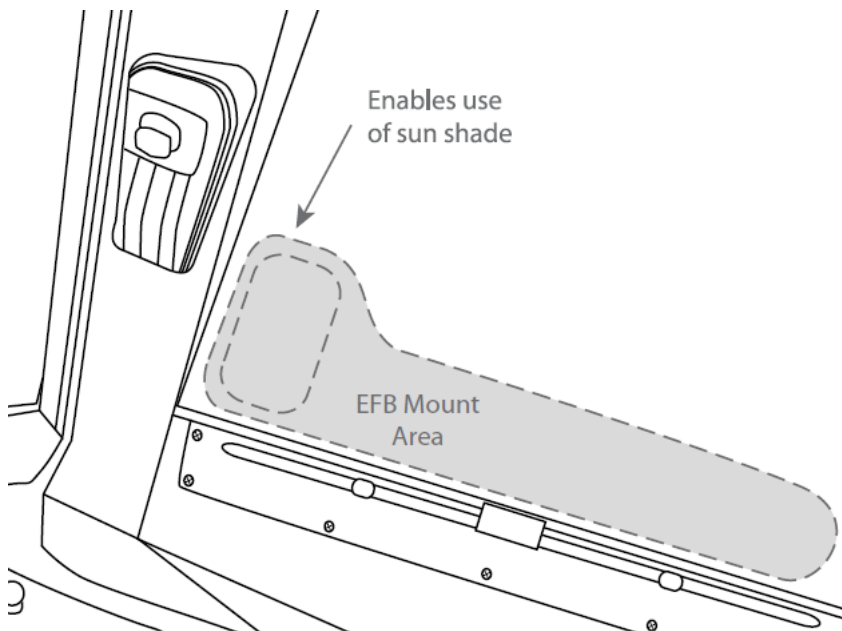
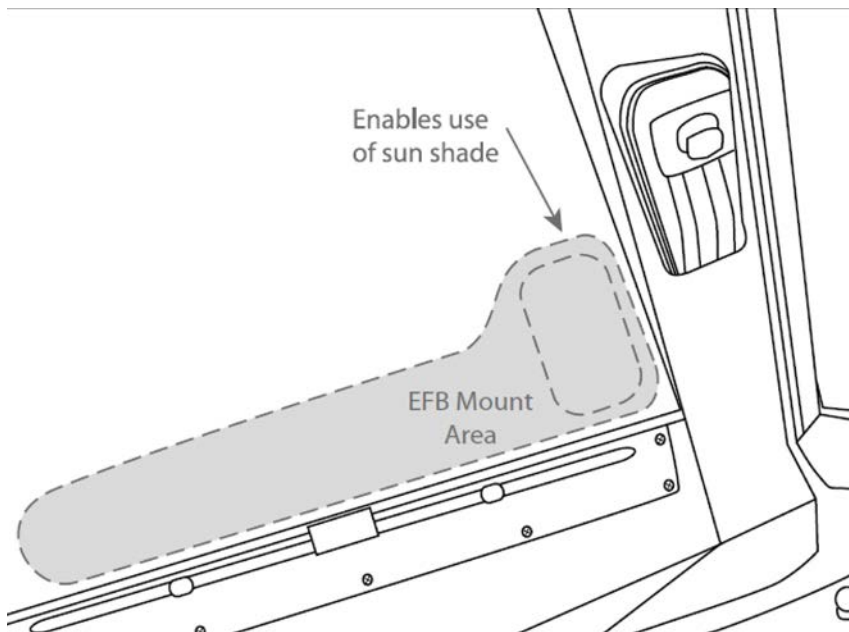
Note: Prior to the first flight of the day, the EFB mounting system must be installed/reinstalled to ensure the mount attachment is secure. During subsequent flights, mount security may be verified with a gentle tug. Reinstall the mount as required.

CAUTION: Do not place the EFB in direct sunlight on the glareshield.

Do not use any other mounting or securing system other than the provided approved system.

To secure the EFB mount in the aircraft:

- Ensure the side window and suction cups are clean. If necessary, wipe with pretreated lens/screen cloth or moist cloth.
- Sunshades (as installed) should be stowed prior to securing the mount.
- Ensure the locking levers are in the OFF position.
- Position the suction cups in the mounting zone indicated in the following diagrams.
- To remove trapped air, press each cup against the window until completely compressed.
- Move the locking levers to the ON position.
- Ensure the EFB and mount are free and clear of all flight controls, and do not restrict access to egress, tiller, oxygen mask, or line of sight.
- Squeeze the gray tabs together to expand the mounting tabs and insert the EFB into the mount.
 - If the EFB is in the portrait mode, the fixed tabs should be positioned at the bottom of the mount to prevent the EFB from slipping.
- Use caution when deploying sunshades with the EFB mount installed to avoid damage.



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Supplementary Procedures

Chapter SP

Air Systems

Section 2

External Low Pressure Ground Air Conditioning Cart Use

The use of low pressure ground conditioned air simultaneously with the aircraft air conditioning packs is prohibited.

External High Pressure Ground Air Conditioning Cart Use

Do not use HP ground (starting) air simultaneously with APU air.

The use of external high pressure air to operate the packs on the ground is acceptable, provided the equipment is owned or controlled by Delta Air Lines.

APU On for Takeoff

When the Thrust/Flap combination on the WDR selected for takeoff includes the annotation APU the following procedures apply.

CAUTION: Do not operate wing anti-ice with APU bleed air selected ON.

Before Takeoff

APU operating

APU BLEED pb ON

After Flaps selected UP

APU BLEED pb off

APU pb off

If the APU is INOP, refer to “Packs Off for Takeoff,” procedure, this section.

Packs Off for Takeoff

When APU is annotated on the WDR, takeoff performance prohibits bleed air from being used for air conditioning and pressurization. Normally this is accomplished by leaving the APU on and turning the APU BLEED pb ON.

If the APU bleed air is not operable, perform the following procedure when APU is annotated on the WDR.

Before Takeoff

PACK 1 and 2 pbs OFF

After reaching the THR RED height or 9,000' MSL, whichever occurs first:

PACK 1 pb on

After Flaps selected UP

PACK 2 pb on

Note: Expect to receive PACK 1(2) OFF ECAM message after the T.O. INHIBIT is removed at 1,500 feet AFE.

Supplementary Procedures

Chapter SP

Anti-Ice, Rain

Section 3

Anti-Ice Operation

Requirements for use of anti-ice and operational procedures for engine and wing anti-ice are contained in SP.16, Adverse Weather.

Windshield Wiper Use

CAUTION: Windshield scratching will occur if the windshield wipers are operated on a dry windshield.

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Supplementary Procedures
Autoflight

Chapter SP
Section 4

Reserved for future use.

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Supplementary Procedures

Chapter SP

Communications

Section 5

PA or Interphone Inoperative, Alternate Procedures

The MDM allows Dispatch with the PA system inoperative as long as the Flight Deck/Cabin Interphone system is operative and alternate procedures for communication are established. If both systems become inoperative while airborne, coordinate alternate communication procedures with the flight attendants for the remainder of the flight.

Inoperative PA (Interphone Operative)

Situation	Procedure
Smoke/Fire or Hijacking or Medical Situation or Disruptive Passenger	Use interphone communications between flight deck and cabin crew. Flight Attendants deliver announcements to passengers verbally or using megaphones
Emergency and/or Evacuation	Pilots use interphone or multiple chimes (three or more) to summon cabin crew member to flight deck. Transfer emergency information using face to face communications. Flash seatbelt sign as a signal for Emergency Landing or Ditching.

HF Radio Preflight

When required for dispatch, perform an HF radio check prior to departure. A SELCAL check is not a required component of the HF radio check.

CAUTION:Do not operate the HF transmitter while fueling operations are in progress.

- RMP Panel Select HF 1
- HF Frequency Tune in ACTIVE window
See Airway Manual, Communications section, HF Flight Control Communications to find an HF frequency. The NIST Radio Station WWV or BBC may be used to verify audio reception.
- ACP PanelSelect to transmit and receive on HF1
- Microphone switch Push to transmit
The coupler tone will be heard for up to 18 seconds during the antenna tuning. The HF radio will be ready to transmit when the tone ceases.
- Listen for a good side tone and for radio traffic. Hearing a good side tone and radio traffic constitutes a satisfactory preflight check.
- Repeat with HF2, if equipped.

Note: Two-way HF radio communication must be established before entering areas that require HF communication. A successful SELCAL check with that controlling agency is desired to preclude maintaining a listening watch on the HF radios.

Communications

Flight Plan S-MELs

S-MELs are included in the FPS flight plan to communicate important information concerning the aircraft or flight. S-MELs used include:

- **MEL S 22-00-LNG ACCOMPLISH LLM AUTOLANDING:** A request from MCC to perform an autoland. This message is generated a few days prior to the autoland expiration date. This is only a request; if an autoland cannot be accomplished for operational reasons, no action is required. See Autoland Recording, this section for ACARS recording procedure.

Note: This request is auto-generated and does not consider weather conditions, airport capabilities, or other MELs, which may restrict the aircraft.

- **MEL S 72-82-ECM ACCOMPLISH ENGINE ECM REPORT:** A request from MCC to perform a manual Engine Condition Monitoring report. See Engine Condition Monitoring, this section for ACARS recording procedure.
- **MEL S 72-83-FTT ACCOMPLISH FULL THRUST TAKEOFF:** A request from MCC to perform a full thrust takeoff. See TOGA Takeoff Recording, this section for ACARS recording procedure.

Aircraft Communication Addressing and Reporting System (ACARS)

Pre-Departure Clearance

The flight crew shall compare the filed flight plan versus the digital pre-departure clearance and shall initiate voice contact with Air Traffic Control if any question/confusion exists between the filed flight plan and the digital pre-departure clearance.

Digital-Automatic Information Service

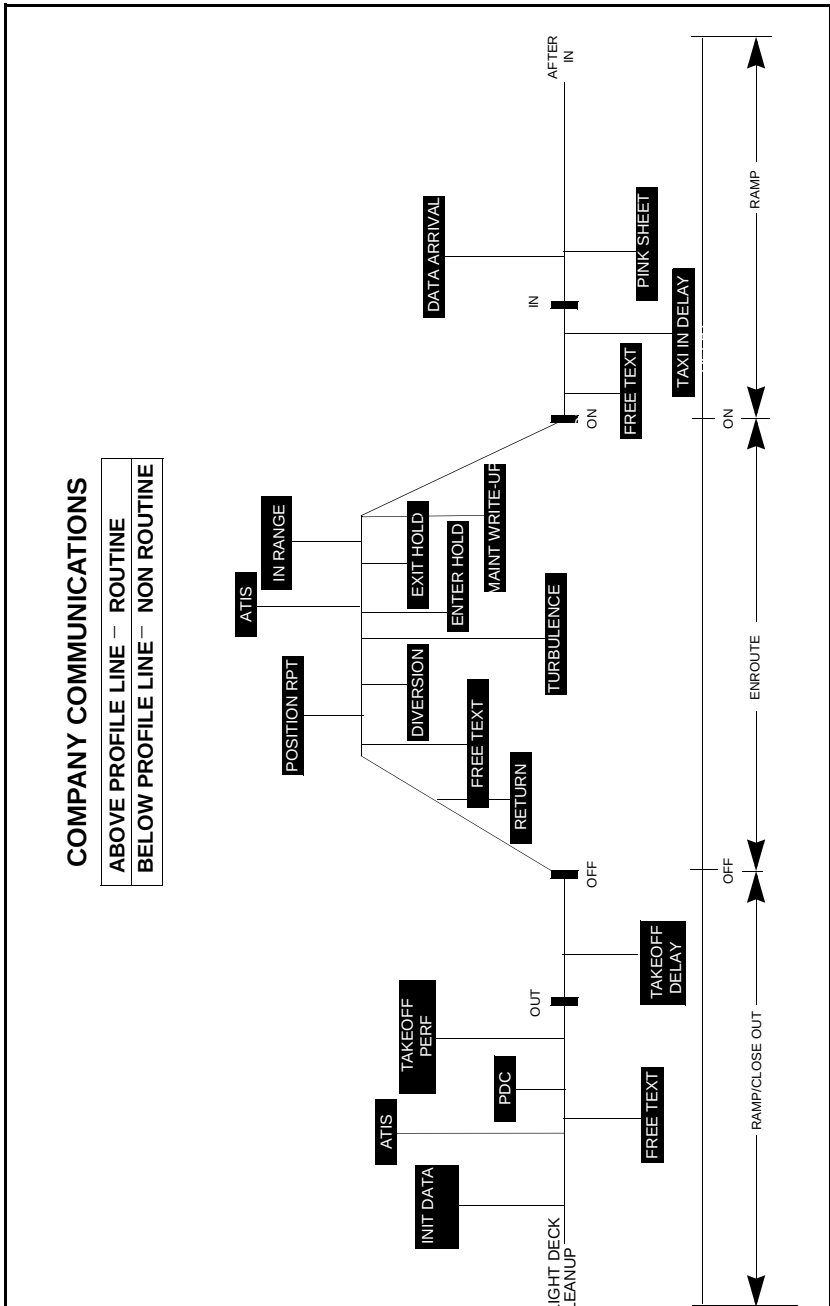
The flight crew shall verify that the D-ATIS altimeter setting numeric value and alpha value are identical. The alpha value is the numeric altimeter setting spelled out (i.e., two niner niner two). This will be depicted on the ACARS ATIS message. If the D-ATIS altimeter setting numeric value and alpha values are different, the flight crew must not accept the D-ATIS altimeter setting.

Company Communications Sequence

The COMMUNICATIONS SEQUENCE chart depicts DATA LINK functions that are currently in effect for Delta Air Lines. The chronological sequence in which DATA LINK messages should be sent is shown as a function of flight phase. The messages that appear above the profile are ROUTINE and should be sent whenever appropriate on every flight. The messages below the profile are NON ROUTINE and should be sent as needed.

Messages are delivered to the Flight Control dispatcher's queue and are also directly processed by Flight Following. This direct processing of DATA LINK messages results in system wide updates in our host computers.

Communications Sequence Chart



ACARS 602 Operation

Introduction

ACARS 602 is the latest standard of Honeywell ACARS software and is replacing earlier ACARS versions in the fleet. This upgrade offers several advances, including:

- Additional selections for Takeoff and Landing Performance Requests (TOPR and LPR), improving the accuracy and usability of these functions.
- A log of sent, as well as received messages.
- Ability to automatically receive ATIS updates, as they occur.
- Simplified gate connection request (destination airport entry is all that's required, the matching outbound ETD and gate will be found).
- Automatic deletion of all messages at the completion of the flight.
- Improved tracking of operational metrics for operational performance gains.

ACARS 602 is recognized by the addition of GMT time along the bottom of each ACARS page.

Menu Navigation

The prompts on the main MENU are divided into three general categories: data, requests, and reports.

Data includes:

- DATA INIT (1L)
- DEPT / ENROUTE (3L)
- SUMMARY / ARR DATA (4L)
- SENT MESSAGES (5L)
- RECEIVED MESSAGES (3R)

Request include:

- ATC REQUEST (1R)
- DAL REQUESTS (2R)

Reports include:

- REPORTS FLT PROGRESS (4R)
- REPORTS MAINTENANCE (5R)



Most pages contain RETURN (6L) and MENU (6R) prompts. The RETURN prompt takes you back to the most recently viewed page. The MENU prompt will always return you to the main menu and will appear any time there is not a higher priority message at (6R). For instance, the MENU prompt will be temporarily replaced with a MESSAGE prompt when a new message is received. After the message is read, the MENU prompt returns to (6R).

Preflight Initialization

To initialize the ACARS, select the INIT RQST prompt at (5L). This auto-populates the INIT screen with flight number, date, and city pair. ETE, pilot ID numbers, and release number can then manually be entered. FOD is automatically populated with the current aircraft FO.

ACARS-~~xxxx~~ INIT DATA 1/2

FLIGHT NO.	ETE
□□□□	□□:□□
FLT RLS DATE	UTC
□□	HHMMSSZ
DEPT STN	
□□□□	
DEST STN	FOD
□□□□	LBS □□□.□
*INIT RQST	ID/RLS DATA
	NEXT PAGE>
<RETURN	HH:MM

Messages

When an uplinked message is received, an active advisory replaces the 'MENU' prompt (6R). Advisory examples include 'MESSAGE', 'TO DLY', or 'CONX GATE'. To view the uplinked message, simply press (6R) to go to the appropriate page. For example, when a message is received, the 'MENU' prompt is replaced by 'MESSAGE*'. Simply press (6R) to be

AOC-~~NNNN~~ MENU

DATA	ATC REQUESTS>
<INIT	
DATA	DAL REQUESTS>
<LOAD	
DEPT	RECEIVED
<ENROUTE	MESSAGES>
SUMMARY	REPORTS
<ARR DATA	FLT PROGRESS>
SENT	REPORTS
<MESSAGES	MAINTENANCE>
<RETURN	HH:MM MESSAGE*>

automatically directed to the RECEIVED MESSAGES page and open the message.

Note: Unlike previous ACARS versions, messages do not automatically open when the RECEIVED MESSAGES page is selected. Select the 'MESSAGE*' advisory (6R) or line-select the desired message from the RECEIVED MESSAGES page.

DEPT/ENROUTE Page

The DEPT/ENROUTE data page consolidates flight progress information on one page.

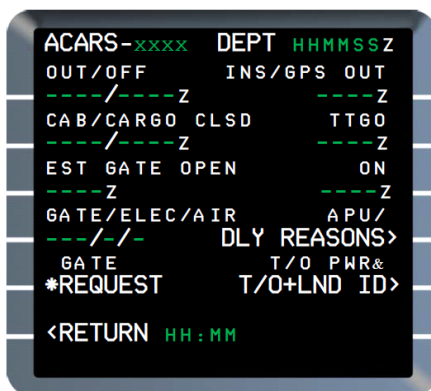
The OUT time (1L) records the first time the parking brake is released after all cabin and cargo doors are closed. Two additional metrics capture the time when all cabin and cargo doors are closed (2L).

Additionally, the INS/GPS OUT time records the first aircraft movement during pushback. This page also displays a Time-To-Go (TTGO) field that counts down the remaining flight time based on the most recent arrival estimate.

The estimated time of arrival is called Estimated On (EON), and all arrival estimates are based on this time.

The following are provisioned for future use: DLY REASONS (4R), GATE/ELEC/AIR indications (4L).

The T/O PWR & T/O-LND ID prompt (5R) allows entry of pilot flying and takeoff thrust setting. For a TOGA takeoff, select (5L) and 'TOGA' appears. If a FLEX takeoff was performed, enter the FLEX temperature used at (5R).



LDG PERF Page

The LDG PERF page includes additional Landing Performance Request (LPR) options, permitting more accurate landing performance calculations.

The runway is entered at 1L with final flap setting (3 or 4 (FULL) at 1R. Field temperature and winds may be entered at (2L) and (3L) respectively, otherwise current airfield conditions are captured by LPR.

ACARS-xxxx LDG PERF 1 / 4

RUNWAY [] FLAPS []

TEMP [] °C WING A/I ON ZZZ

WIND [] / [] LDG WT []

AIRPORT [] SPD ABOVE VREF []

*SEND SYS STATUS / RWY COND>

<RETURN HH:MM

Note: A change from previous ACARS is the wind entry is now entered in normal three-digit format. For example, winds of 020 at 15 are entered as '020/15', or winds of 300 at 05 are entered as '300/05'.

LDG WT may be entered at (3R). If no entry is made, LPR uses FPS flight planned arrival weight (if known) or maximum landing weight (if unknown).

Note: WING A/I ON (2R) and SPD ABOVE VREF (4R) are reserved for future use and are currently non-functional.

The AIRPORT prompt (4L), is used to check landing distance at an airport other than the planned destination. For example, if considering a diversion, the possible divert airport is entered at (4L) with that airport's landing runway at (1L).

The second page of the LDG PERF allows direct manual entry of the current runway condition (e.g. for MEDIUM braking action, select the (3R) prompt)

ACARS-xxxx LDG PERF 2 / 4

RUNWAY COND

6	DRY	5	GOOD
4	GOOD/MED	3	MED
2	MED/POOR	1	POOR

*SEND SYS STATUS>

<RETURN HH:MM

LDG PERF page 3 includes an option for AUTO BRAKES (1R) with entries of LO, MED, and OFF possible.

The OFF selection equates to the ODM "Maximum Manual Braking" and provides the best calculated stopping performance.

Note: Use of autobrakes is required for every landing on the A320 family.

Note: Additional selections on this page are provided for future use and are currently non-functional.

ARRIVAL Page

Fuel remaining ('FREM') is automatically populated using the total FOB.

As with the DEPT/ENROUTE page, the thrust setting used for takeoff can be entered in the 'TOGA' (5L) and 'FLEX TEMP' (5R) fields.

RNP approach data collection is facilitated directly through the 'RNP APPR' prompt (2R). SAT/UNSAT are toggled from the (1L) prompt, with runway entered at (1R). Optional information may be entered at (2L) and (2R) with remarks entered through (5R).

AUTOLAND data collection is available from the ARRIVAL page (3R) prompt. Category selection is toggled at (1L) with success YES/NO toggled at (2L). Optionally, the runway used may be entered at (2R) and remarks at (3R).

ACARS-xxxx AUTOLAND
CATEGORY
ZZZZZZZZZZ
SUCCESSFUL NO
RUNWAY
REMARKS
EDIT TEXT>
[[[[]]]]
<RETURN HH:MM

ACARS 602 Flight Tips

Preflight

From the Main Menu select DATA INIT (1L) followed by INIT RQST (5L). Flight Number, Date, and City Pair uplink automatically. Manually enter ETE and any other data that fails to automatically initialize. Enter CAPT ID, F/O ID, and release number on page 2.

General

As received messages no longer open automatically, keeping the ACARS on the MAIN MENU page provides the quickest access to incoming messages. When the 'MESSAGE*' advisory appears, the advisory prompt (6R) selects the incoming message directly.

The 'AUTO ATIS' function provides automatic updating of the ATIS as ATC updates the information. This can be selected anytime during the flight.

Arrival

Having the ability to enter the autobrake setting increases the accuracy and usefulness of the Landing Performance Request (LPR). Verify the received LPR weight against your estimated landing weight to avoid an unintentional overweight landing.

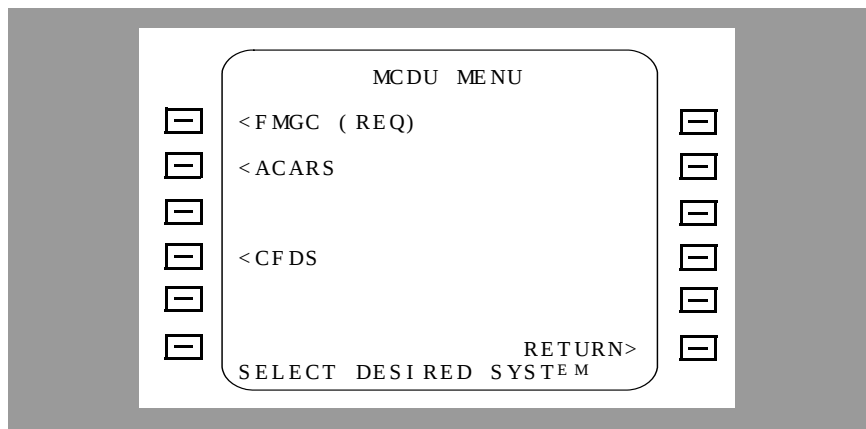
Entries for T/O PWR can be made using either the ARR DATA or ENROUTE page.

Received messages clear automatically after the block IN time.

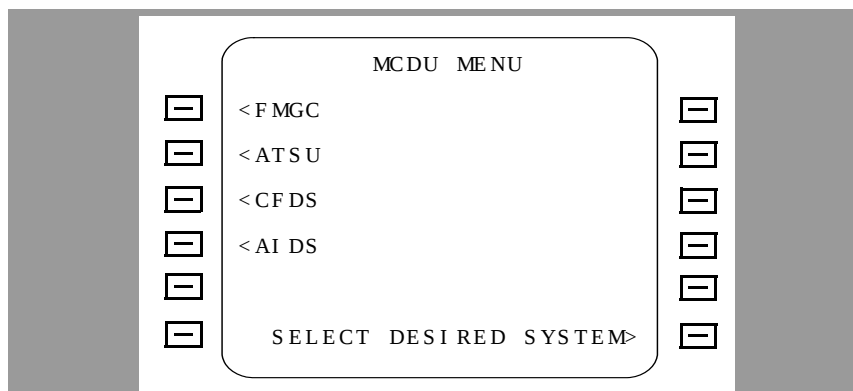
Menu Layout

This section provides general usage information and menu layouts for operating the Honeywell ACARS unit. The system is interactive, and methods for using it are consistent for all messages. With some experimentation and use, it will become simple to use each feature.

For Ship numbers 3107-3270, the main ACARS MENU is accessed by pressing the MCDU MENU key on the MCDU, then selecting <ACARS (see below).

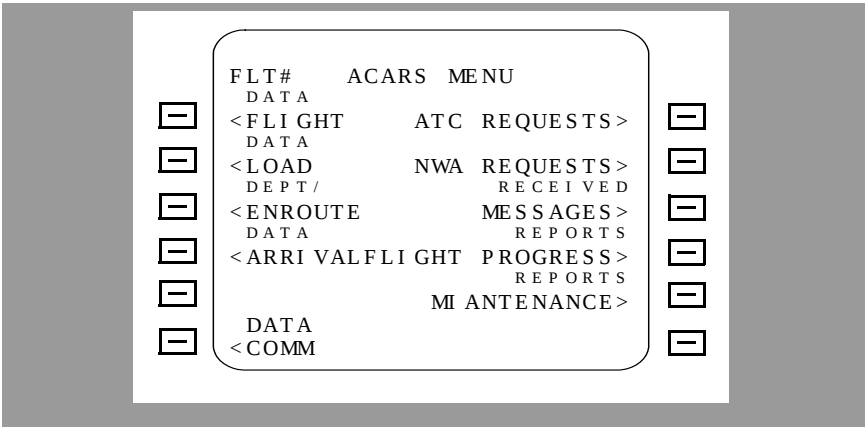


For ship numbers 3101-3171 and 3271, the main ACARS MENU is accessed by pressing the MCDU MENU Key on the MCDU, then selecting the <ATSU prompt (1) followed by the >AOC prompt (2).

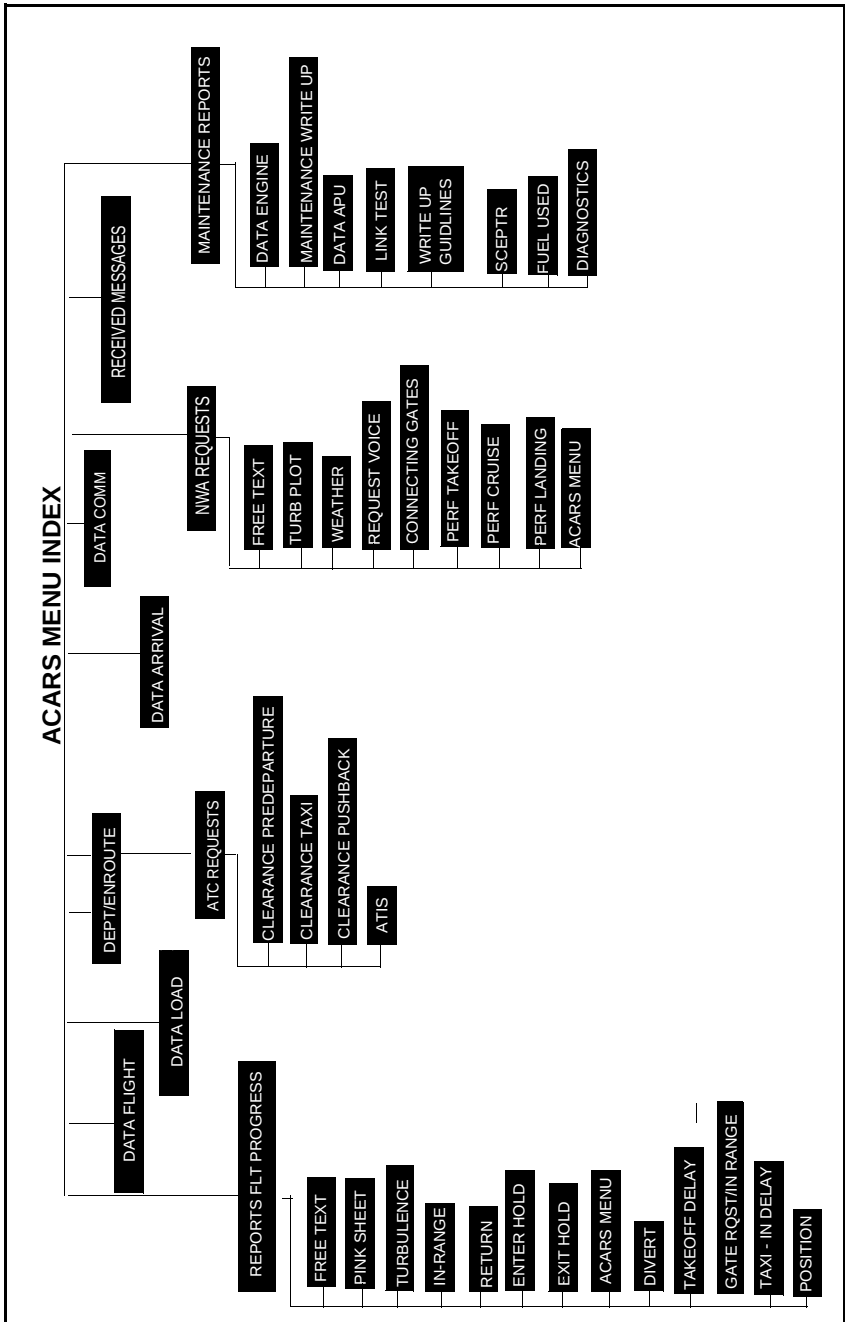




The desired page or sub-menu may be selected from the ACARS MENU by pressing the appropriate LSK.



Menu Layout Chart



Advisory Messages

Alert Advisories

The bottom line (MCDU scratchpad area) on each MCDU page is used to display advisories. The following table lists the messages and their meanings.

VHF LINK ARMED	A downlink has been manually initiated. Once the ground station receives the downlink, the page automatically reverts to the MAIN MENU.
NO COMM-MSG QUEUED	Appears if a link with a ground station cannot be made. Messages will be stored in memory and automatically downlinked when in range of a ground station.
VOICE GO AHEAD	A message has been received requesting normal voice communications. View the message from the Received Messages Menu.
VOICE SELECTED	VOICE mode has been selected by changing the frequency of VHF 3 on the RMP. The VOICE SELECTED advisory and the ECAM message VHF.
TEXT BUFFER FULL	No additional characters can be entered on the Free Text or Remarks pages.
MESSAGE WAITING	An uplink message has been received.
LOAD REVISION	A revision to the load advice has been uplinked to the aircraft.
FLT DISAGREE	The flight number, route, or date uplinked in the load advice disagrees with the Flight Data page.
ENTER FUEL DATA	Fuel on departure on the Flight Data page has not been loaded between the OUT event and OFF event. Also appears if the fuel remaining field on the Arrival Data page is not loaded between the IN event and the transmitting of the IN event data.

ENTER ID DATA	The fields CAPT ID and/or FO ID on the Flight Data page are not loaded between the OUT event and OFF event. Also appears if the T/O ID or LAND ID Menu is not loaded on the Arrival Data page between the ON event and the transmitting of the IN event data.
GATE REVISION	A revision to the gate assignment has been uplinked to the aircraft.
INALID ENTRY	Attempting to load data that is out of range, entering numeric data into an alpha field, or alpha data into a numeric field.
MU FAILURE	Appears when an ACARS fault is detected in the airborne avionics of the ACARS system.

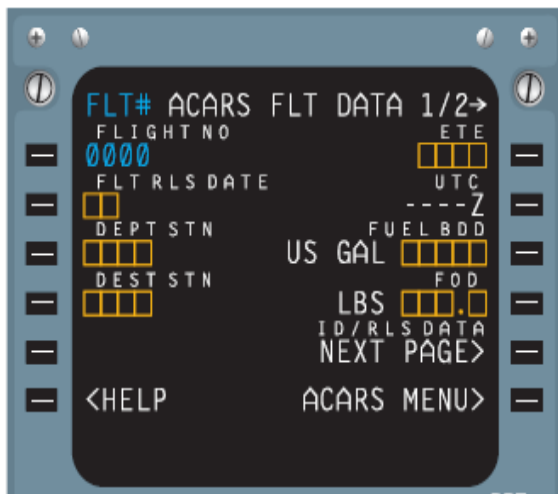
Preflight

FLIGHT DATA page 1/2

Access the DATA FLIGHT page from the ACARS MENU page.

FLIGHT DATA (1L) Select

The following page will be displayed.



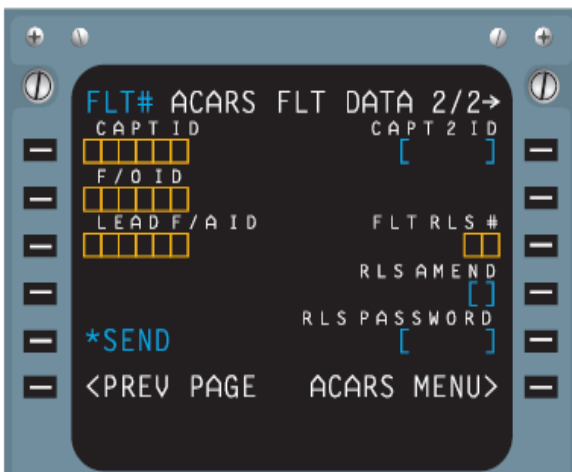
Flight Data page 1 of 2

- **DEPT/DEST Station**
(4 character ICAO identifier, e.g. KMSP vs. MSP)
- Enter FUEL BDD as "0" to satisfy screen logic. This data is not needed for downlink.
- Enter FOD from gauges.

FLIGHT DATA page 2/2

ID/RLS DATA (4R) Select

The following page will be displayed.



Flight Data page 2 of 2

- Enter DL ID number for pilots for automated TO/LDG function.
- Enter FLT RLS# to satisfy screen logic.

ATC Pre-Departure Clearance

ATC REQUESTS (1R)..... Select

PRE DEPARTURE CLEARANCE (1L) Select

The following page will be displayed.

DEST

KFSD

VERIFY YOUR DEST STN

PRI OR TO REQUESTING

ATC CLEARANCE

* SEND

< PREV MENU

ACARS MENU >

DEST (1L)..... Verify/Enter

The DEST field Defaults to the 4 letter identifier for the destination airport entered on the ACARS FLT DATA page. Use the four letter city code (e.g., KMSP, KDTW) for this field. Pressing LSK 5L downlinks a request for the ATC clearance. The clearance message appears on the RECEIVED MESSAGES MENU when it becomes available.

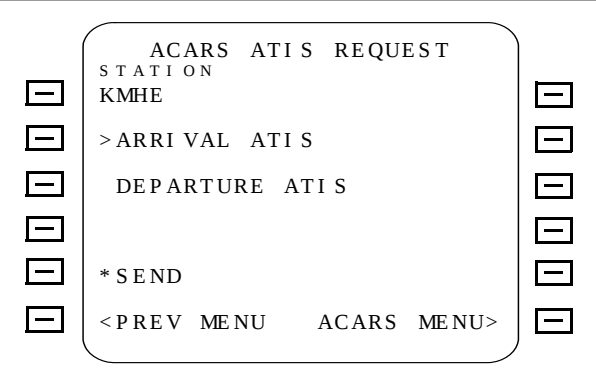
SEND (5L) Select

ATIS

ATC REQUESTS(1R) Select

ATIS(4L) Select

The following page will be displayed.



STATION Verify/Enter

This page defaults to the departure station and the departure ATIS before takeoff. It automatically changes to the destination station and arrival ATIS after takeoff.

The crew can enter any desired station (use the four letter ICAO code) and manually select either departure or arrival ATIS at any time. Press the *SEND prompt to downlink the request. ATIS information prints when the *PRINT prompt is pressed.

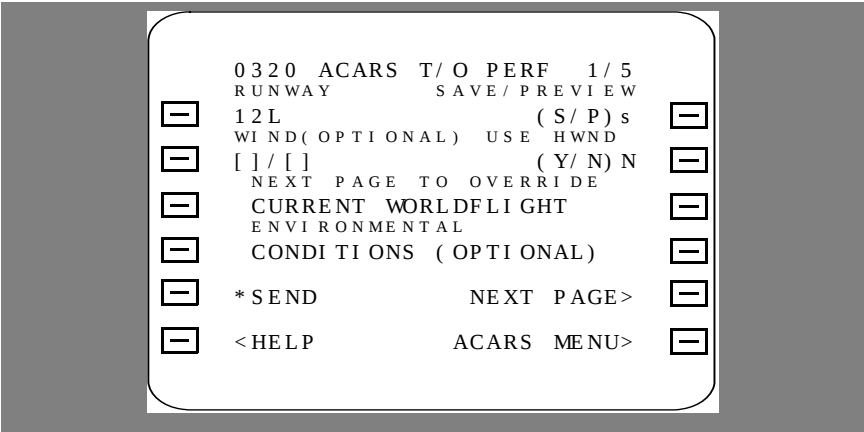
The caret (>) indicates whether departure or arrival ATIS has been automatically or manually selected. After the desired ATIS is selected, the ATIS appears on the RECEIVED MESSAGES MENU when it becomes available.

SEND(5R) Select

Takeoff Performance

REQUESTS(2R) Select
PERF TAKEOFF(3R) Select

The following page will be displayed.



The ACARS T/O PERF selection contains 5 pages on which various factors can be selected to be used in the performance calculation. The only necessary variable is the runway prompt. Once the pilot has entered a runway in 1L, the *SEND prompt will become available. Press the *SEND prompt to downlink the request.

The WDR (Weight Data Record) information appears on the RECEIVED MESSAGES MENU when it becomes available and will print when the *PRINT prompt is pressed.

Pilot requested runways are available after the ACARS WDR update is received. Make takeoff performance data request via the ACARS T/O PERF page. AWABS returns performance data for the runway (full length) and two intersections.

If a desired runway **intersection** is not on the ACARS WDR, the crew can either:

- Request the runway (i.e. 32L) via ACARS NWA REQUESTS menu, TAKEOFF PERF. Verify the assigned intersection is on the WDR or,
- Request the specific intersection via ACARS (32L-T10) or,
- Call dispatch or local gate radio if the data is still not available.

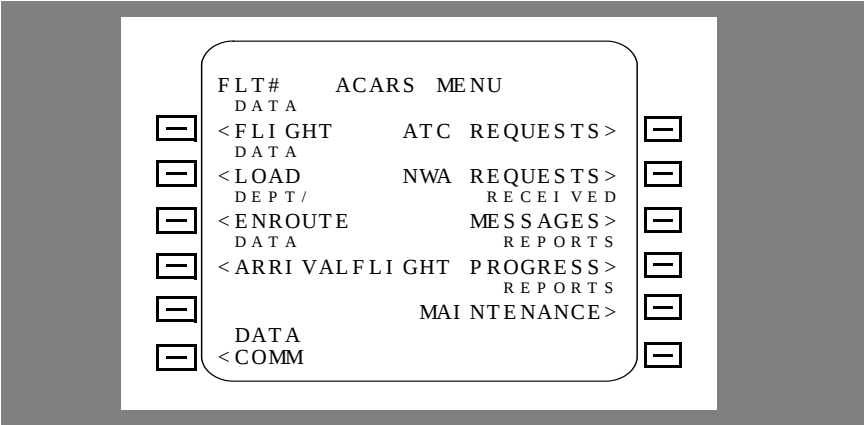
ACARS T/O PERF Notes:

- Save/Preview option no longer functional. All requests are essentially the same as the NW default "Save", so closeout data is computed.
- "Use Headwind Y/N" field does not function in AWABS.
- Flaps entry is no longer functional. AWABS provides the flap information on the paper printout.
- Anti Ice and PACKS ON/OFF entries do not work with AWABS. (Provided in the information on the paper printout).

CRUISE

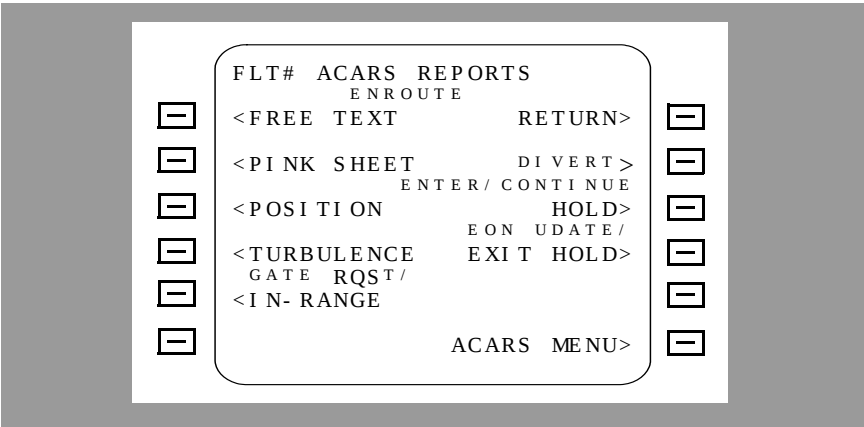
Position Report

- Position Report required only if published on the flight plan.
- In Range report required.



REPORTS FLT PROGRESS

Select REPORTS FLT PROGRESS (LSK 4R) from the ACARS MENU page. The ACARS REPORTS menu displayed depends on the phase of flight (taxi out, enroute, taxi in). In each phase of flight, the ACARS system allows for a Free Text Message to be sent.



POSITION

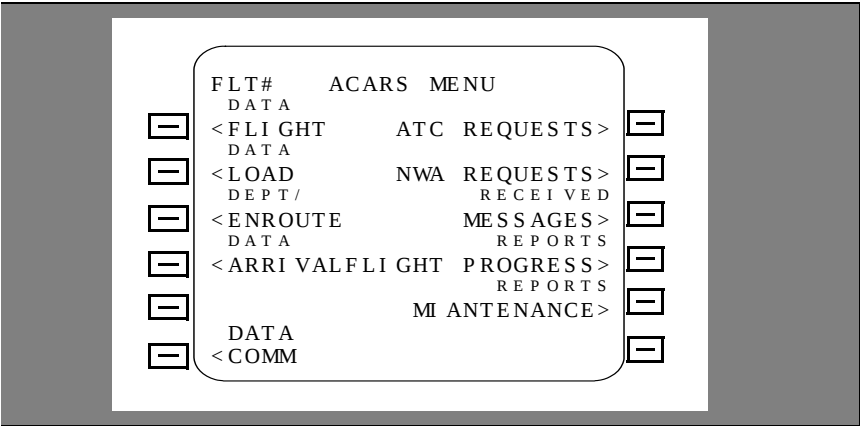
When enroute, selecting LSK 3L from the FLIGHT PROGRESS menu displays the DOMESTIC POSITION REPORT page. Enter applicable values. Position reports are sent to Dispatch and Meteorology.

[]	FLT# ACARS DOM REPORTS.	[]
	POSITION EON OLD/ NEW	
	1635/ Z	
[]	TIME OVER FREM	[]
	CCCCZ	
[]	ALTITUDE ENTER/ CONTINUE	[]
	FL250 SAT	
[]	ABEAM DIR - 30C	[]
	[] DEG WIND	
[]	ABEAM DIST TRUBULENCE	[]
	[] NM NEXT PAGE>	
[]	<PREV MENU ACARS MENU>	[]
	fl±	

TURBULENCE PLOTS (TPs)

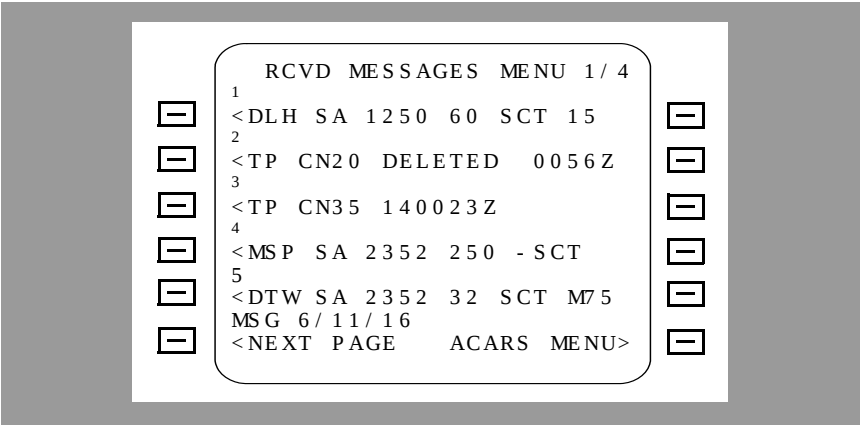
Selecting the LSK 2L from the NWA REQUEST menu allows the crews to request all active TP's, request active TP's by regions, or request an individual TP.

Received Messages



RECEIVED MESSAGES

Select RECEIVED MESSAGES (3R) from the ACARS MENU



RECEIVED MESSAGES MENU

When airborne, pressing LSK 3L displays the DOMESTIC POSITION REPORT page. Position Reports are automatically sent to Dispatch and Meteorology.

IN - RANGE REQUESTS

	FLT# DATA <FLIGHT DATA <LOAD DEPT/ <ENROUTE DATA <ARRIVAL FLIGHT DATA <COMM	ACARS MENU ATC REQUESTS> NWA REQUESTS> RECEIVED MESSAGES> REPORTS PROGRESS> REPORTS MI ANTENANCE>	
--	---	---	--

REPORTS FLT PROGRESS

Select the REPORTS FLT PROGRESS (4R) prompt on the ACARS MENU page.

	FLT# EON OLD/ NEW - - - / CONNECTING GATE RQSTS: FLT NO [] [] [] * SEND < HELP	ACARS IN- RANGE 1 / 3 PERF RWY [] [] [] [] GND SVC RQSTS NEXT PAGE> ACARS MENU>	
--	---	---	--

Landing information is received off the WDR (Weight Data Record) at the departure station. Prompts on this page are no longer functional and no response will be received. No error messages will be uplinked as a result of sending an IN-RANGE request. Uplink response to In Range downlink will include inbound gate assignment, and automatically list all working and/or DH pilots and Flight Attendants and their next flight schedule departure, destination, and gate number time (or “terminate” at the end of a rotation).

FLT SUMMARY

```

graph TD
    Root[ACARS MENU] --> FLT[FLT#]
    Root --> COMM[COMM]
    FLT --> FLI[< FLI GHT DATA >]
    FLI --> ATC[ATC REQUESTS]
    FLI --> NWA[< LOAD DATA >]
    NWA --> RECD[RECEIVED]
    FLI --> ENR[< ENROUTE DATA >]
    ENR --> MSG[MESSAGES]
    ENR --> RPT[REPORTS]
    FLI --> ARR[< ARRI VAL FLI GHT DATA >]
    ARR --> PRG[PROGRESS]
    ARR --> RPT2[REPORTS]
    ARR --> ANT[MI ANTENANCE]
    COMM --> COM1[DATA]
    COMM --> COM2[< COMM]
  
```

The diagram illustrates the ACARS MENU structure. It is a hierarchical tree starting from the root 'ACARS MENU'. The first level branches into 'FLT#' and 'COMM'. 'FLT#' further branches into '< FLI GHT DATA >', '< LOAD DATA >', '< ENROUTE DATA >', and '< ARRI VAL FLI GHT DATA >'. These then branch into specific data types: 'ATC REQUESTS', 'RECEIVED', 'MESSAGES', 'REPORTS', 'PROGRESS', and 'MI ANTENANCE'. The 'COMM' branch leads to 'DATA' and '< COMM'.

```

0100 ACARS ARRIVAL
OUT / OFF FREM
1+55/1621Z 018.2
ON / IN FLEX T / O TH R
1703/1741 (Y / N) Y
ACT BLOCK AUTOLAND
01:13 CAT(1 / 2 / 3) -
GATE / ELEC / AIR
- - - / - / -
DELAY
<REASON T / O+LND ID>
PRINT
*F / A TIMES ACARS MENU>

```

DATA ARRIVAL PAGE

Fill out appropriate information on ACARS Arrival page. Select T/O + LND ID.

0000 ACARS T/O+LAND ID
TAKE OFF LAND
< CAPTAIN 000001 >
< F/O 000002 >
< CAPTAIN [] >
<ARR DATA ACARS MENU>

T/O+LND ID

Fill out appropriate information on ACARS T/O + LND ID page.

ACARS Data Collection

Autoland Recording

Per Delta's Lower Landing Minimums (LLM) program, aircraft must accomplish and record an autoland periodically.

Note: When the aircraft is approaching its autoland due date, MCC will request the crew perform an autoland using an S-MEL. This is only a request; if an autoland cannot be accomplished for operational reasons, no action is required.

Use the following procedure to record when an autoland is accomplished, whether it is for aircraft currency, weather, or pilot proficiency:

After an autoland, complete the ACARS ARRIVAL page at destination as follows:

- Enter "1", "2", or "3" (for actual weather approach category) into the AUTOLAND field at LSK 3R.
- Select "Y" or "N" into the SUCCESS field at LSK 4R. If the autoland was attempted and unsuccessful, make a logbook write-up including as much pertinent information as possible. Do not enter "N" unless an autoland was unsuccessful due to aircraft automation reasons

Autoland Criteria

An autoland is successful if no malfunctions occur which would prevent an autoland under CAT III conditions. Additionally, the aircraft must land within the normal touchdown zone (approximately 1,500 to 3,000 feet from the threshold), within 27 feet of centerline, and with satisfactory rollout performance.

Note: Data on the ARRIVAL page must be entered within 7 minutes of the 'IN' time or the data will be lost.

Note: Entering autoland data updates autoland currency for both pilots (Ref. FOM Part 2, Chapter 15).

Engine Condition Monitoring (ECM) Recording

When automatic engine data collection is unavailable, the crew may be asked to complete an ECM report. Use the following procedure to complete the report:

- Select ACARS MENU.
- LSK 5R REPORTS MAINTENANCE
- LSK 2L DATA ENGINE
- See Vol. 2, Chapter 23 for data entry codes.

Record the data using the following guidelines:

- (1) Fuel balanced.
- (2) No turbulence.
- (3) Straight and level for 15 minutes.
- (4) Usable packs ON.
- (5) Engine/wing anti-ice OFF.
- (6) Disconnect autothrust as follows:
 - a. Match thrust lever position (white circle) with the current N1.
 - b. Disconnect autothrust using the instinctive disconnect pb.
- (7) Set N1 for speed trend zero.
- (8) Wait 5 minutes for stabilization without changing thrust.
- (9) Record readings and appropriate switch positions.
- (10) Airspeed must be steady within 5 kts start to finish.

Note: Airspeed variations can invalidate results. If airspeed varies by more than 5 kts during recording period, re-accomplish report.

- (11) After recording data, re-engage autothrust as follows:
 - a. Select the FCU A/THR pb to ON (illuminated).
 - b. Place the thrust levers in the CL detent.

Note: Send at least one ACARS ECM report per flight, if possible. On flights of more than 2.5 hours, complete two reports.

Note: If ACARS is inoperative, the data should be recorded in the Inflight Engine Monitoring logbook.

RNAV (RNP) Approach Recording

An important part of RNAV (RNP) certification is data collection. Upon completion of an RNAV (RNP) approach, send a free text ACARS message to address F - “CREW SKDS” with the following information:

- Airport, RNP approach conducted, and runway, e.g. KMDW RNP 22LY (spaces ok but not required).
- For data collection purposes, the free text report must include “RNP”.
- SAT or UNSAT. UNSAT indicates a failure of aircraft or procedure; ATC clearance changes, traffic conflicts, or weather changes do not constitute an UNSAT.
- If UNSAT, the reason for UNSAT (e.g., loss of GPS PRIMARY, excessive track deviation, GPWS warning, autopilot disconnect, navigation database error, etc.)
- Any other pertinent comments. Sample entries:
KMDWRNP22LYSAT or KDCARNVARNP19UNSAT
EXCESSIVE TRK DEV.

Note: Address “F” is listed in ACARS as “CREW SKDS”, however it is used for data collection in this case.

TOGA Takeoff Recording

Delta aircraft must accomplish and record a TOGA takeoff periodically for engine currency.

Following any TOGA takeoff (requested or otherwise), complete the ACARS ARRIVAL page at destination as follows:

- Enter “N” into the FLEX T/O field at LSK 2R.

Note: Data on the ARRIVAL page must be entered within 7 minutes of the ‘IN’ time or the data will be lost.

Turbulence Recording

Crew should make a turbulence report when any significant turbulence is encountered or when encountered turbulence was not forecast. (Meteorology uses these reports to update the TP forecast).

Note: The lack of turbulence when forecast should also be reported.

- From ACARS MENU select FLIGHT REPORTS
- LSK 4L TURBULENCE

- Enter turbulence reporting data including turbulence levels 1 through 6.
- LSK 5R REMARKS for any free text messages regarding the turbulence (i.e. where encountered, duration, ATC comments, any smooth altitudes).

Waypoint Position Reporting (WPR)

Note: Turbulence information is not included in waypoint reports. Crews must report any significant turbulence to flight control through the ACARS TURBULENCE page, which is accessed from the FLT PROGRESS page.

Automatic Waypoint Reporting

Normally, waypoint reporting will not require any initiation by the crew as the process is intended to be fully automatic. Flights that have normal ACARS coverage can expect waypoint reporting to be active during the flight.

When an ACARS OUT event occurs, a "trigger" signal will be sent to the aircraft which configures the FMS to report all ** DAL POSN RPT ** automatically designated waypoints as they are sequenced.

Manual Waypoint Reporting

In some cases, waypoint reporting cannot be automatically configured and manual activation is required. When this is the case, it can be activated after departure, provided ACARS coverage is available. The following circumstances require manual WPR activation:

- A failure is suspected
- An error message was received
- Your dispatcher advises that WPR is not functioning
- A significant in-flight reroute is entered into the MCDU flight plan

Note: In the case of an in-flight reroute, flight control must also be notified to update your flight plan prior to requesting manual WPR activation. This assures that the proper waypoints are included to report.

To Manually Activate WPR:

- Send a FREE TEXT message to the shared address "F" (labeled "CREW SKEDS"), with the text "WPR RESET."
- This message will trigger the Datalink system to configure WPR.

- An ACARS message response "WPR VERIFIED" confirms that WPR reporting is now active for remainder of flight.
- If no "WPR VERIFIED" message is received, crews are to revert to manual ACARS position reporting.

Manual WPR Activation Screen:

```
0320 AOC FREE TEXT 2/2
ADDR: F/-/
WPR RESET
[                ]
[                ]
[                ]
[                ]
[                ]
[                ]
[                ]
*SEND
<PREV PAGE      AOC MENU>
```

ABEAM Waypoints

Due to FMS design limitations, automatic position reports are unavailable for waypoints that are sequenced abeam (i.e. ABXXX). In this case, a manual ACARS position report is required and should be sent when the ABEAM waypoint is sequenced.

Note: When manually completing the ACARS position report page, use the flight plan FIX name (i.e. NOT ABXXX). The RAD/DIST fields do not have to be completed.

Wi-Fi Phone (Door 2L)

Note: WiFi Phone Service is currently unavailable. Crews will be notified by bulletin when service resumes.

Making Calls

To make a call:

- Press and hold the “SND” key until the phone turns on.
- Key in “DAL” or “325” to unlock the phone.
- Press “RCL” key to access the phone book, then scroll to the desired name using the up/down keys.
- Press “SND” key to call, “END” key to hang up.
- Press “FNC”, “5”, “STO” keys to relock handset.

Inhibiting Passenger Use

To inhibit passenger use of Wi-Fi (Non-Normal Operations):

- Press the “FNC” key, then “8.”
- Scroll to “PAX WIFI network” using the up/down keys, then press “SND.”
- Scroll to “PAX WIFI OFF” using the up/down keys, then press “SND.”

Flights with Nontraditional Call Signs

Delta flights occasionally operate with an ATC-filed call sign that differs from the Delta flight number. This occurs on certain military charter flights (e.g. “Camber”) and on sub flights. (Refer to FOM chapter 5.2, Stub Flights.)

Verify or enter the ATC-filed call sign in the FMS. This will assure ADS and transponder information are properly transmitted to ATC. The ACARS flight number will be populated with the ATC-filed number and must remain unchanged. ACARS messages will be received by Delta OCC dispatchers as a result of an automated process; however, an ACARS error message will be transmitted to the flight. This message can be ignored.

The flight plan will include the following dispatcher remarks for any flight operated with a call sign differing from the Delta flight number:

FLIGHT PLAN FILED AS CMBxxx

**CMB CALL SIGN MUST BE ENTERED IN THE FMS AND USED
FOR ALL ATC COMMUNICATIONS**

**DO NOT ATTEMPT TO ENTER DELTA FLIGHT NUMBER IN FMS
OR ACARS**

The message below will be sent via ACARS:

--DATALINK ADVISORY- - FLIGHT TO BE OPERATED AS xxx

DO NOT CHANGE UPLINKED FLIGHT NO IN FMS

**CONFIRM CITY PAIR AND FLT RLS DATE ON ACARS FLT DATA
PAGE**

**IGNOR FLT DATA ERROR MESSAGES WHEN RECEIVED. ACARS
MESSAGES WILL BE DELIVERED AS EXPECTED.**

Cabin Medical Communication System (Med Comm)

The Med Comm panels allow a cabin crewmember or other delegated person to communicate with the flight crew via the interphone (INT) system and also communicate with a ground station, or another aircraft, using the onboard radios. The A319/320/321 are equipped with two Med Comm panels located in PSUs at the right aisle above right seats at rows (A319 rows 13 and 25), (A320 rows 14 and 26) and (A321 rows 5, 20, and 33). A David Clark headset is stored in an aft cabin overhead bin (alongside the AED and EEMK equipment) in a black pouch labeled MEDICAL HEADSET. The headset includes a 30 foot cord, equipped with a Push-To-Talk (PTT) switch. Once communication is established from the first observer's audio control panel (ACP3), the cabin crew will have direct communication via the headset.

A319/320 Functionality

The Med Com panels are wired in parallel with the first officer's position. For communication between the cockpit and either Med Comm panel, put ACP 3 in the INT position. Any other flight crew member can join in the conversation by selecting their ACP to the INT position. For off-aircraft transmission, choose a desired active radio and frequency on any RMP and select that radio at ACP 3. When the INT/RAD switch on ACP 3 is depressed and held, the person in the cabin can transmit off-aircraft any time the PTT switch on the Med Comm headset/cord is depressed.

Note: Note: The PTT switch must be released to return reception capability.

Two-way communication capability will therefore require the active participation of a person in the cockpit; to depress and hold the INT/RAD switch on ACP 3 to the RAD position for the person in the cabin to transmit, and to release the INT/RAD switch for the person in the cabin to receive. It is the captain's discretion (e.g. workload management) as to whether or not this functionality is practical; flight deck operating crewmember relay of the information obtained on the Medical Assistance Form (MAF) may be a better option.

A319/320 Flight Deck Procedures for Establishing a Med Comm Connection with ATL Radio/STAT-MD

Receive-only communications:

- (1) Direct the cabin crew to connect the Med Comm headset and cord to the most accessible PSU panel jacks and establish the interphone connection.
- (2) Establish the radio connection via ATL Radio to STAT/MD.
- (3) Select the respective VHF or HF and INT communications reception knobs on ACP 3.
- (4) Establish interphone communications (INT) with the cabin and remind the cabin crewmember of the receive-only status.

Note: Any transmit capability from the cabin must be enabled from the flight deck in conjunction with the use of the PTT switch. (See Additional Procedures below.)

- (5) Leave the INT/RAD switch on ACP 3 in the INT position.
- (6) Monitor the conversation, as necessary, via your respective ACP interphone (INT) communications reception knob.

Note: CA and FO may want to exit “hot microphone” so as not to interrupt the Med Comm communications with other flight deck communications.

Additional Procedures to Enable Two-Way Communications (Transmit and Receive)

Note: A flight deck crewmember must manipulate the INT/RAD switch on ACP 3 to enable this functionality.

- (7) Select the appropriate transmitter selection key (VHF/HF) on ACP 3.
- (8) Push and hold the INT/RAD switch on ACP 3 in RAD when the person in the cabin desires to transmit using the Push-To-Talk switch.

Note: The use of the word “over” is appropriate for identifying the end of the cabin crewmember’s desired transmission. Release of the PTT switch will re-enable cabin reception.

- (9) Release the INT/RAD switch when the person in the cabin desires to end the transmission and return to the reception mode.

A321 Functionality

Located on the top of the overhead panel is an 'AUDIO CAB ON 3' pushbutton. When selected ON, the MED COMM audio jacks are connected directly to ACP 3. This permits the FA or medical personnel to employ the headset to transmit and receive on either the radio or intercom (whichever is selected in ACP 3), through use of the headset's push-to-talk switch. The pilot(s) can monitor the radio conversation through their own ACPs, or talk to the MED COMM user directly through the intercom.

A321 Flight Deck Procedures for Establishing a Med Comm Connection with ATL Radio/STAT-MD

1. Direct the cabin crew to connect the Med Comm headset and cord to the most accessible PSU panel jacks and establish the interphone connection.
2. Select the INT transmit key and reception knob on ACP 3.
3. Select the AUDIO CAB ON 3 pb on the overhead panel to ON.
4. Establish interphone communications with the MED COMM user.

To permit direct VHF 2 communications between the MED COMM user and STAT MD:

1. Establish the radio connection via ATL Radio to STAT/MD on VHF 2.
2. Select the VHF 2 transmitter selection key and reception knob on ACP 3.
3. Select/verify the AUDIO CAB ON 3 pb on the overhead panel to ON.
4. Advise the MED COMM user that they may transmit directly to STAT MD through use of their headset push-to-talk switch.
5. Pilots can monitor communications through their individual ACP panels, if desired.

Note: CA and FO may want to exit "hot microphone" so as not to interrupt the Med Comm communications with other flight deck communications.

6. Select the AUDIO CAB ON 3 pb to OFF (lights out) when conversation is over.

Intentionally
Blank

Supplementary Procedures

Electrical

Chapter SP

Section 6

Electrical Power Up

WARNING: If a red A/C Out-of-Service tag is installed, personnel are not to activate any system, control, or switch without obtaining approval of Maintenance personnel (preferably the AMT actually performing the repairs)

WARNING: Do not establish any hydraulic power which will result in flap movement unless the wing/flap area has been cleared of personnel and equipment. Use an outside observer

Use the following procedure to apply electrical power to the aircraft.

Check BAT voltage. If above 25.5 volts, continue with power - up. If at or below 25.5 volts, attempt to charge the BAT using EXT PWR with the BAT pb in AUTO.

BAT 1, BAT 2 pbs AUTO (lights out)

If external power is desired:

EXT PWR AVAIL light Illuminated

EXT PWR pb ON (blue)

IF APU power is desired:

Note: Accomplish the APU Fire System Test procedure in the Supplementary Fire Protection section.

APU FIRE TEST Accomplish

APU MASTER pb ON

Note: If the green LOW OIL LEVEL message is displayed, contact maintenance before starting the APU.

APU START pb ON

Note: The start light extinguishes and the AVAIL light illuminates when the start is complete.

Preflight Battery Check

BAT 1, BAT 2OFF

Check the voltage of BAT 1 and BAT 2 is greater than 25.5 volts.

Note: If any battery is at or below 25.5 volts, complete a charging cycle using external or APU power (charging may take up to 20 minutes). If the battery voltage is still below 25.5 volts, maintenance action is required.

ELEC pb on ECAM control panel Select

BAT 1, BAT 2 pbs AUTO

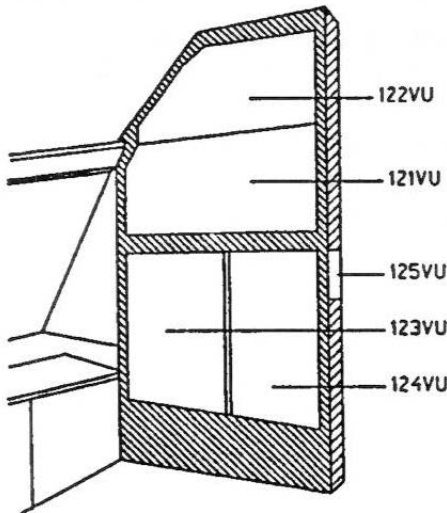
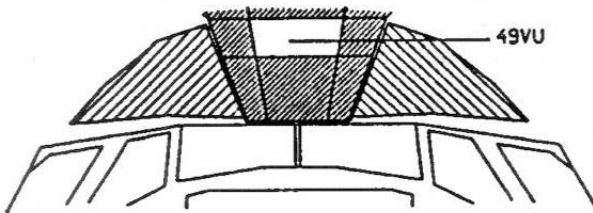
Verify that the battery current for each battery drops below 60 amps within 10 seconds.

Circuit Breaker Locations

The following alphabetical listing of circuit breaker locations is to be used in conjunction with a published procedure or as instructed by Maintenance personnel.

The following coding is used to identify circuit breaker locations in the various groups of aircraft on pages SP.6.2-6.

All Aircraft	1
Aircraft 3209-3211	2
Aircraft 3212-32XX	3
Aircraft 3101-31XX	4
Aircraft 3001-30XX	5



System or Item.....	C/B Location
A	
AC bus 1 & 2 & svce ctl.....	V25, V27, V29 (1)
AC bus 1 supply.....	AB11, AB12, AD11, AF11 (1)
AC bus 2 supply.....	AB1, AB2, AD2, AD3, AF2 (1)
AC bus monitoring.....	H11 (1)
AC essential bus on bus 1.....	AC12 (1)
AC essential bus on bus 2.....	AC1 (1)
ACARS MU.....	L6 (2, 3)
Audio control panel, captain.....	G6 (1)
Audio control panel, first officer.....	G7 (1)
Audio control panel, 3rd occ.....	M2 (1)
ADF 1.....	K3 (2); H14 (3, 4)
ADIRU 1.....	F6, F7 (1)
ADIRU 2.....	N5, N7, N9, N11 (2); N4, N6, N8, N10 (3, 4)
ADIRU 3.....	F9 (1); N4, N6, N8, N10 (2); N3, N5, N7, N9 (3, 4)
Aft cargo ventilation fan.....	S22 (1)
Aft cargo ventilation/heating.....	S20 (2); C7 (3, 4)
Air data probes, anti-ice.....	D2-4, Y11-16, Z12-16 (1)
Air Cond mixer flap.....	V23 (2); V22 (3, 4)
Air Cond Temp Control.....	D08, W22, Y20, W21, Y21 (5)
AIDS DMU.....	K15
(1)	
AOA probes, anti-ice.....	D4, Y13, Z15 (1)
APU control.....	L42 (1)
APU ECB supply.....	L41 (1)
APU fire auto-extinguishing test.....	L40 (1)
APU fire detection.....	L43, L44 (1)
APU fire extinguishing.....	L38, L39 (1)
APU fire fuel valve.....	M41, M42 (1)
APU fuel blow off.....	B14, K39 (1)
APU GCU.....	Y25 (1)
APU generator.....	Y31, AA8 (1)
APU LP fuel valves.....	M39-42 (1)
APU fuel pump.....	M38
(1)	
APU oil heat.....	K41
(4)	
ATC transponder 1.....	G11 (1)
ATC transponder 2.....	K7 (1)
ATSU.....	L15,16
(4)	
Avionics compartment lighting.....	Z7-9 (1)
Avionics ventilation.....	D6, Y17 (1); D7 (2); D5 (3, 4)
Avionics ventilation blower fan.....	AD10 (1)
Avionics ventilation extract fan.....	AE2 (1)

System or Item.....	C/B Location
B	
Battery bus power supply	CC1 (1)
Bleed air, engine 1	D11, 12 (1)
Bleed air, engine 2	Z22, 23 (1)
Bleed, x-bleed valve - battery	Z21 (2); D13 (3, 4)
Bleed, x-bleed valve - normal	Z20 (1)
Blower fan, avionics vent	AD10 (1)
B hydraulics electric pump	AB9 (1)
B hydraulics warning/control	D14 (2); C12 (3, 4)
B reservoir air pressure transmitter	P34 (2, 3)
Brake Fan Control	M32 (5)
Brake Fans (Wheels 1 + 2)	L32 (5)
Brake Fans (Wheels 3 + 4)	L35 (5)
Brake pressure indicator, Y hydraulics	C10 (1)
Brake temperature detection unit	M37 (1)
Braking & Steering SYS 1	M33, 34 (1)
Braking & Steering SYS 2	M35, 36 (1)
C	
Cabin pressure control	D9, Y22, 23 (1)
Cargo fire extinguishing	T19 (1)
Cargo smoke detection (SDCU CHAN 1, CHAN 2)	T18 (1); T17 (2); C6 (3, 4)
Center tank pumps	P23, 26, R25-27 (1)
CFDS	J17-20 (1)
CIDS	G3-5, N12-14 (1); G2, M5-14 ((2, 3); N11 (3); G1,2, M5-14, P12-14, Q13, Q14 (4)
Clock normal supply	F11 (1)
Clock standby supply	N3 (2), N2 (3, 4)
Cockpit dome lights	H8, Y6 (1)
Cockpit lights	Y3-5, Z4-6, H4 (1)
Cockpit seat, Capt	U11 (3, 4)
Cockpit seat, F/O	U14 (3, 4)
Cockpit Voice Recorder	E13, 14 (1)
Crew oxygen supply	C1 (2); HA1 (3, 4)
CSM/G auto	Z25, 26 (1)
D	
Data loader supply	J16 (1)
DC bus power supply	CD1, CE1, BG1, BF1, BE1 (1)
DC bus tie	U24, W25, 26 (1)
DC service bus	U30, X24 (1)
DC service bus power supply	BD1, BB1 (1)
DDRM1	F13 (1)
DMC 1 switching & supply	E9, E11 (1)
DMC 2 switching & supply	R8, Q8 (1)
DMC 3 switching & supply	E7, Q9 (1)
DMC 3 standby power supply	E10 (1)
DME 1	G14 (1)
DME 2	K6 (1)
Doors, avionics & passengers	P2, 5, T13 (1)
Doors, cargo	T12 (1)
Doors, flight deck	T13 (1)

EECAM control panel	E12(1)
ECAM, lower DU	R10, 11(1)
ECAM, upper DU	E5, 6(1)
EGIU 1	Z30, 31, AF12, AA7(1)
EGIU 2	Y30, 31, AF1, AA8(1)
EIS, horn supply	P9(1)
EIS, relay box, captain	E8(1)
EIS, relay box, first officer	R7(1)
EIU 1 & 2	A4, 5, R41(1)
ELAC 1 & 2 normal supply	B11, R20(1)
Electrical lighting control	H10(1)
Emergency cabin lights	H5-7, V7(1)
Emergency generator - auto	Z25, 26(1)
Engine 1 & 2 bleed air	D11, 12, Z22, 23(1)
Engine 1 & 2 HP fuel shut off valves	A1, 2(1)
Engine 1 & 2 ignition	A3, P39-42(1)
Engine anti-ice	W10, X10(1)
Engine fire detection loops	A6, A, Q38, 39(1)
Engine fire extinguishing	Q41-44(1)
Engine fire hydraulic shut off valves	C13, 14(1)
Engine LP valve motors	A8, 9, M25, 26(1)
Engine oil quantity/pressure 1 & 2	N39-42(1)
Engine rev lock	N44, 45(3, 4)
Essential bus transformer	H3(1)
EVMUs 1 & 2	R44(1)
External power & EGIU 1	Z31, AA7(1)
External power lights control	X28-31(1)
External power protection	AB7(1)
Extract fan, avionics ventilation	AE2(1)
Extract fan, lavatory & galley	U19, 21(1)

F

FAC 1	B3, 4(1)
FAC 2	M18, 19(1)
FADECs	A4, 5, Q40, R41(1)
FCDC 1 & 2 supply	B10, Q20(1)
FCU 1 & 2	B5, M21(1)
FDIU	K17(1)
Fire extinguishing, cargo	T19(1)
Fire extinguishing, engines	Q41-44(1)
Flap control & monitoring system 1 & 2	B7, Q21(1)
Flap position indicator	B12, P16(1)
Flap WTB system 1 & 2	S7, P20(1)
Flight interphone	G8(1)
Flight recorder	K16-18(1)
FMGC 1 & 2	B2, M17(1)
Fuel quantity indicator channels	A13, L26, M27(1)
Fuel, high level supply	L25(1)
Fuel, left tank pump 1 standby power supply	AD12(1)
Fuel, left tank pumps	N23, 26, R23, 29(1)
Fuel, refuel/defuel valves	L23, 24, S27, U28, 29(1)
Fuel, right tank pump 1 standby power supply	AE12(1)
Fuel, right tank pumps	Q23, 26, R24, 28(1)
Fuel, smoke configuration pump control	A14(1)
Fuel, wing transfer valves	A10, 11, M22, 23(1)
Fuel, crossfeed valve motors	A12, M24(1)
FWC 1 & 2 power supply	Q7(1); E2(2); F1(3, 4)

System or Item.....	C/B Location
G	
Galleys.....	S24-26, 28, AD4, 9, AF4, 9, AE10, AC10 (1)
GCU's 1 & 2 & APU.....	T26, 27, Y25 (1)
Generator 1 & 2 OFF.....	T28-31 (1)
Generator 1 & EGIU 1.....	AF12, Z30 (1)
Generator 2 & EGIU 2.....	AF1, Y30 (1)
Ground power protection.....	AB7 (1)
GPCU.....	Y24 (1)
GPWS.....	P6, 7 (1)
Green hydraulic pump, engine 1.....	R34, 35 (1)
H	
HF.....	HA14 (3)
HYD, blue system warning/control.....	D14 (2); C12 (3, 4)
HYD, low level indicators.....	N32 (1)
HYD, pressure transmitters.....	D13 (2); C11 (3, 4)
HYD, quantity indicators.....	P35 (1)
I	
IDG disconnects.....	T24, 25 (1)
Ignition, engines 1 & 2.....	A3, P39-42 (1)
ILS 1.....	G12 (1)
ILS 2.....	K9 (1)
In Flight Entertainment (IFE).....	D08, C03, C02, C04, C05, C06, C07, C08 (5)
ISIS.....	F12 (5)
L	
Lavatory/galley extract fan.....	U19, 21 (1)
Leak test G/Y/B hydraulic systems.....	N35 (1)
LGCIU 1.....	C9 (1)
LGCIU 1 ground supply.....	Q34 (1)
LGCIU 2.....	Q35 (1)
Lights, annunciator light test board.....	X6 (1)
Lights, annunciator light transformer supply.....	H3, X3-5 (1)
Lights, avionics compartment.....	Z7-9 (1)
Lights, beacons.....	U3, 6 (1)
Lights, flight deck, normal.....	Y3-6, Z4-6 (1)
Lights, emergency cabin lights.....	H5-7, V7 (1)
Lights, emergency flight deck dome lights.....	H8 (1)
Lights, essential bus transformer.....	H3 (1)
Lights, ice indicator.....	H4 (3, 4)
Lights, landing lights.....	T4-7 (1)
Lights, logo.....	T2, 3, V2, 3 (3, 4)
Lights, navigation lights.....	T2, 3 (1)
Lights, runway turnoff lights.....	W5, 6 (1)
Lights, standby compass light.....	H4 (1)
Lights, strobes.....	V5 (1)
Lights, taxi & takeoff lights.....	W7-9 (1)
Lights, wheel well lights.....	X7, 8 (1)
Lights, wing & engine scan.....	W2, 3 (1)
Loudspeaker, captain.....	F10 (1)
Loudspeaker, first officer.....	P8 (1)

System or Item.....	C/B Location
M	
MCDU 1	B1 (1)
MCDU 2	N20 (1)
MCDU 3	N21 (2, 3)
N	
ND, captain	Q10, 11 (2); E1, 2 (3, 4)
ND, first officer	R4, 6 (1)
O	
Oxygen, crew supply.....	C1 (2); HA1 (3, 4)
Oxygen, passenger.....	C2-8 (2); HA2-8 (3, 4)
P	
Pack 1 flow control & indicators	V22 (2); D7 (3, 4)
Pack 2 flow control & indicators	V21 (1)
Pack 1 temperature control system	X21, 22; Y18, 19 (1)
Pack 2 temperature control system	W21, 22; Y20, 21 (1)
Parking brake control.....	N36, 37 (1)
PFD, captain.....	E3, 4 (1)
PFD, first officer	R3, 5 (1)
Pitot probes anti-ice	D2, Y14, Z16 (1)
Pneumatic crossfeed valve.....	Z20 (1); Z21 (2); D13 (3, 4)
Printer	J21 (1)
PTU	N34 (1)
PTU Inhibit	Q32, Q33 (5)
R	
Radar 1	K13 (1)
Radio altimeters 1 & 2	K11, 12 (1)
Ram air inlet (emergency).....	D10 (1)
RAT	P33 (1); P32 (2, 3); D14 (4)
Recirculation fans	W18, 20, X18, 20 (1)
Refuel/defuel valves.....	L23, 24, S27, U28, 29 (1)
RMI	F13 (1)
RMP 1, 2 & 3.....	G10, L2, 3 (1)
Rudder artificial feel	N17 (1)
Rudder trim indicator.....	M20 (1)
S	
SDAC 1	F2, 4, 5, P2-5, Q3, 4 (1)
SDAC 2	F3, 5, P2-5, Q2, 5, 6 (1)
SDCU channel 1	T17 (2); C6 (3, 4)
SDCU channel 2	T18 (1)
SEC 1 normal supply	B8 (1)
SEC 2 normal supply	Q18 (1)
SEC 3 supply	Q19 (1)
Selcal	M4 (1)
Service buses	AA5, AB5, 8, BB1, BD1 (1)
Shed bus contactor.....	U25, 26 (4)
Shed bus supply	BA1, AC2 (4)
Slat control & monitoring system 1	B6 (1)

System or Item.....	C/B Location
Slat control system 2.....	R21 (1)
Slat WTB system 1 & 2.....	S6, P19 (1)
Slat/flap position indicator.....	B12, P16 (1)
Slides armed warning.....	P10, 11 (1)
Standby altimeter.....	F14 (1)
Standby compass light.....	H4 (1)
Standby horizon.....	F12 (1)
Static ports, probes anti-ice.....	Y11, 13, 14 (1)
Stick lock.....	N16 (1)
T	
TAT probe anti-ice.....	Y15, Z12 (1)
TCAS.....	K10 (1), L01 (5)
THS actuator motors.....	B9, Q16, 17 (1)
TR 1.....	CF1, AB10 (1)
TR 2.....	AB4, 8, BC1 (1)
TRs monitor & control.....	W29, 30, X25, 26 (1)
V	
VHF 1.....	G9 (1)
VHF 2.....	L4 (1)
VHF 3.....	L5 (1)
VOR 1.....	G13 (1)
VOR 2.....	K8 (1)
W	
Water Line Heater.....	B01, E03 (5)
Window heat computer 1 & 2.....	W13, X13 (1)
Windshield heat, left.....	X14, AF10 (1)
Windshield heat, right.....	W14, AF3 (1)
Wing anti-ice.....	V14, 15 (2); C1, 2 (3, 4)
Wingtip brakes.....	P19, 20, S6, 7 (1)
Wipers.....	W12, X12 (1)
Y	
Y hydraulics, brake pressure indicator.....	C10 (1)
Y hydraulics, engine 2 pump.....	Q36, 37 (1)
Y hydraulics, electric pump control.....	N30 (1)
Y hydraulics, electric pump supply.....	AB3, 6 (1)
Z	
Zone temperature control.....	V17-20 (1)

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Supplementary Procedures

Chapter SP

Engines, APU

Section 7

Engine Start - Manual

Perform a Manual Engine start for any of the following conditions:

- When directed to do so by a QRH or MEL procedure, or
- When APU or external air pressure is inadequate for an auto start (i.e. hot or high altitude conditions), or
- For all first flight engine starts when the ambient temperature is 10°C or below.

Note: First flight is defined as when the engine has been shut down for 4 hours or longer.

CAUTION: The FADEC provides only partial protections during a manual start. Monitor engine indications throughout the start.

Note: Maximum motoring speed provides the best opportunity for a successful start. Maximum motoring speed is indicated when N2 acceleration is less than 1% in approximately 5 seconds. Recommended minimum N2 is 26%, although a start may be attempted with at least 20% N2 if necessary.

THR LEVERS IDLE

CAUTION: The engine will start, regardless of thrust lever position, and will rapidly accelerate to the thrust commanded by the thrust lever.

ENG MODE selector NORM then IGN/START

ENG 1 (2) MAN START pb ON

When maximum motoring N2 speed is achieved (recommended minimum 26%):

Note: If unable to reach 26% N2 (i.e. hot or high altitude airport), an engine start may be attempted to a minimum of 20 % N2. If unable to achieve 20%, verify pack valves are closed and attempt to unload the APU (GALLEY, BLUE ELEC PUMP, BLOWER, CABIN FANS, all but one FUEL PUMP.)

ENG 1 (2) Master ON

EGT rise within 15 seconds after fuel flow Verify

When N2 reaches 50%:

ENG 1 (2) MAN START pbOFF

Verify: Start valve closed (between 50 and 56% N2), igniter indication OFF, gray background on N2 indication disappears, and engine idle parameters normal,

ENG MODE selector NORM

Engine Start Valve - External Operation

If the start valve fails to open automatically, advise the ground crew of the need to open the valve manually. When the ground crew is ready, proceed with a normal start.

Communications with mechanic Pushback coordinator Establish

Pushback procedure and checklistAccomplish

Beacon ON

ENG MODE selectorIGN/START

ENG MASTER switch ON

Order the ground crew to open the start valve.

Engine Start Monitor

When N2 reaches 50%:

Order the ground crew to close the start valve.

Note: Allow time for the mechanic to close the start valve. Observe the valve closure on ECAM.

APU Bleed Inoperative Engine Start

Use the following procedure only when the APU Bleed is inoperative.

Normally the high pressure air cart is positioned on the left side of the aircraft and engine 2 is started using this procedure. The APU can be used as an electrical source. It is permissible to start engine 1 with coordination with ramp personnel if required due to MEL or other operational needs.

Preflight procedure and checklist	Accomplish
PACK 1 and PACK 2 pbs	Off
ENG 1 and ENG 2 BLEED pbs	Off
X BLEED selector	OPEN
CARGO HEAT HOT AIR pb	OFF
PUSHBACK procedure and checklist	Perform
Beacon	ON
High pressure air available and area clear	Confirm
Engine Start procedure	Perform

When engine has stabilized:

EXT PWR pb	Off/AVAIL
Request removal of external air and external electrical (if connected) power.	

**CAUTION: Do not allow engine bleed air and external air to
pressurize the pneumatic manifold at the same time.**

Operating engine BLEED pb	On
PACK 1 and PACK 2 pbs	On
CARGO HEAT HOT AIR pb	On

If engine #2 started using this procedure:

Note: Single engine taxi out using number 2 engine is permitted only when required to reposition aircraft for a crossbleed start.

CAUTION: Single engine taxi with engine 2 reduces hydraulic system redundancy and should be performed with caution.

Note: N/W STRG, REVERSER 1 and SPLR 1+5 will appear under INOP SYS on STATUS page until PARKING BRK selected OFF.

Note: The PTU will operate continuously after PARKING BRK is selected OFF.

After Start procedure and checklist Perform

Pushback clearance coordinate with ATC and ground crew

Start remaining engine using the Engine Crossbleed Start procedure in this section.

APU Generator Inoperative Engine Start

Use the following procedure only when the APU Generator is inoperative.

Preflight procedure and checklist Accomplish
 APU AVAIL
 APU BLEED pb ON
 EXT PWR pb ON
 PUSHBACK procedure and checklist Perform
 Beacon ON
 Engine Start procedure Perform

When engine has stabilized:

EXT PWR pb Off/AVAIL
 Request removal of external electrical power.

If engine #2 started using this procedure:

Note: Single engine taxi out using number 2 engine is permitted only when required to reposition aircraft for a crossbleed start.

CAUTION: Single engine taxi with engine 2 reduces hydraulic system redundancy and should be performed with caution.

Note: N/W STRG, REVERSER 1 and SPLR 1+5 will appear under INOP SYS on STATUS page until PARKING BRK selected OFF.

Note: The PTU will operate continuously after PARKING BRK is selected OFF.

After Start procedure and checklist Perform
 Pushback clearance coordinate with ATC and ground crew
 Start remaining engine using the Engine Crossbleed Start procedure in this section.

APU Inoperative (Bleed and Generator) Engine Start

Use the following procedure when the entire APU is inoperative.

Normally the high pressure air cart is positioned on the left side of the aircraft and engine 2 is started using this procedure. It is permissible to start engine 1 with coordination with ramp personnel.

Preflight procedure and checklist	Accomplish
PACK 1 and PACK 2 pbs	off
ENG 1 and ENG 2 BLEED pbs	off
X BLEED selector	OPEN
CARGO HEAT HOT AIR pb	OFF
PUSHBACK procedure and checklist	Perform
Beacon	ON
High pressure air available and area clear	Confirm
Engine Start procedure	Perform

When engine has stabilized:

EXT PWR pb	off/AVAIL
Request removal of the external air and external electrical power.	

CAUTION: Do not allow engine bleed air and external air to pressurize the pneumatic manifold at the same time.

Operating engine BLEED pb	on
PACK 1 and PACK 2 pbs	on
CARGO HEAT HOT AIR pb	on

If engine #2 started using this procedure:

Note: Single engine taxi out using number 2 engine is permitted only when required to reposition aircraft for a crossbleed start.

CAUTION: Single engine taxi with engine 2 reduces hydraulic system redundancy and should be performed with caution.

Note: N/W STRG, REVERSER 1 and SPLR 1+5 will appear under INOP SYS on STATUS page until PARKING BRK selected OFF.

Note: The PTU will operate continuously after PARKING BRK is selected OFF.

After Start procedure and checklistPerform

Pushback clearance coordinate with ATC and ground crew

Start remaining engine using the Engine Crossbleed Start procedure in this section.

APU Start

Delay starting the APU until just prior to pushback, if possible.
Refer to FOM, 3.4, APU Policy.

APU MASTER pb ON

Note: The APU systems page appears automatically on the SD.
Ensure the green LOW OIL LEVEL message is not displayed.
If this message is displayed, contact Maintenance before starting the APU.

APU START pb ON

Note: Check the START light extinguishes and AVAIL illuminates on the APU panel when the start is complete.

Engine Start - Crossbleed

The area behind the airplane should be considered, however the thrust required for an engine crossbleed start is usually less than break away thrust for single engine taxi. As this is the case, local restrictions against crossbleed starts do not apply as long as N1 is kept under 40%.

Crossbleed start guidelines while attached to the tug:

- Crossbleed starts are not permitted during pushback or when an aircraft is under tow.
- Crossbleed starts are permitted when attached to a pushback tug provided the parking brake is set.

CAUTION: Do not allow engine bleed air and external air to pressurize the pneumatic manifold at the same time.

Note: If the aircraft is in a turn at the time of power transfer, a slight steering bump may be noticed.

YELLOW ELEC pboff
APU BLEED pboff
Operating engine BLEED pb on
Engine BLEED pb (Engine to be started) OFF
X BLEED selector..... OPEN
ENG MODE selectorIGN/START

Start the remaining engine using the following procedure:

Engine thrust lever
(operating engine)Advance thrust lever until
bleed duct pressure
indicates 30 PSI

ENG MASTER sw ON

Note: A slight increase in power on the operating engine may be required to maintain at least 25 PSI at the start valve. When start valve closes retard thrust lever to IDLE.

When the engine has stabilized:

X BLEED selector AUTO

Started engine BLEED pbon

If above procedure performed after pushback:

AFTER START procedure and checklistPerform

If above procedure performed during taxi phase:

DELAYED AFTER START procedure and checklistPerform

Note: After APU shutdown GALLEY SHED on the ECAM ELEC page and MAIN GALLEY under INOP SYS on STATUS page is normal until both engines are operating.

Note: PTU operation is inhibited with the parking brake set and one engine running while on the ground.

Engine Condition Monitoring (ECM) Report

Normally the ECM report is automatically downloaded and no flight crew action is required.

However, certain MDMs require flight crews to manually submit this report. Flight crews should send at least one ACARS ECM report per flight. On flights of more than 2.5 hours, complete two reports. If ACARS is inoperative, the data should be recorded in the Inflight Engine Monitoring logbook.

Record the data using the following guidelines:

- (1) Fuel balanced
- (2) No turbulence.
- (3) Straight and level for 15 minutes.
- (4) Usable packs ON.
- (5) Engine/wing anti-ice OFF.
- (6) Disconnect autothrust as follows:
 - a. Match thrust lever position (white circle) with the current N1.
 - b. Disconnect autothrust using the instinctive disconnect pb.
- (7) Set N1 for speed trend zero.
- (8) Wait 5 minutes for stabilization, don't change thrust.
- (9) Record readings and appropriate switch positions.
- (10) Airspeed change < 5 kts start to finish. Airspeed variations can invalidate results. If > 5 kts during recording period, re-accomplish report.
- (11) After recording data, re-engage autothrust as follows:
 - a. Select the FCU A/THR pb to ON (illuminated).
 - b. Place the thrust levers in the CL detent.

Supplementary Procedures

Chapter SP

Fire Protection

Section 8

APU Fire Warning System Test

Note: If external power is in use, do not perform the fire test until the FWCs have had sufficient warm up time (approximately 1 minute).

Check APU FIRE pbin and guarded

AGENT lightout

APU FIRE TEST pbpress and hold

Verify the following:

- APU FIRE pushbutton lighted red.
- SQUIB and DISCH lights illuminate
- MASTER WARN lights (2) + CRC
- APU FIRE warning on ECAM
- APU page is displayed

Note: If test is accomplished on battery only power; the only indications received will be the illumination of the APU FIRE pb and the SQUIB and DISCH lights on the APU AGENT pb.

APU FIRE TEST pbrelease

Engine Fire Warning System Test

ENG 1 and 2 FIRE pbs in and guarded

AGENT 1 and AGENT 2 lights out

ENG 1(2) FIRE TEST pb press and hold

Verify the following:

- ENG FIRE pushbutton lighted red.
- SQUIB and DISCH lights illuminate.
- MASTER WARN lights (2) + CRC
- ENG 1 (2) FIRE warning on ECAM
- ENG page is displayed
- FIRE light (on ENG panel) on.

ENG 1(2) FIRE TEST pb release

Cargo Smoke Warning System Test

Note: The pushbutton must be held for approximately three seconds to test the system.

CARGO SMOKE TEST pb press and release

Verify the following:

- The FWD / AFT pb SMOKE lights illuminate.
- The FWD / AFT pb DISCH lights illuminate.
- The MASTER WARN lights (2) + CRC
- The warning messages on ECAM.
- The COND page displays on the lower ECAM.

Note: The test will cycle through two times to check both SDCU channels in the FWD and AFT CARGO bins.

Supplementary Procedures

Chapter SP

Flight Controls

Section 9

Slat and Flap Retraction at the Gate

Use this procedure if the slats and flaps need to be retracted at the gate.

WARNING: Do not select the YELLOW ELEC PUMP ON during preflight, unless clearance is obtained from Ground Crew.

Ground crew clearance Accomplish
Yellow ELEC PUMP pb ON
Flaps Retract
Yellow ELEC PUMP pb off

Non-routine Flight Control Checks

Note: The following flight control checks are done as part of the Maintenance Check profile and are not necessary on routine flights.

Flight Control Check

Two people are required: One at the controls, the other in the cabin confirming movement of control surfaces.

FLIGHT CONTROL CHECK	
FLIGHT DECK ACTION	CABIN RESPONSE
Exercise both sidesticks individually	Verify the surface deflections
Deploy the speed brakes	Verify deflection of all 4 panels on each wing
Exercise rudder trim in both directions and reset back to zero	No verification necessary

Sidestick Priority Check

Check both sidestick priority takeover pbs. Both pilots will be required in the flight deck.

SIDESTICK PRIORITY CHECK	
CAPTAIN	FIRST OFFICER
Depress and hold the autopilot disconnect/takeover pushbutton. Verify the “PRIORITY LEFT” audio message is heard and the red arrow appears on the FO’s instrument panel	Displace sidestick and verify the CAPT green light illuminates on the Captain’s instrument panel. Release sidestick and verify the CAPT green light extinguishes on the captain’s instrument panel.
Release the autopilot disconnect/takeover pushbutton	Depress and hold the autopilot disconnect/takeover pushbutton. Verify the “PRIORITY RIGHT” audio message is heard and the red arrow appears on the captain’s instrument panel.
Displace sidestick and verify the FO green light illuminates on the FO’s instrument panel. Release sidestick and verify the FO green light extinguishes on the FO’s instrument panel.	Release the autopilot disconnect/takeover pushbutton.

Supplementary Procedures

Chapter SP

Flight Instruments, Displays

Section 10

Flight Recorder Check

Place the PARKING BRK to ON.

Place the RCDR GND CTL pb to ON.

Press the CVR TEST pb

- Listen for a low frequency signal through the loudspeakers.

Note: The PARKING BRAKE must be ON for this signal to be heard.

Note: If using external power, ensure that the recorder remains ON when electrical power is transferred to APU. The recorder must be ON when the Preflight checklist is read.

Clock Display on Lower ECAM

After an electrical power interruption, the UTC time may be lost on lower ECAM and display as amber X's.

Initialize UTC and date through the FO's MCDU as follows:

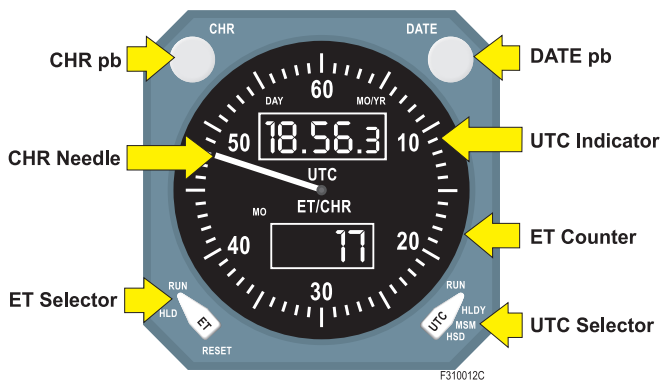
- Select CFDS on FO's MCDU.
- Select next page.
- Enter GMT and Date.

If the clock cannot be reset, contact Maintenance Control

Clock Setting Procedure

Use the following procedures to set the aircraft clock when required.
Perform these steps on the ground only.

Smiths Model (All A319s and newer A320s)



To set TIME:

Note: If TIME is not displayed; press DATE knob once to display the TIME.

- Place the UTC selector from RUN to the position for the value to be set. When UTC selector is placed in the desired position, the selected value will count UPWARDS only.
 - Minutes.....MSM
 - Hours.....HSD
- When desired value is displayed move the UTC selector to next value to be set or to the HLDY position. In the HLDY position, clock time stops.
- When UTC selector is placed to RUN, clock time restarts at the time displayed.

To set DATE:

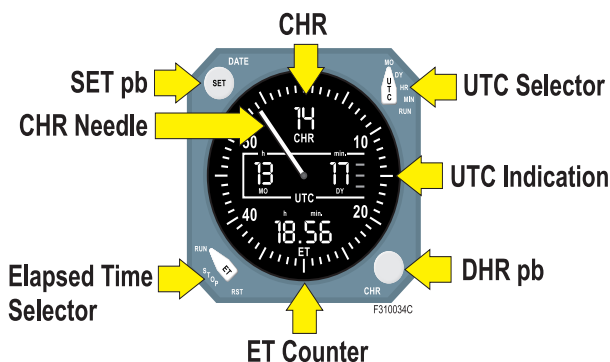
Note: If DATE is not displayed press DATE knob once to display the DATE, the date and time display will cycle between MO/DAY and YEAR.

- Place the UTC selector from RUN to the position for the value to be set. When setting the DATE, the display will stop cycling and display the value selected.
 - Months.....MSM
 - Year.....HSD

Note: When UTC selector is placed in the desired position, the selected value will count UPWARDS only.

- When the desired value is displayed, move the UTC selector to next value to be set or to the RUN position.
- Press the DATE PB to return to the TIME mode.

Air Precision Model (Most A320s)



To Set Time and Date:

- Move the UTC selector from the RUN position to the desired selection.

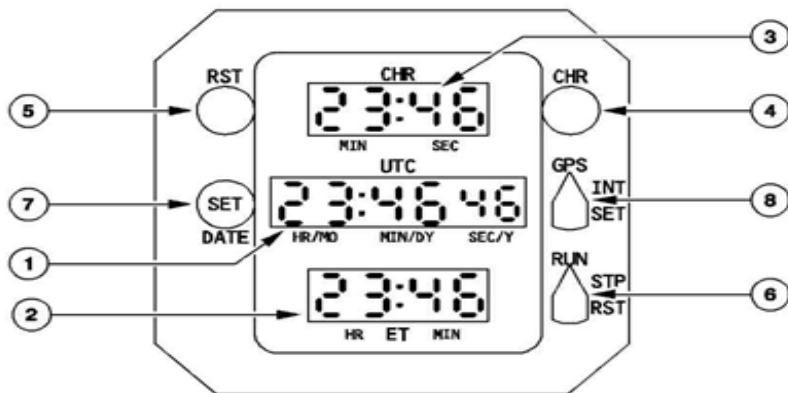
Note: All time/date information other than the selected data is removed from the display and clock time stops running.

- MONTH / YEAR.....MO
- DAY.....DY
- HOUR.....HR
- MINUTES.....MIN
- To INCREASE the desired value, rotate the SET knob.
- To DECREASE the desired value, push the SET knob.

Note: There is no direct setting of the desired year, to set the year it is necessary to scroll through 12 months per year.

- When UTC selector is placed to RUN, clock time restarts at the time displayed. To set time to nearest second, move UTC selector to RUN as time reference reaches 00 seconds.

A321 Clock



The A321 clock is timed-synced through the GPS system with the UTC selector (#8 in illustration) set to "GPS". Thus it does not typically require manual adjustment. However, if manual time and/or date adjustment is required, proceed as follows:

- Set the UTC selector on "SET". The minutes' digits flash, and the seconds' digits are blank.
- A single push on DATE/SET knob allows for hour selection. To increase the hour, turn the DATE/SET button clockwise. To decrease, turn the DATE/SET button counterclockwise.
- A second push allows for a month selection.
- A third push allows for a day selection.
- When finished, set the UTC selector to "INT" and the clock starts with the seconds' digit at 00.

Note: This process must be completed in less than one minute. Otherwise, it will be necessary to reset the CFDS in order to synchronize the lower ECAM time display with the cockpit clock display (See SP.10.2, Clock Display on Lower ECAM).

Intentionally
Blank

Supplementary Procedures

Flight Management, Navigation

Chapter SP

Section 11

ADIRS Full Alignment

A full alignment of the ADIRS takes approximately 10 minutes and is required under the following conditions:

- First flight of the day
- If previous flight had limited position updating (GPS or radio nav aids unavailable)
- If any IRS drift error (FMS POSITION MONITOR page) is 5 NM or greater
- When required per the Company pages.

CAUTION: Do not perform a full alignment with the flaps extended, as damage to the Rudder Travel Limiter Unit (RTL) mechanical stop can result.

Note: To retract flaps, see Slat and Flap Retraction at Gate (Ref. Vol. 1, SP.9.1)

CAUTION: Ensure the ground crew is clear of the aircraft prior to selecting the yellow electric hydraulic pump to ON. Selecting the yellow electric hydraulic pump powers both yellow and green systems.

A319/320

IR 1, 2, and 3 mode selectors OFF

Leave IR mode selectors in OFF for more than 10 seconds before selecting NAV.

IR 1, 2, and 3 mode selectors NAV

Check the ON BAT light illuminates for a few seconds and then extinguishes.

IR 1, 2, and 3 Align lights Verify Steady ON

DISPLAY DATA switch STS

DISPLAY SYS switch Switch to 1, 3, and 2

Note: Refer to “ADIRS Status Messages” in this section for information if a status message is present.

DISPLAY DATA switch PPOS

ADR 1, 2, and 3 pbs Verify On (lights out)

Enter the present position on the INIT page of the MCDU.

FMS Perform a database swap

INIT REQUEST* Select

Uplink the flight plan or enter the TO/FROM city pair on the INIT page of the MCDU.

IRS INIT page Select

Verify the airport reference coordinates displayed in the LAT/LONG fields against the flight plan coordinates or airport 10-9 page. If GPS is inoperative, enter gate coordinates.

Note: A small discrepancy (1 or 2 tenths of a degree) in coordinates may occur from differing revision schedules.

ALIGN ON REF prompt Select

GPS PRIMARY Verify, after alignment complete

A321

IR 1, 2, and 3 mode selectors OFF

Leave IR mode selectors in OFF for more than 5seconds before selecting NAV.

IR 1, 2, and 3 mode selectors NAV

Check the ON BAT light illuminates for a few seconds and then extinguishes.

IR 1, 2, and 3 Align lights Verify Steady ON

ADR 1, 3, and 2 pbs Verify On (lights out)

FMS Perform a database swap

INIT REQUEST* Select

Uplink the flight plan or enter the TO/FROM city pair on the INIT page of the MCDU.

IRS INIT page Select

Verify the airport reference coordinates displayed in the LAT/LONG fields against the flight plan coordinates or airport 10-9 page. If GPS is inoperative, enter gate coordinates.

Note: A small discrepancy (1 or 2 tenths of a degree) in coordinates may occur from differing revision schedules.

GPS Primary Verify, after alignment complete

ADIRS Quick Alignment

On flights when the turn-around time is less than 4 hours and unless otherwise specified, a quick alignment may be performed. A quick alignment retains the existing attitude and heading alignment, resetting only the present position and velocities. A quick alignment takes approximately 3 minutes and can only be accomplished while stationary on the ground.

Note: A full alignment should be performed if any IRS drift error (FMS POSITION MONITOR page) is 5 NM or greater.

A319/320

IR 1, 2, and 3 mode selectors OFF

Leave IR mode selectors in OFF for no more than 5 seconds before re-selecting NAV.

Note: This action may be accomplished with flaps extended.

IR 1, 2, and 3 mode selectors NAV

IR 1, 2, and 3 ALIGN lights Verify Steady ON

DISPLAY DATA switch STS

DISPLAY SYS switch Switch to 1, 3, and 2

Note: Refer to “ADIRS Status Messages” in this section for information if a status message is present.

DISPLAY DATA switch PPOS

ADR 1, 2, and 3 pbs On (lights out)

FMS Perform a database swap

INIT REQUEST* Select
Uplink the flight plan or enter the TO/FROM city pair on the INIT
page of the MCDU.

IRS INIT page Select
Verify the airport reference coordinates displayed in the
LAT/LONG fields against the flight plan coordinates or airport 10-9
page. If GPS is inoperative, enter gate coordinates.

Note: A small discrepancy (1 or 2 tenths of a degree) in coordinates
may occur from differing revision schedules.

GPS PRIMARY Verify, after alignment complete

A321

IR 1, 3, and 2 mode selectors OFF
Leave IR mode selectors in OFF for no more than 5 seconds before
re-selecting NAV.

Note: This action may be accomplished with flaps extended.

IR 1, 3, and 2 mode selectors NAV

IR 1, 3, and 2 ALIGN lights Verify Steady ON

ADR 1, 3, and 2 pbs Verify On (lights out)

FMS Perform a database swap

INIT REQUEST* Select
Uplink the flight plan or enter the TO/FROM city pair on the INIT
page of the MCDU.

IRS INIT page Select
Verify the airport reference coordinates displayed in the
LAT/LONG fields against the flight plan coordinates or airport 10-9
page. If GPS is inoperative, enter gate coordinates.

Note: A small discrepancy (1 or 2 tenths of a degree) in coordinates
may occur from differing revision schedules.

GPS PRIMARY Verify, after alignment complete

IR Alignment in ATT Mode

If an IR loses both AC and DC power, the alignment is lost. Alignment can also be lost if the mode selector is moved out of the NAV position.

If the alignment is lost in flight, the navigation mode (including present position and the ground speed) will be inoperative for the remainder of the flight. Selecting ATT, however, allows the attitude mode to be used to re-level the system and provide attitude information.

The attitude mode requires approximately thirty seconds of straight and level, unaccelerated flight to complete the re-leveling sequence. Some attitude errors may occur during acceleration, but will be slowly removed after the aircraft speed has stabilized.

The attitude mode can also provide heading information. To establish compass synchronization, you must enter the initial magnetic heading. Drift of the IR heading may occur. Therefore, when in the ATT mode the operating compass system must be cross-checked and an updated magnetic heading entered in the IR, if required.

IR Mode Selector ATT

The ALIGN light will be on for 30 seconds and “ATT MODE” is displayed on the CDU.

Note: Hold a level aircraft attitude and maintain a constant airspeed for 30 seconds.

MCDU DATA key Select

IRS MONITOR (2L key) Select

Aircraft heading Enter

Note: The heading must be entered in the SET HDG field (5R key).

| ADIRS Status Messages (A319/320)

Status messages appear when setting the DISPLAY DATA switch to STS. If more than one condition exists, the message will scroll every two seconds.

Message	Description
STS - IR FAULT	Hard Failure. Select ATT (if corresponding message is displayed) or refer to MDM or remove ADIRU for maintenance
STS - DELAY MAIN	Failure not affecting IR functioning. Service ADIRU when convenient.
STS - ENTER PPOS	Enter present position.
STS - SELECT ATT	Hard IRU failure, select ATT mode.
STS - EXCESS MOTION	Excess motion detected during alignment. ADIRU will automatically restart alignment. Ensure aircraft is not moving.
STS - SWITCH ADR	ADR invalid
STS - CHECK CK/BK	Check Circuit Breakers
STS - CDU FAULT	Remove CDU for maintenance
STS - ENT MAG HDG	Enter magnetic heading

MCDU Manual Wind Entry

Cruise winds may be manually inserted on the INIT A page of the MCDU if the wind auto upload feature is not functioning.

Wind promptSelect (LSK 4R on INIT A page)

NEXT PHASE prompt Select to display CRUISE WIND

Enter the wind at the initial cruise altitude and at downline waypoints that reflect significant wind changes (10° or 10 knots).

Each waypoint has its own page, use the MCDU arrow pb to scroll select the appropriate page for each wind. Within each CRUISE WIND waypoint page, there are 4 possible altitude selections. Once an altitude has been inserted on a given line, that line will be dedicated to that altitude for every CRUISE WIND. Putting in a different altitude on a line that has already been dedicated will erase all previous winds at previous waypoints on that line (e.g. if you have a step climb, insert that wind on line 2 if you have already inserted an altitude in line 1).

Time permitting, enter additional winds for your expected range of cruising altitudes. The lowest and highest anticipated cruise altitudes are usually sufficient because the FMS interpolates the wind values between these two flight levels.

Temperature for the corresponding flight level may be entered at each waypoint.

Providing as much reliable wind information as possible improves FMS predictions and calculations of optimum altitudes and step climb points.

Note: Cruise wind entries are not available during preflight if the entered flight plan consists of only a SID & a STAR.

WIND UPDATE Select

Review the winds and altitude/temperature pair for each waypoint to confirm a successful uplink.

FM Resynchronization

An FM resynchronization automatically occurs when a self comparison between FM 1 and FM 2 reveals discrepancies. A resynchronization takes approximately 25 seconds. The following messages indicate that an FM resynchronization is in progress:

Both NDs display “MAP NOT AVAILABLE” and both MCDUs display “PLEASE WAIT” in the scratch pad. The MCDU associated with the FM resynchronization reverts to the STATUS page (both MCDUs reverting to the STATUS page indicates a dual resynchronization).

Note: The associated autopilot and managed guidance modes are temporarily lost and the flight guidance reverts to HDG & V/S.

Procedure

- Do not make any MCDU inputs while the “PLEASE WAIT” message is displayed. MCDU inputs are ignored.
- Wait 60 seconds after the “PLEASE WAIT” message disappears before engaging the FD or AP of the affected FMGC.

Several consecutive resynchronizations within a short period of time may cause loss of data (F-PLAN, GW, CI, CRZ FL, MCDU entered speeds and NAVAIDS), and a possible data base swap.

Restoring Lost Data:

- On the AC STATUS page, select the current Data Base.
- Execute a DIR TO to the next waypoint. LAT REV from the TO waypoint and re-establish the DESTINATION AIRPORT.
- Enter the current Zero Fuel Weight (ZFW) on the FUEL PRED page.
- Enter the CRZ Flight Level (FL) on the PROG page.
- Enter the Cost Index (CI) on the PERF page.
- Re-engage the desired vertical and speed mode.
- Perform a NAV ACCUR Check when possible.

Navigation Accuracy Check

Perform navigation accuracy check prior to entry into Class II airspace.

Check on PROG page that the “ESTIMATED” value (lower right corner) is less than the “REQUIRED” value (lower left corner).

Check “Nav accuracy checks completed” on HOWGOZIT section of the flight plan.

A321 Backup Navigation (NAV B/UP) Operation

To select Backup Navigation for each FMGC individual

MCDU MENU key Select

SELECT NAV B/UPSelect (1R)

To de-select Backup Navigation for each FMGC individually:

MCDU MENU key Select

DESELECT NAV B/UPSelect (1R)

FMS F-PLN

With Backup Navigation selected managed NAV capability is available along the current FMS F-PLN. However, access to the NAV database is lost, as long as NAV B/UP is selected. Any new waypoints must be added with their LAT/LONG coordinates. To insert a new waypoint, use either of the following formats:

- IDENT/LAT/LONG: e.g. 'SVM/4224.3N/08335.4W', or
- LAT/LONG: e.g. '4224.3/08335.4W'.

Including the waypoint name with its LAT/LONG allows display and reference to the waypoint by name. For example, entering 'SVM/4224.3N/08335.4W' displays the waypoint name SVM in the left column. SVM can then be used for waypoint name entries such as DIR TO. If '4224.3/08335.4W' was entered instead, the resulting waypoint name would be N42W083, which might be difficult to distinguish from other similar appearing waypoint names.

DIR TO

Direct to capability is available in Backup Navigation through selection of the DIR key. To perform a DIR TO a F-PLN waypoint:

DIR key Select

Desired F-PLN waypoint Line select

DIR TO INSERT Select (6R)

To proceed DIR TO a point not in the FMS F-PLN:

DIR key Select

Waypoint ident/coordinates Enter into DIR TO (1L)

DIR TO INSERT Select (6R)

Note: New waypoint format is:

- IDENT/LAT/LONG: e.g. 'SVM/4224.3N/08335.4W', or
- LAT/LONG: e.g. '4224.3/08335.4W'.

For additional information, see A321 QRH 'Back Up Navigation'.

Flight Plan Uplink Unavailable Preflight Procedure - Pilot Flying

The following procedures are to be executed when the flight plan uplink is unavailable and manual entries are required.

Normally, this procedure is accomplished by the Pilot Flying (PF), however, it does not preclude the Pilot Monitoring (PM) from completing all or part of the procedure if time and conditions dictate.

Failure to enter enroute winds can result in flight plan time and fuel burn prediction errors.

ADIRS PanelSet

Refer to the Supplementary Flight Management, Navigation section for IRS alignment instructions.

MCDU ON

Verify no amber annunciator lights are illuminated.

FMSSet

A/C STATUS page Check

Select the DATA key, then select A/C STATUS on DATA INDEX page 1.

Verify the model number is A319-1XX, A320-2XX, or A321-2XX.

Verify that the current database is active based upon the local date of departure. Verify that the database code begins with DAL2.

Select other database and re-select current database to verify that all stored data has been erased.

CAUTION: Changing the database erases the flight plan as well as the stored data.

INIT A page Set

Select the INIT key on the MCDU.

Enter the ICAO codes for the departure and destination airports in the FROM/TO fields.

Enter the ICAO code for the alternate airport if applicable.

Enter the flight number in the FLT NBR field from the Dispatch Release in format of DAL####.

Enter the initial COST INDEX from the dispatch release paperwork.

Enter the initial CRZ FL and CRZ TEMP.

IRS INIT page Set

Select the IRS INIT prompt (LSK 3R) on INIT A page.

Verify the airport reference point is displayed in the LAT and LONG fields then press the ALIGN ON REF prompt.

Note: A321 Only - If GPS is available, initialization is automatic using GPS position.

Note: During full alignment, ALIGN ON REF prompt may not immediately be available.

Note: This step must be accomplished within 15 minutes after selecting the ADIRS Mode selectors to NAV or excessive IRS drift may occur.

Note: Enter the gate coordinates when GPS is inoperative.

Select the RETURN prompt (LSK6L).

INIT B PageSet

Use the arrow key to access INIT B page.

Enter TAXI fuel (1L).

Enter the alternate fuel value from the dispatch release in the ALTN field if applicable.

Enter the reserve fuel from the dispatch release in FINAL/TIME (5L).

Enter planned ZFW.

Enter planned BLOCK fuel.

PERF TAKE OFF page Check

Select the PERF key on the MCDU.

Review the THR RED/ACC altitudes on airport Company Pages. |
 For NADP 1 (1,000/3,000 AGL), NADP 2 (1,000/1,000 AGL).

PERF DESC pageSet

Select the NEXT PHASE prompt twice; the DES page displays.

For arrivals in high demand airports enter/300 in the MANAGED field.

F-PLN pageSet

Enter the routing from the flight release.

Confirm routing from flight release and ATC Predeparture Clearance (PDC).

Enter Departure/Arrival procedures, if known.

Note: If Place/Bearing/Distance waypoints (i.e. MTU248040) appear in the Air Route Traffic Control (ARTC) routing text, enter their corresponding LAT/LONG from the flight plan into the MCDU. If an alpha/numeric waypoint (i.e. ABC12) is part of an airway in the flight plan, enter the alpha numeric waypoint. Verify the correct LAT/LONG of all alpha numeric waypoints against the flight plan. If doubt exists as to the correct LAT/LONG for a waypoint, refer to the LAT/LONG in the flight plan, the Jeppesen chart, or contact Dispatch.

Enter the planned step climb/descent altitude(s) using the STEP ALTS prompt from any vertical revision page.

Confirm the DIST at the bottom of the F-PLN agrees with the Flight Dispatch Release Acknowledgement.

WindsEnter

Select INIT on MCDU.

Select WIND prompt (LSK4R).

Manually enter wind data (time permitting).

Note: See SP.11 Flight Management, Navigation for manual wind entry.

Note: Attempt a wind data uplink after departure if desired.

Insert HISTORY WINDS if desired.

Note: Inserting winds from a flight that blocked in over 2 hours prior can have a negative affect on climb predictions.

SEC F-PLN page Set

Select the SEC F-PLN key then the COPY ACTIVE prompt (1L).

Enter changes to the secondary flight plan as desired.

Takeoff Data Uplink (TDU) Unavailable - Taxi Procedure

TDU provides several safety features and is the preferred method for populating the takeoff PERF page. If TDU is unavailable, attempt to determine the reason. Possible reasons and corrective actions include:

- **Runway mismatch:** Verify the FMS departure runway matches the TDU runway. If there is a discrepancy, the 'INSERT UPLINK' prompt is unavailable.
- **Planned vs. actual ZFW:** If there is a significant discrepancy between planned and actual ZFW, the 'INSERT UPLINK' prompt is unavailable.
- **ICY runway condition:** If the WDR lists 'ICY' as a contaminant for the runway, TDU is unavailable. If 'ICY' data is not required, request a TOPR with the current runway condition.
- **SHIPS:** For certain runways (e.g. BOS 22 or MSY 19), 'SHIPS' can be obstacles and TDU is unavailable. In this case a supplemental ACARS message will be sent. PERF data can be entered manually or Flight Control advised if no ships are obstructing the departure corridor.
- If none of the previous conditions applies, check with Flight Control. The reason may be a host computer issue.

If TDU is unable to populate the PERF and ZFW blocks of the MCDU use the following procedure (normally these entries are accomplished by the first officer):

Referencing the WDR data:

FMS F-PLNselect

Enter/verify the correct takeoff runway.

FMS INIT B pageselect

- ZFW and ZFWCG - enter
- Block Fuel - verify or enter actual fuel

FMS PERF TAKE OFF pageselect

- FLAPS/THS - enter
- FLEX TO TEMP - enter (if desired)
- V1, Vr and V2 speeds - enter
- THR RED/ACC altitude - verify/enter

Note: If an intersection takeoff is planned, enter the distance (in feet) from the runway threshold to the actual runway position at which takeoff thrust is applied into the TO SHIFT field (2R).

Resume normal Taxi procedure and continue with normal operations.

Route Change Procedures

(Use of the Secondary Flight Plan Uplink)

The following procedures describe both the communications interface with Flight Control/dispatcher and the flight crew procedures for managing the In Flight Revision via the Secondary Flight Plan uplink capability.

Procedures

- Notify the Dispatcher via ACARS free text of the new routing, to include:
- ETA and fuel estimate for the appropriate forward waypoint
- Current Altitude and any planned altitude (step) changes
- Fuel Temperature (coldest fuel tank)
- Cost Index and/or Mach assignment (if applicable)
- Once FPS 2.0 has been updated with the IFR, the ACARS 22 message will be sent by flight control.
- Delete the SEC F-PLN and use the SEC F-PLN INIT function to request the new flight plan routing. (DELETE SEC generates an INIT> prompt at LSK 1R; select INIT> then INIT REQUEST*.)
- After confirming the accuracy of the uplinked SEC F-PLN route, SEL HDG and ACTIVATE the SEC F-PLN. Perform a DIR TO the appropriate waypoint.
- Referencing the ACARS 22 message, update any appropriate ETPs and enter any planned altitude changes. (Use STEP ALTS page or SXXX on the F-PLAN page.)
- Select the WIND REQUEST * prompt to request a manual wind data uplink. Insert the winds.
- Perform a WPR RESET to ensure automatic company position reporting.

Note: ACARS 22 can be used for the HOWGOZIT or the information can be transcribed onto the original flight plan.

A319/320 Radar Operating Procedures

General

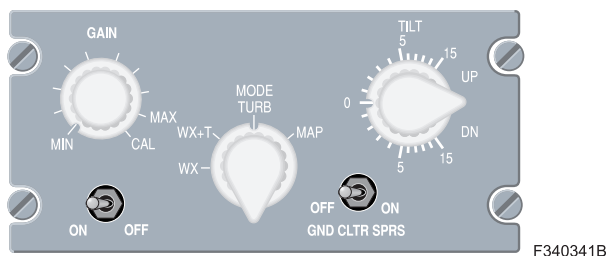
Weather radar detects droplets of precipitation such as rain or wet hail generally associated with areas of turbulence and severe weather. It does not detect turbulence by itself, even in the “turbulence mode”. Therefore, it has no ability to warn of clear air turbulence. At high altitude on the downwind side, thunderstorm-associated turbulence often extends several thousand feet above a storm, and outward more than 100 miles. Radar frequently fails to paint hail present several miles from a cell.

Radar Control Panel

ON/OFF Switch - On the control panel is a toggle switch to turn the radar ON and OFF. Take care not to confuse the GND CLTR SPRS switch with the ON/OFF switch.

Gain Selector - The detented (normal) position is CAL. Rotating the Gain Selector out of this position to MAX increases receiver gain to its maximum setting; approximately 3000% increase. Continued rotation counterclockwise progressively decreases the sensitivity toward its minimum. When out of CAL, the annunciation on the ND is MAN in white.

Adjusting the gain can enhance the detection capability of the system at longer ranges (80 NM or more). Setting the gain control to positions other than CAL causes targets to appear more intense than normal. Manual adjustment of gain will never cause a target to be displayed less intense, since gain can only be increased from that existing with the control in the CAL (normal) position. Judicious use of gain and tilt allows enhancement of targets that might otherwise not reflect energy, such as hail, ice crystals and light precipitation. ALWAYS return the gain control to CAL when you have completed an analysis of a radar presentation with variable (manual) gain. Note that TURB information is never affected by varying the gain.



Mode Selector

WX - Weather mode, colors indicate the intensity of precipitation. Black indicates the lowest intensity, green, amber, and red indicate progressively higher intensities, magenta indicates saturated areas.

WX + T (typical operating mode) - Weather and turbulence mode, precipitation and turbulence are indicated. The range must be set at 40 NM or less in order to depict turbulence.

TURB - Turbulence mode, the screen displays turbulence areas (magenta) only. The range must be set at 40 NM or less in order to depict turbulence.

MAP - Map mode, radar operates in ground mapping mode. Black indicates water, green indicates the ground, and amber indicates cities and mountains.

TILT - This knob controls antenna tilt. Zero represents the horizon, as determined by ADIRS.

GND CLTR SPRS - The radar features Ground Clutter Suppression using a momentary toggle switch spring-loaded to OFF. This function allows pilots to eliminate approximately 85% of the ground clutter targets that may appear during normal precipitation detection modes. It identifies ground targets in a manner similar to turbulence targets. Because of this, some stationary weather targets might be incorrectly identified as ground targets and eliminated from the display when using this feature. For this reason, use this function momentarily to identify ground targets, and limit the tilt to shallow angles (0 to 5 degrees down works best). At steeper tilt angles, the system may incorrectly identify ground and weather targets.

Weather Radar (WR) Test

The radar self tests when turned on. The radar is fully operational if none of the following failure messages annunciate on the ND after the 45 second self-test. Adjust the brightness as necessary.

Fault Display

TR (Red) indicates a radar transceiver failure.

ANT (Red) indicates a radar antenna failure.

CTL (Red) indicates a radar control unit failure.

RNG (Red) indicates an error in the range.

WEAK (Amber) indicates a calibration failure.

ATT (Amber) indicates an attitude control failure.

STAB (Amber) indicates an antenna stabilization failure.

Tilt Management

You must manage antenna tilt when using the radar for weather avoidance. Keep in mind the following factors:

The system incorporates a Flat-Plate antenna producing a much narrower beam (3°) of energy compared to traditional Parabolic antennas. This results in better precision at longer ranges, but requires more tilt and gain management; especially at the higher altitudes.

The inertial reference system stabilizes the center of the radar beam to the horizon, not the longitudinal axis of the aircraft.

You must adjust the tilt as the aircraft altitude and/or pitch attitude changes. Maintain the radar beam at the best angle for viewing cells along the aircraft's flight path.

Tilt set too low will result in excessive ground returns, while tilt set too high can result in the radar beam "overscanning" or passing over the top of a weather target. Under ideal conditions, the upper limit for ground returns is about 200 NM due to the earth's curvature. By slowly raising the tilt, weather targets will emerge from ground returns because of their height above the ground. To minimize ground returns below the aircraft's flight level, select the shortest range which allows full depiction of the area of interest.

At high altitudes, a low altitude storm detected on the long range setting may disappear from the display as you approach it. While it may have dissipated, you could be overscanning the storm as you get closer. Judicious management of the antenna tilt control prevents overscanning a weather target.

When uncertain about possible build-ups in your flight path (night or IMC), select the shortest range, then slowly adjust the tilt down until ground returns appear at the outer edge of the indicator. Step through all display ranges to the longest range, then repeat the process. You will be walking the beam through the aircraft's path to avoid flying over undetected build ups.

When using turbulence detection, set the tilt to eliminate all ground returns within 90 NM, if possible.

Return Interpretation

Extremely heavy rainfall causes the radar to attenuate and display a picture of high-intensity returns with “shadows” (no return) immediately behind them. Tilt the antenna down and look for ground returns behind the radar echo. If no ground returns are present, this indicates a larger area of precipitation exists than appears on the indicator

The shape of a storm is just as important as its intensity levels, and may indicate hail shafts or tornadoes. Examples are:

U-Shapes

Thin Protruding Fingers

Scalloped Edges

Hooks

When flying at high altitude over fairly even terrain, ground returns seldom paint beyond 80 to 90 nautical miles because the radar beam and the earth's surface are practically parallel. However, objects such as large buildings, steep hills, mountains or storms reflect the signal and show strong returns at greater distances.

You may find it difficult to differentiate between ground and weather returns. Knowing the geography of the area you are overflying will prevent you from circumnavigating islands mistaken for storm cells. This is true of cities, bodies of water, and mountains as well. Ground returns tend to have well-defined features that are smaller and more angular in appearance than weather targets. Weather targets appear larger with less definite shape than ground targets. Progressive upward adjustment of the tilt changes the shape, size, and color of ground returns, eventually causing them to disappear, while weather returns remain relatively unchanged.

This weather radar features Path Attenuation Correction, or PAC to compensate for attenuation due to intervening precipitation (up to a range of 80 NM). The PAC circuit will incorrectly interpret the return signal from ground targets as intense storm targets and try to compensate for the attenuated signal. Consider this when adjusting the tilt to display weather. Excessive ground returns may cause falsely displayed targets. The PAC alert annunciation identifies areas of severe attenuation. If the intervening precipitation is so intense that the signal attenuates below the minimum discernible level, a yellow arc (PAC alert bar) paints at the outer range mark to indicate the azimuth of heavy precipitation. Targets painted beyond the intervening storm cell in this direction may not be accurately depicted.

The PAC alert bar only displays when the GAIN control is set to CAL and the intervening attenuating precipitation is 80 NM or less from the aircraft. Areas of heavy precipitation beyond this range may still hide or distort targets beyond them, but will not cause the alert bar to appear at the outermost range mark. Due to the diameter of the beam cross section at 80 NM, avoid any detected targets beyond this range.

Using the Turbulence Mode

The Turbulence Mode (WX+T or TURB selections) uses the doppler principle to detect turbulence measuring the frequency shift of the return signal due to the relative motion between the aircraft and the storm cell. Remember that turbulence detection requires the presence of precipitation as clear air turbulence cannot be detected. To display turbulence (magenta returns), the ND range must be set at 40 NM or less. Analyze storm cells taking both rainfall rate and doppler-detected turbulence indications into account. Radar depicts rainfall gradients as closely-spaced color gradations which usually indicate the most severe turbulence.

Takeoff and Climb Out Procedures

During taxi out, when the aircraft is clear of the terminal area, select the 10 NM range and turn the radar on. Adjust the antenna tilt downward until ground returns appear at the top of the display. This is a confidence check to ensure that the radar is operational.

When viewing hazardous weather in the immediate airport vicinity, select a range of twenty or forty miles. While observing the weather returns, slowly rotate the antenna tilt in one or two degree increments from 0 to +15°, and back to about +4°.

Repeat this avoidance procedure after takeoff and during climb out by tilting the antenna from full up to down where ground returns appear, then back to about +4°.

Note: Since the Airbus radar uses an IRS reference for stabilization, it is not affected by acceleration forces

Cruise Procedures

Plan a deviation path early. Simply skirting the areas of intense thunderstorm activity may not be enough. All weather echoes which appear beyond 100 miles should be considered very strong.

When studying a weather formation, GAIN can play a role in the display of potential weather. Below FL250, having the GAIN set to CAL provides the best resolution of precipitation. Above FL250, use the MIN-MAX range to help display weather phenomena such as ice crystals and dry hail. The following steps may be used as a guide to assist pilots when interrogating potential weather hazards:

Set the RANGE to either 80 or 160 NM.

Adjust the TILT until the ground appears in the upper third of the display.

Adjust the GAIN control as follows depending on the aircraft altitude:

> FL250 use MIN through MAX

< FL250 leave the GAIN in CAL

When viewing the short ranges, avoid flying into a “box canyon” by periodically switching to longer range displays to observe distant conditions. Also avoid flying directly over the top of a rapidly building thunderstorm cell. Strong updrafts may be encountered.

When deviating around thunderstorms at higher altitudes, avoid the blow-off that produces significant turbulence. Radar may not depict these areas since they may be lacking liquid water in sufficient quantities to reflect the beam. As a general rule, avoid deviating around the downwind side of large thunderstorms, if possible. When this is not possible, stay at least one mile downwind from the return for every one knot of wind. (e.g., If the wind is 50 knots, deviate at least 50 miles to the downwind side.)

Approach Procedures

Approaches and landings should not be attempted when thunderstorms are near the airport unless the runway and flight path are clear of thunderstorms and the associated gust front.

Use the tilt control in a manner similar to cruise. The tilt must be increased as the aircraft descends to prevent excessive ground return on the displays.

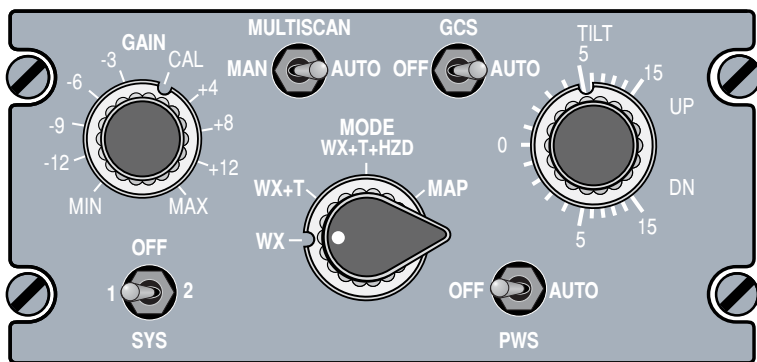
A321 Multiscan Radar Operating Procedures

Weather Radar (WR) Test

Select SYS 1 to turn the radar ON and operate for at least 30 seconds and verify functionality. The radar is operational if no warning messages are displayed on the ND. This test also checks the operation of the predictive windshear system.

Possible ND messages are:

- NO WXR (red): Radar System failure
- WXR RT (red): Radar Transceiver failure
- WXR ANT (red): Radar antenna failure
- WXR CTL (red): Radar control unit failure
- WXR RNG (red): Range error
- WXR WEAK (amber): Calibration failure
- WXR ATT (amber): Attitude control failure
- WXR STAB (amber): Antenna stabilization failure
- PRED W/S (amber): PWS function failure
- NO AUTO TILT (amber): Automatic tilt adjustment failure
- WXR TEST (amber): Radar System test (MX CFDS function)



Note: The SYS 2 position is deactivated, select SYS 1 position to turn radar ON.

Pre-Departure

To verify radar operation and to scan for weather along the departure corridor.

- Select SYS 1 to turn the radar ON.
- Set the MultiScan sw to MAN to enable manual TILT control.
- Adjust TILT as desired to display weather prior to departure.
- Return MultiScan sw to AUTO position prior to takeoff.

Note: The PWS switch should be left in the AUTO position to enable Predictive Windshear Function.

Cruise

Use of the AUTO position is recommended in flight to enable MultiScan features. TILT and GAIN controls are inactive with the MultiScan sw in the AUTO position. If the pilot wishes to use the MAN mode to manually adjust TILT or GAIN, the radar should be returned to the AUTO position as soon as practicable.

Descent and Approach

The AUTO Position of the radar is recommended to enable MultiScan features. MultiScan operation optimizes weather returns during descent by using one beam to scan ahead of the aircraft and a second beam at a tilt setting considerably lower than +2° to look down the aircraft flight path. Because MultiScan is able to look down into the ground clutter, the radar can detect and protect against thunderstorms that are growing beneath the aircraft and would normally fall below the radar beam.

Operations At Airports Not In a Database

Occasionally, the A319/320/321 is used for a charter flight into an airport that is not in the FMS database. Normally, you will be informed of this in advance. Using the following procedure, build the landing runway in the FMS which will allow a more normal operation for arrival and departure from such an airport.

Arrival Airport Not In Database

Be advised that upon arrival at destination, the only available approach options are ILS, LDA with GS and visual approach. RNAV, VOR, NDB or LOC approaches are not authorized because they cannot be selected from the database. See Approaches Not In the Database SP.11.24

Procedure:

- Push the MCDU DATA pb, then the right arrow (next page) to display DATA INDEX page 2/2.
- Push the STORED RUNWAYS prompt at LSK 3R.
- Enter the ICAO identifier for the airfield, followed by the runway identifier (e.g., KEDW22L) into the NEW RUNWAY page.
- At LSK 2L enter the LAT/LONG of the runway approach end.

Note: Determine the LAT/LONG of the approach end using the grid reference on the Jeppesen airfield diagram page.

- At LSK 4L enter the usable length of the runway in feet (e.g. 8500).
- At LSK 5L enter the TDZE (e.g. 650).
- At LSK 6L enter the magnetic heading of the runway (e.g. 185).
- Enter the ILS 4-letter identifier in LSK 1R. Complete the NEW NAVAID page (CLASS=ILS, CATEGORY=1).
- Push LSK 5R 'RETURN' and then LSK 6R "STORE".

Note: Inserting the "VFR" runway into the MCDU F-PLN displays a "CF" and the runway on the ND.

Approach Not in Database

ILS or LDA with GS approaches may be manually tuned and flown when not in the database. Use the following procedures for these approaches.

Note: RNAV, VOR, NDB, or LOC approaches must be selected from the database.

- Select the VFR runway from the database.
- The approach and missed approach may be manually constructed on the F-PLN page for situational awareness, if desired.
- Select the RAD NAV page. At LSK 3L enter the frequency in the ILS/FREQ field (e.g. 110.3).
- At LSK 4L enter the course in the CRS field (e.g. 185).
- Enter the published DA or MDA on the PERF APPR page.
- Select the CSTR pb on the EFIS control panel to display altitude constraints on the ND.
- Select the (I)LS pb on the EFIS control panel to display raw data (localizer course and ILS DME) on the PFD.
- Ensure raw data for crossing radials and step-down fixes is displayed.
- Select the APPR pb when cleared for the approach.

Departure Airport Not In Database

Flight Plan Uplink will not be available. Use the Flight Plan Uplink Unavailable procedure (SP.11.8) with the following modifications:

- Populate the INIT page with the airport FROM/TO 4 character codes.
- If the departure airport is not in the database, the NEW RUNWAY page appears after entering the airport code.
- At LSK 1L enter the airport code and departure runway (e.g. KBRU18) into the IDENT field.
- At LSK 2L enter the airport reference lat/longs (e.g. 4212.7N/8355.6W) from the airport diagram page (i.e. 10-9 or back on 11-1).
- At LSK 4L enter the runway length (e.g. 8500).
- At LSK 5L enter the runway ELV (e.g. 650).
- At LSK 6L enter the runway magnetic course (e.g. 185).
- At LSK 6R select 'STORE' and align from the IRS INIT prompt. Verify lat/longs.
- Verify 'GPS PRIMARY' on the PROG page after IRs align.

Takeoff Data Uplink may be unavailable. If so, use TDU Unavailable procedure (SP.11.12).

IRS Drift Error Recording

If the aircraft is operated in Class II airspace for more than one hour:

Check IRS drift rate as follows:

- MCDU DATA INDEX page – LSK 2L IRS MONITOR.
- IRS MONITOR page – Verify drift rate less than 2.0 NM/H.
- Make a logbook entry if any IRS drift is greater than 2 NM/H.

Terrain Box FMS Loading Procedures

Load the appropriate CO RTE (listed in the FPS Flight Plan) into the Secondary Flight Plan (SEC F-PLN) of the FMS using the following procedure:

- (1) Select SEC F-PLN pb.
- (2) Delete the current Secondary Flight Plan (DELETE SEC LSK 3L).
- (3) Select INIT from the SEC INDEX page (LSK 1R).
- (4) Enter the Terrain Box CO RTE at 1L (e.g., SAT01) from the FPS Flight Plan.

Note: Disregard the origin and destination airports that are automatically populated after loading the CO RTE. These airports have no operational significance.

- (5) Select SEC F-PLN pb.
- (6) Select SEC F-PLN (LSK 2L) to view Secondary Flight Plan.
- (7) Clear all 'DELETE' points in the Secondary Flight Plan.
- (8) Do not close the route discontinuities. This keeps the critical terrain boxes separated.
- (9) Select SEC F-PLN to display terrain boxes on ND.

Note: Do not activate the Secondary Flight Plan.

Note: Repeat this process whenever a new CO RTE is to be loaded.

Supplementary Procedures

Chapter SP

Fuel

Section 12

Fuel Balancing

A lateral fuel imbalance may be due to a fuel leak, an uneven engine fuel burn condition, or APU fuel consumption. Use this procedure to rectify a lateral imbalance unless the imbalance is due to a fuel leak.

CAUTION: If fuel leak is suspected refer to QRH, chapter 12, Fuel Leak.

Note: When a significant imbalance condition exists, the FUEL page is automatically displayed and the low tank fuel quantity pulses.

Note: When a significant imbalance condition exists, the ECAM Fuel Advisory page is automatically displayed and the low tank fuel quantity pulses. There is no requirement to correct an imbalance until the ECAM Fuel Advisory is displayed.

If the center tank is empty:

X FEED pb ON (OPEN light illuminated)

Both TK PUMP pbs (lighter wing) OFF

When the fuel is balanced:

Both TK PUMP pbs ON

X FEED pb OFF

If the center tank is not empty:

X FEED pb ON (OPEN light illuminated)

Both TK PUMP pbs (lighter wing) OFF

Both CTR TK PUMP pbs OFF

When the fuel is balanced:

Both TK PUMP pbs ON

Both CTR TK PUMP pbs ON

X FEED pb OFF

Refueling, Tank-to-Tank Transfer, and Defueling

The following aircraft specific procedures are described in Delta's Fueling Procedures Manual:

- Pressure Refueling (Automatic and Manual control)
- Tank-to-Tank Transfer
- Defueling

All three procedures are accomplished by manipulation of the refueling control panel at the leading edge of the right wing. When the refueling control panel door is opened, the panel is energized and a REFUELG memo appears on the ECAM.

Refueling can be accomplished without requiring any specific flight deck power settings using the BATT POWER switch on the refueling control panel.

Fuel can be inserted directly into the wing tanks via overwing fueling ports.

CAUTION: (A321) With the MODE SEL pb in the MAN position, the center tank transfer valves will open. Wing tank overflow must be prevented by selecting the CTR TK XFR pbs OFF when the wing tanks are full. They must also be selected OFF when the center tank is empty.

Fuel Distribution During Refueling

During automatic refueling, if the selected fuel load exceeds the capacity of the wing tanks (approximately 27,500 lbs.), fuel is supplied to the wing tanks and center tank simultaneously. This condition may trigger a FUEL AUTO FEED FAULT ECAM message to be displayed during refueling. This message should automatically clear when the inner cells fill.

A319/320

If center tank fuel is not required, fuel is supplied only to the outer cells until they are full at which time the fuel overflows into the inner cell until the total is reached.

If the aircraft is refueled manually, the wing tanks must be filled before the center tank is filled. Therefore it is not normal for there to be an appreciable amount of fuel in the center tank until the wing tanks are full.

Standard Fuel Distribution

The minimum fuel quantity for dispatch is 8,000 lbs and the WING TK LO LVL warning must not be displayed on the ECAM.

The standard fuel distribution for dispatch is as follows:

A319/320

Outer cells of wing tank:	Full. Maximum quantity of each cell is approximately 1,550 lbs.
Inner cells of wing tank:	Filled equally until the planned fuel level is reached. Maximum quantity of each cell is approximately 12,200 lbs.
Center tank:	Only fueled in inner cells of wing tank are full. (i.e., only fueled when total fuel load exceeds approximately 27,500 lbs). Maximum quantity is approximately 14,500 lbs.

Maximum total fuel quantity is approximately 42,100 lbs.

A321

Wing tank:	Maximum quantity of each wing tank is approximately 13,711 lbs.
Center tank:	Only fueled when wing tanks are full (total fuel exceeds approximately 27,420 lbs.) Maximum quantity of center tank is approximately 14,190 lbs.

Maximum total fuel quantity is approximately 41,600 lbs.

Note: For low fuel quantities, up to 13,200 lbs, a fluctuation of the wing tank fuel quantity indications occurs after takeoff. Due to acceleration and high pitch angle, the fuel moves in the tank and the FOB indication will reduce for 2 minutes, then increase and come back to accurate values about 6 minutes later during the climb. The maximum fluctuation may reach 3,000 lbs. The EFOB indication may turn amber on the MCDU during this phase. For higher fuel loads, the phenomenon does not occur. In case of go-around, the fluctuation will not be more than 660 lbs.

Non-Standard Fuel Distributions

Outer Cells Are Not Full (A319/320)

If both transfer valves are found OPEN during preflight:

- Verify that transfer valves operate normally:
 - Instruct personnel to open the refueling control panel door thus applying power to the refueling control panel.
 - Verify that both Transfer Valves indicate closed on FUEL systems display page. If either Transfer Valve does not close, refer to MEL 28-15-01A or MEL 28-15-01F.
- Use normal WDR data. CG effect is negligible.
- Expect to see fuel return to outer cells en route due to IDG cooling system logic.
- Enroute, make a FOR INFO ONLY write-up in the aircraft logbook.

If one or more transfer valves is found CLOSED during preflight:

- Unless transfer valves were closed by applying power to the refueling control panel, consider the possibility that one or more transfer valves is inoperative in the closed position. Refer to MEL.

Wing Tank Lateral Imbalance

Pre-departure:

If wing tank lateral imbalance exceeds 815 lbs., the WDR is inhibited. Coordinate with the OCC to rectify.

Fuel in Center Tank With Wings Not Full

Note: A small amount of fuel in the center tank is considered normal.

If the Automatic Fuel Feed system is determined to be inoperative, refer to MEL 28-20-01.

If the Automatic Fuel Feed System is operative but fuel is found in the center tank (e.g., a manual fueling error, incomplete fuel burn from center tank due to diversion, etc.):

- Use normal WDR data. CG effect is negligible.
- Use normal fuel management procedures.

Inoperative Fuel Quantity Indication

Fuelers are responsible for following the procedures in Delta's Fueling Procedures Manual to refuel an aircraft when both flight deck and refueling panel indications are inoperative for a particular tank. The guidance essentially requires the fueler to determine the fuel quantity before refueling and then after refueling using the "stick method." (Airbus refers to "fuel sticks" as Magnetic Level Indicators (MLIs).)

Note: Failing to determine the fuel quantity **before** refueling using the stick method is a common mistake by fuelers. Coordination with the fueler before refueling is suggested.

The stick method essentially requires the fueler to perform the following before and after refueling:

- Determine the pitch and roll of the aircraft. Although the preferred method is for the fueler to refer to the aircraft's built-in Attitude Monitor in a panel on the underside of the aircraft, alternatively the fueler can request pitch and roll information from the pilot.
 - From the MCDU MENU, select AIDS.
 - Select CALL-UP PARAM (1L).
 - Select PARAM ALPHA CALL-UP (2L).
 - Type PTCH into scratchpad and select any line. IRS 1 and 2 pitch data will then display (N = negative value).
 - Type ROLL into scratchpad and select any line. IRS 1 and 2 pitch data will then display (N = left roll).
- **Measure the fuel quantity in the tank using the Magnetic Level Indicators (MLIs). The stick (MLI) number and readings are entered by the fueler into the appropriate Pre-Service and After-Servicing lines on the Fuel Service Record (FSR).**
- Use Fuel Quantity Calibration Charts in the Fueling Procedures Manual to determine the fuel quantity in the tank. This information is then entered by the fueler into the FSR in the Prior to Servicing and After Servicing fuel quantity blocks.

FMS Fuel Quantity Calculations

The FMS maintains fuel quantity information for internal calculations. The FMS depends on fuel quantity information from both the aircraft's Fuel Quantity Indication (FQI) system and Fuel Flow (FF) to determine fuel quantity.

Should FQ or FF become unreliable, the pilot can instruct the FMS to disregard one or the other. Refer to line 4R on the FUEL PRED page. The entry defaults to FF + FQ (i.e., both inputs used).

- Enter “/FQ” to disregard FF input.
- Enter “/FF” to disregard FQ input.

These entries can only be made after both engines are running and will automatically clear at the end of the flight. Entering CLR into the scratchpad and then selecting 4R returns the entry to FF + FQ.

Fuel Management (A319/320)

Automatic

MODE SEL pb in AUTO and all fuel pump pbs ON (lights out).

If center tank is not empty:

After engine(s) start:	Expect center tank-to-engine fuel feed.
After slat extension:	Expect inner cell-to-engine fuel feed. (After minimum of 2 minutes of center tank feeding.)
After slat retraction after takeoff:	Expect center tank-to-engine fuel feed. Because some center tank fuel is returned to the outer cells following IDG cooling, system may automatically revert to inner cell-to-engine fuel feed when inner cells are sensed full. When sufficient fuel is burned from inner cells (approximately 1,100 lbs.), the auto fuel feed system will automatically resume center tank-to-engine fuel feed. Expect inner cell-to-engine fuel feed should slats be re-extended before center tank depletion.
After low level sensed in center tank:	Pumps run for a short time, then automatically shut off (crossline green indication). Expect inner cell-to-engine fuel feed.
When approximately 1,650 lbs. is sensed in either inner cell:	Left and right wing transfer valves open. Transfer valves may open before 1,650 lbs if descent attitude and/or acceleration/deceleration occurs.

If center tank is empty:

After engine(s) start:	Expect inner cell-to-engine fuel feed.
When approximately 1,650 lbs. is sensed in either inner cell:	Left and right wing transfer valves open. Transfer valves may open before 1,650 lbs if descent attitude and/or acceleration/deceleration occurs.

Manual

MODE SEL pb in MAN and all fuel pump pbs ON (lights out).

With fuel in center tank:

- Before engine start:
CTR TK PUMPS 1 and 2 -- Verify on
- Three minutes after engine(s) start:
CTR TK PUMPS 1 and 2 -- OFF
- After slat retraction following takeoff:
CTR TK PUMPS 1 and 2 -- on
- After CTR TK PUMP LO PR warning illuminates --
CTR TK PUMPS 1 and 2 -- OFF

With no fuel in center tank:

- Before engine start:
CTR TK PUMPS 1 and 2 -- OFF

Fuel Management (A321)

Automatic

The transfer system controls the flow of fuel from the center tank to the wing tanks. The Fuel Level Sensing Control Unit (FLSCU) has automatic control of the transfer valve. The FLSCU automatically closes the associated center tank transfer valve when the wing tank is full. The FLSCU then reopens the center tank transfer valve when the engines have used 550 lbs. of wing tank fuel (when the fuel level reaches the under-full sensors).

Manual

With the MODE SEL pb in MAN position, the center tank transfer valves will open. Wing tank overflow must be prevented by selecting the CTR TK XFR pbs OFF when the wing tanks are full. They must also be selected OFF when the center tank is empty.

CAUTION: In the MAN mode wing tank overflow must be prevented by selecting the CTR TK XFR pbs OFF when the wing tanks are full.

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Supplementary Procedures
Hydraulics

Chapter SP
Section 13

Hydraulics

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Supplementary Procedures

Chapter SP

Landing Gear

Section 14

Preflight Brake Check

WARNING: Do not select the YELLOW ELEC PUMP ON during preflight unless clearance is obtained from Ground Crew.

Note: The preflight brake check is not valid with the YELLOW ELEC PUMP ON.

PARK BRK OFF

While stepping on both brake pedals, ensure the proper resistance and deflection.

Verify the left/right alternate (yellow) ACCU-PRESS/BRAKES gauge indicators show positive pressure.

Release pressure on the brake pedals.

PARK BRK ON

Verify the PARK BRK SET memo is displayed on the E/WD.

Taxi Brake Check

PARK BRK ON

Brake pedalsdepress and hold

PARK BRK OFF

Check that the left/right alternate (yellow) ACCU-PRESS/BRAKES gauge indicators show zero after releasing the PARK BRK.

Release the brake pedals.

Once the aircraft starts moving, check that the normal (green) brake system is operational (step on the brakes and slow the aircraft), and no spongy pedal is felt. (A “spongy” pedal indicates degraded performance of the alternate brake system.)

Brake Temperature

To avoid a BRAKES HOT ECAM during takeoff roll or climb, crews should verify brake temperatures are a maximum of 275°C prior to initiating takeoff.

Maintenance should be contacted if any of the following conditions are noted:

- The temperature difference between the two brakes on the same gear is greater than 150°C and the temperature of one brake is either:
 - Above 600°C (possibility of a binding brake, avoid taxi as long as the “BRAKES HOT” message is displayed), or
 - Below 60°C (inoperative brake).
- The mean temperature of the left brakes differs by more than 200°C from the mean temperature of the right brakes with no crosswind or pilot application of asymmetric braking.
- Any brake temperature exceeds 900°C.
- A fuse plug has melted.

Note: “BRAKES HOT” message is inhibited until engines are shut down.

Residual Brake Pressure

Before landing, if residual pressure is indicated on either brake pressure indicator (triple gauge):

Press the brake pedals several times to zero the pressure.

If pressure remains, select AUTO BRK MED for landing.

Be prepared for possible braking asymmetry during landing.

Do not select A/SKID & NWS to OFF.

Hot Brake Considerations

Carbon brake wear is highest when the brakes are cold (i.e., during taxi out) and is minimized when the brakes are hot (i.e., after landing). Wear is proportional to the number of brake applications not to the energy applied. Carbon brakes heat and cool relatively quickly.

Brake temperatures peak approximately 5-10 minutes after landing and then immediately begin to cool. Regardless of the peak brake temperature after landing, brake temperatures are typically below 300° by the time the A/C is ready for pushback.

It is not uncommon for brake temperatures to exceed 300° resulting in a caution and an ECAM message during taxi in. This is most common on hot days, after landing with medium brake selection or aggressive braking, during long taxi operations or at high density airports.

Note: “BRAKES HOT” message is inhibited until engines are shut down on newer Flight Warning Computers.

Temperatures exceeding 400° can be an indication of excessive:

- braking on roll-out
- “riding” the brakes during taxi.
- asymmetric braking (work being performed primarily on one side).
- a brake malfunction (e.g., a dragging brake).

The BRAKES HOT message is not normal during taxi out. The source of the message should be investigated. The BRAKES HOT message appears almost routinely after landing during the summer or when aggressive braking is used. If the temperatures are not asymmetrical, continue to taxi in normally; the brakes will cool relatively quickly

Pilots should not be overly concerned with hot brakes after landing unless:

- The temperature difference between the two brakes on the same wheel is greater than 150°C and the temperature of one brake is either above 600° C or below 60° C, or
- The mean temperature of the left brakes differ by more than 200° C from the mean temperature of the right brakes (no cross wind or asymmetric braking), or
- Any brake temperature exceeds 900° C, or
- A fuse plug has melted.

If there is a major difference between the displayed brake temperatures, the QRH should be consulted for write-up guidelines. In the event a BRAKES HOT message appears on the ECAM, do not leave the PARK BRK set after parking the aircraft (i.e., ensure aircraft is chocked and release the PARK BRK, unless parking brake set required per local directives).

In the case of high altitude arrivals during warm temperatures, pilots must use care when braking during landing and taxi when the temperature is warm. During the summer of 2001, there were multiple cases of hot brakes leading to tire failures in KDEN after taxiing in. FOQA analysis determined that many pilots were using incorrect braking techniques at KDEN. The following is suggested:

- Pilots should select autobrakes LO if runway conditions permit.

-
- Pilots should plan a runway turnoff point that is reasonable. Do not attempt to aggressively brake to make an early turnoff.
 - Pilots should permit reverse thrust to initially slow the aircraft. The use of LO brakes will lead to minimal braking while reverse thrust is being used.
 - Pilots should revert to manual braking normally but should use only the braking necessary to slowly decelerate the aircraft to the planned turnoff point. Avoid the temptation to aggressively brake to make an earlier turnoff unless required by ATC or other operational reasons.

Manage the taxi speed to minimize the needs for braking.

A BRAKES HOT message is normal after landing at a high altitude airport with warm temperatures. Brake temperatures will peak about the time the aircraft normally reaches the gate.

Note: “BRAKES HOT” message is inhibited until engines are shut down.on newer Flight Warning Computers.

Follow-up the event of a tire failure with a Logbook entry.

Brake Fan Operation (A321)

Brake fans are provided to augment normal brake cooling. As such they provide an additional tool to manage brake temperatures. They do not eliminate the need for brake temperature management (see previous section), nor is it expected that they will be required following each landing.

Brake fans cool the brakes as well as the brake temperature sensor. Therefore, while the fans are running, the indicated brake temperature will be significantly lower than when they are off. After the fans are turned OFF in preparation for takeoff, the indicated brake temperature will rise to reflect the actual temperature. It may take several minutes for this to occur. When the fans are running, the difference between the indicated and the actual brake temperature can range from 50 °C (when the actual brake temperature is 100 °C) to 150 °C (when the actual brake temperature is 300 °C).

Preflight

CAUTION: Ensure ground personnel are clear of the main wheels prior to selecting the brake fans to ON to avoid injury from carbon brake dust.

If brake temperatures are high, verify ground personnel are clear of the main wheels and select the brake fans to ON. The fans should be turned OFF once the highest brake temperature decreases to 100 °C. Expect to see a normal increase in brake temperatures once the fans are OFF, as cooling air is no longer flowing over the temperature sensor.

Taxi

If brake temperatures exceed 100 °C at time of pushback (with the fans ON), the fans may be kept running during push and taxi. If/when the highest brake temperature decreases to 100 °C or less, the fans should be turned OFF.

Before Takeoff

Takeoff should be delayed if the highest brake temperature exceeds 150 °C with the fans ON to prevent a BRAKES HOT caution from occurring during the takeoff roll. Brake fans should be selected to OFF prior to takeoff to prevent FOD ingestion.

CAUTION: Brake fans should not be used during takeoff, in order to avoid Foreign Object Debris damage to the fans and brakes.

In Flight

Brake fan operation is inhibited with the gear retracted. Additionally, though operational, brake fans are not effective in flight with the gear extended. Therefore, if a BRAKES HOT ECAM occurs, the gear should be extended for cooling per the QRH procedure and the brake fans left OFF.

After Landing

Airbus recommends that the brakes be allowed to thermally stabilize for 5 minutes after landing prior to operating the brake fans. This prevents unequal temperature distribution, which can lead to eventual brake failure. However, brake fans should be selected ON prior to gate arrival (when needed) to prevent ground crew injury from carbon brake dust.

CAUTION: Ensure ground personnel are clear of the main wheels prior to selecting the brake fans to ON to avoid injury from carbon brake dust.

Determine if the brake fans are required prior to employing them. If the brakes are not hot, if in cool ambient conditions, or with a long turn time, brake fans may not be required.

Shutdown/Securing

Fans may be left ON if the aircraft will be doing a quick turn. For all other cases, coordinate with MX or ramp personnel before leaving the aircraft with the fans operating. The fans should be selected OFF prior to securing the aircraft to prevent injury to ground crew when power is again applied to the aircraft.

Supplementary Procedures

Chapter SP

Warning Systems

Section 15

Warning Systems

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Supplementary Procedures

Chapter SP

Adverse Weather

Section 16

Introduction

Airplane operation in adverse weather conditions may require additional considerations due to the effects of extreme temperatures, precipitation, turbulence, and windshear. Procedures in this section supplement normal procedures and should be observed when applicable.

Cold Weather Operation

Considerations associated with cold weather operation are primarily concerned with low temperatures and with ice, snow, slush, and standing water on the airplane, ramps, taxiways, and runways.

Icing conditions exist when OAT (on the ground) or TAT (in flight) is 10°C or below and any of the following exist:

- visible moisture (clouds, fog with visibility of one statute mile (1600m) or less, rain, snow, sleet, ice crystals, etc.) is present; or
- ice, snow, slush or standing water is present on the ramps, taxiways, or runways.

CAUTION: Do not use engine anti-ice when OAT (on the ground) is above 10°C. Do not use engine or wing anti-ice when TAT (in-flight) is above 10°C. [AFM]

Preflight Procedure

Although removal of surface snow, ice or frost is normally an ACS function, the flight crew should carefully inspect areas where surface snow, ice or frost could change or affect normal system operations.

Exterior Inspection

Do the normal Exterior Inspection with the following additional steps:

Surfaces Check

Ensure all leading edge devices, all control surfaces, and the upper wing are free of snow, ice, and frost. The upper wing surfaces should be confirmed free of frozen contamination by inspection from the best vantage points.

Note: After inspection, monitor environmental conditions and ensure control surfaces remain free of contamination.

Note: Takeoff with light coatings of frost, up to 1/8 inch (3mm) in thickness on lower wing surfaces due to cold fuel is allowable.

Thin hoarfrost is acceptable on the upper surface of the fuselage provided all vents and ports are clear. Thin hoarfrost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to distinguish surface features underneath, such as paint lines, markings or lettering.

Probes, sensors, ports, vents, and drains (as applicable) Check

Check all probes, sensors, ports, vents, and drains are free of ice and snow. Water rundown after snow removal may refreeze immediately forward of static ports and cause an ice buildup which disturbs airflow over the static ports resulting in erroneous static readings even when static ports themselves are clear.

Pack inlets and outlets Check

Verify the air inlets and outlets, including the outflow valve, are free of snow and ice.

Engine inlets Check

Verify the inlet cowling is free of snow and ice.

Landing gear Check

Gear strut, actuators, doors, tires, brakes, and wheels should be free of snow or ice.

APU air inlet Check

The APU inlet door must be free of snow or ice prior to APU start.

Preflight Procedure

Do the following step after completing the normal Preflight Procedure -
First Officer:

PROBE/WINDOW HEAT pb As reqd

Note: Select AUTO once flight deck windows are defrosted.

Note: During ground operations, deicing fumes can cause a false
SMOKE (FWD/AFT) CRG SMOKE warning. Refer to QRH
before discharging the agent.

Engine Start Procedure

Note: When anticipating taxiing on a slippery or contaminated surface, consider starting both engines.

Do the normal Engine Start procedure with the following modifications:

- Oil pressure may be slow to rise
- Initial oil pressure rise may be higher than normal
- Additional warm-up time may be needed to allow oil temperature to reach the normal range

A small momentary fuel leak from the drain mast below the engine is possible after starting a cold soaked engine. If the ground crew informs you of the fuel leak; continue to run the engine at idle for 5 minutes.

- If the leak stops within 5 minutes, continue with normal operations.
- If the leak is still present after 5 minutes, shut down the engines and contact Maintenance for corrective action.

Engine Anti-ice Operation - On the Ground

Engine anti-ice must be selected ON immediately after engine start and remain on during all ground operations when icing conditions exist or are anticipated.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when OAT is above 10°C.

When engine anti-ice is needed:

ENG 1 and ENG 2 ANTI ICE pbs ON

When engine anti-ice is no longer needed:

ENG 1 and ENG 2 ANTI ICE pbsoff

Taxi Procedure

Do the normal Taxi procedure with the following modifications:

CAUTION: Avoid taxiing in deep snow or slush since steering will be more difficult. Brakes, landing gear and flaps may also freeze after takeoff if contaminated with snow or slush.

CAUTION: Taxi at a reduced speed. Use smaller nose wheel steering and rudder inputs and apply minimum thrust evenly and smoothly. Taxiing on slippery taxiways or runways at excessive speed or with high crosswinds may start a skid.

CAUTION: When operating the engines over significant amounts of standing deicing or anti-icing fluid, limit thrust to the minimum required. Excessive ingestion of deicing or anti-icing fluid can cause the fluid to build up on the engine compressor blades resulting in compressor stalls and engine surges.

Engine Ice Clearing Procedure

In icing conditions performing the engine clearing procedure is required before takeoff. The procedure should be performed in conjunction with the standing takeoff procedure. However, additional clearing procedures may be required depending on the taxi time and icing conditions. If performing the clearing procedure on a surface other than the departure runway, crews should confirm that the area behind the aircraft is clear and must assess the surface braking action to ensure it is suitable for engine run-up.

Coordination with ATC may be required.

During icing conditions, do an engine run up, as needed, to minimize ice build-up. Use the following procedure:

- Check that the area behind the airplane is clear.
- Run the engines up to 70% N1 for approximately 30 seconds duration at intervals no greater than 30 minutes.

Note: Fan blade ice build up is cumulative. If the fan spinner and fan blades were not deiced prior to taxi out, the time the engines were operating during the taxi in should be included in the 30 minute interval.

If airport surface conditions and the concentration of aircraft do not allow the engine thrust level to be increased to 70% N1, then set a thrust level and time as high as practical.

Note: When operating in conditions of freezing rain, freezing drizzle, freezing fog or heavy snow, run-ups to 70% N1 for approximately 1 second duration at intervals no greater than 10 minutes enhance ice shedding.

Before Takeoff Procedure

Note: FLEX takeoff procedures are authorized after deicing fluid has been applied.

Note: Do not use FLEX takeoff procedures if the runway is contaminated.

Refer to the Takeoff Runway Contaminant Decision Tree in this section. For performance corrections, refer to the WDR.

Takeoff Procedure

Refer to the Takeoff Runway Contaminant Decision Tree in this section.

Do the normal Takeoff Procedure with the following modifications:

| Standing Takeoff Procedure

During icing conditions, the takeoff must be preceded by a standing takeoff.

A standing takeoff is accomplished by holding the brakes while in position on the assigned runway until the engines are stabilized at or above 70% N1 before the start of the takeoff roll.

Do not use wing anti-ice for takeoff. If conditions warrant, wing anti-ice may be used after the flaps are retracted.

Climb, Cruise, and Descent Procedures

Engine Anti-Ice Operation – In Flight

Engine anti-ice must be ON during all flight operations when icing conditions exist or are anticipated, except during climb and cruise when the temperature is below -40°C SAT. Engine anti-ice must be ON before, and during descent in all icing conditions, including temperatures below -40°C SAT.

When operating in areas of possible icing, activate engine anti-ice before entering icing conditions.

WARNING: Do not rely on airframe visual icing cues before activating engine anti-ice. Use the temperature and visible moisture criteria because late activation of engine anti-ice may allow excessive ingestion of ice and result in engine damage or failure.

CAUTION: Do not use engine anti-ice when TAT is above 10°C.

When engine anti-ice is needed:

ENG ANTI-ICE pbs ON

When engine anti-ice is no longer needed:

ENG ANTI-ICE pbs off

Wing Anti-Ice Operation – In Flight

Ice accumulation on the windshield wiper arm or the visual ice indicator (located between the two flight deck windshields) may be used as an indication of structural icing conditions and the need to turn on wing anti-ice.

CAUTION: Do not use wing anti-ice when TAT is above 10°C.

CAUTION: Avoid extended flight in icing conditions with the slats extended.

When wing anti-ice is needed:

WING ANTI-ICE pb ON

When wing anti-ice is no longer needed:

WING ANTI-ICE pb off

Cruise Procedure

Cold Temperature Altitude Corrections

Extremely low temperatures create significant altimeter errors and greater potential for reduced terrain clearance. When the temperature is colder than ISA, true altitude will be lower than indicated altitude.

To ensure adequate obstacle clearance in conditions of extreme cold weather (-10°C or lower), refer to Airway Manual Weather, Altimeter Corrections.

Approach and Landing Procedures

Refer to the Guidelines for Contaminated Runways procedure in this section, if applicable.

Do the normal Approach and Landing procedures with the following modifications:

If there is evidence of significant ice accretion and to take into account ice formation on non heated structure, multiply the landing distance by 1.1.

On snow covered surfaces, reversers should be stowed by 25 knots ground speed.

After Landing Procedure

Do the normal After Landing procedure with the following modifications:

After prolonged operation in icing conditions with the flaps extended, when an accumulation of airframe ice is observed, or when landing on a runway contaminated with ice, snow, or slush:

Do not retract the flaps until the flap areas have been checked to be free of contaminants.

Refer to Taxi procedure in this section for engine anti-ice, engine run up, and taxi guidance.

Secure Procedure

Do the normal Secure procedure with the following modifications whenever the temperature falls below 0°C (32°F) or the aircraft may be de/anti-iced during overnight parking:

Parking brake As required

If the ramp is contaminated with ice or snow, parking brake should remain set.

DITCHING pb ON

Display PRESS page and verify outflow, inlet, and extract valves are fully closed. After all the valves are closed:

APU and External power As required

Note: Allow the APU automatic cool down cycle to complete and the flap to close prior to removing battery power. This process takes approximately two minutes.

- If only ground service power is required:
 - MAINT BUS switch (located overhead in the forward entrance area) - Latched ON
 - EXT PWR pb - Deselect (AVAIL light illuminated)
 - APU MASTER SW pb - Off
 - BAT 1 and 2 pbs - OFF
- If electrical power is not required:
 - APU MASTER SW pb and EXT PWR pbs - OFF
 - BAT 1 and 2 pbs - OFF

DITCHING pb off

Note: Since there is no electrical power, you will not see the light in the pb go out. Press the pb only once.

The above procedure positions the outflow valve fully closed to inhibit intake of snow, ice, or deicing fluid.

Note: Additional cold weather securing procedures are required to be accomplished by maintenance and/or ACS personnel. Stations have the responsibility for draining the water system.

CAUTION: Application of external air to a secured aircraft can result in cabin pressurization. Remove external air source and permit aircraft to depressurize prior to opening the main cabin door.

Guidelines for Takeoff on Contaminated Runways or Landing with Braking Action Less than Good

When there is contamination on the runway or the braking action is less than good, captains must evaluate crew, aircraft, and environmental conditions in determining the safety of operating their flight.

Procedure Guidance

General

- Consider crew capability.
- Consider current Maintenance Carry Overs (MCOs) - reversers, antiskid, etc.
- Consider type and amount of contaminant.
- Consider source and age of reported braking action.
- Consider usable runways and taxiways (NOTAMS, ATIS, etc.).

Taxi

- Be aware that ramps and taxiways may be very slippery.
- Be cautious of jet blast effect on ground personnel and equipment.
- Taxi onto and off runways at an extremely slow speed. Nose wheel slippage may occur causing the aircraft to continue straight ahead and possibly off the paved surface.

Crosswind Guidance

- On slippery runways, crosswind guidelines are a function of runway surface condition, airplane loading, and proper pilot technique.
- The following crosswind guidelines are applicable for takeoff and landing:

Braking Action	Runway Condition	ICAO	MU	RCR	Takeoff/ Landing Max Recommended Crosswind Component	Tailwind Limit
---	Dry	6	≥ 40	≥ 19	38	10
Good	Damp Frost ($<1/8''$)	5				
Good / Medium	Wet	4		39-36		
Medium (Fair)	Dry Snow*	3	35-30	13-18	25	5
Medium / Poor	Wet Snow/ Standing Water/ Slush	2	29-26	—	20	0
Poor	Ice - No Melting*	1	25-21	6-12	15	
Nil	Do Not Operate					

* Takeoff on untreated ice or snow should only be attempted when no melting is present.

Note: Crosswind guidelines are not considered limitations. Refer to the Limitations chapter for crosswind limits.

Note: Reduce crosswind guidelines by 5 knots on wet or contaminated runways whenever asymmetric reverse thrust is used.

Note: When multiple reports are present, e.g. “Braking Action Fair to Good”, use the lower crosswind value.

Takeoff

- Refer to the Takeoff Runway Contaminant Decision Tree, this section.
- Do not take off with braking action report of NIL by any air carrier aircraft or airport operator.
- A rolling takeoff is strongly advised when the crosswind exceeds 20 knots.
- Do not take off with standing water, slush, or wet snow in excess of 1/2 inch (1.2 cm) depth.
- Do not take off in dry snow in excess of four inches (10 cm) depth.

AWABS Determinations

Airport Customer Service (ACS) maintains a template in AWABS which describes conditions on each runway. ACS will enter the runway contaminant type and depth when more than 25% of the runway is affected. AWABS interprets this information according to rules established by Flight Operations to automatically select the contaminant type.

Note: For the A319, A320, A321, B717, B737NG, B757-300, B767-400, A330 and 777-200LR, W (WET) is automatically selected by AWABS when the runway is reported wet. For other aircraft types, the Captain must notify the gate agent or Operations if he wants Load Control Center (LCC) to load plan for W (WET) numbers.

AWABS limits the takeoff weight, as appropriate, based upon the selected contaminant type.

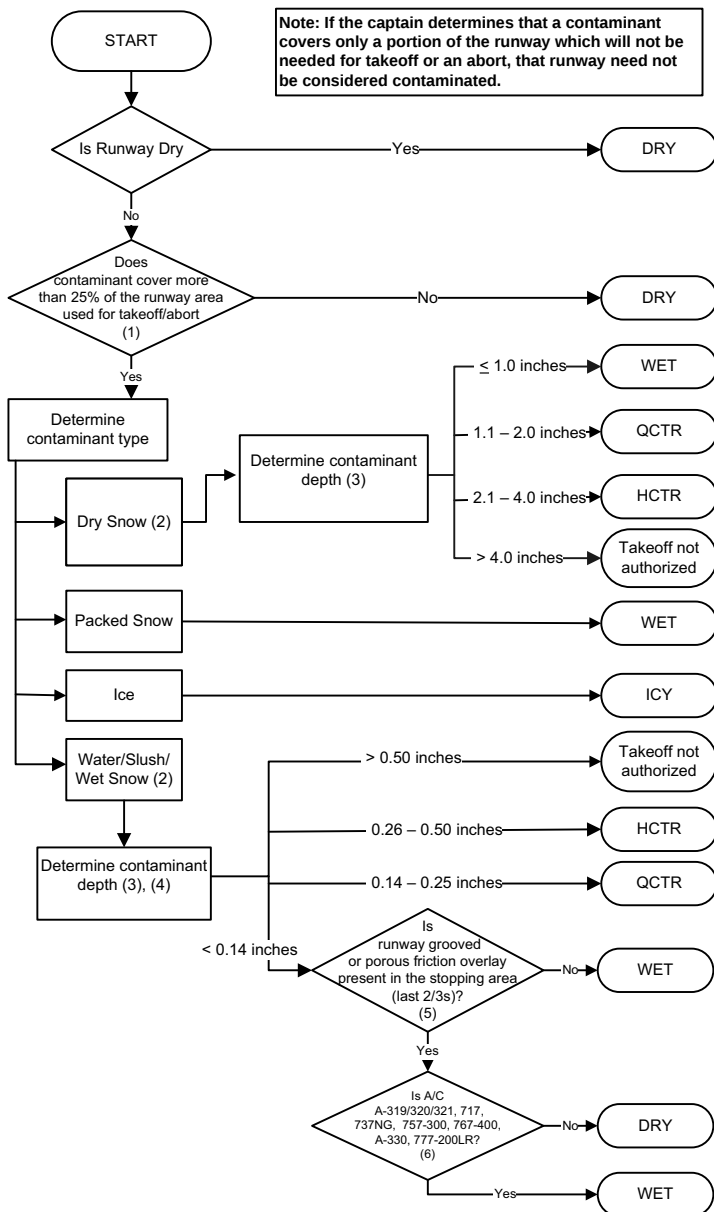
If the captain determines that a contaminant covers only a portion of the runway which will not be needed for takeoff or an abort, that runway need not be considered contaminated. The captain's determination affects his flight only and should be communicated to the dispatcher so AWABS can be updated appropriately, via Load Control Center (LCC).

Category Definitions

- **DRY** - A runway is dry, or can be considered dry, based upon the considerations discussed in the Takeoff Runway Contaminant Decision Tree.
- **Slippery** - Under slippery conditions it is assumed that only the aircraft's braking capability is degraded; the aircraft's ability to accelerate is assumed to be unaffected.
 - **W (WET)** - A runway which is wet and on which the Captain considers the aircraft's braking capability to be degraded, or a runway covered with packed snow.
 - **I (ICY)** - A runway whose surface is covered by ice.
- **Cluttered** - Under cluttered conditions it is assumed that there is sufficient depth of contaminant that both the aircraft's acceleration and braking capability are degraded.
 - **QCTR** (1/4 inch clutter) - A runway whose surface is covered by an equivalent standing water depth of between 0.14 and 0.25 inches.
 - **HCTR** (1/2 inch clutter) - A runway whose surface is covered by an equivalent standing water depth of between 0.26 and 0.50 inches. Refer to the Takeoff Runway Contaminant Decision Tree, this section, for dry snow equivalent depths.

Takeoff Runway Contaminant Decision Tree

Use the following decision tree to determine runway condition for takeoff.



Takeoff Runway Contaminant Decision Tree Notes		
1	If the captain determines that a contaminant covers only a portion of the runway which will not be needed for takeoff or an abort, that runway need not be considered contaminated. Note: There are circumstances that permit the Airport Authority to clear only the center 100 feet of the runway. In those circumstances, only the contaminant coverage within the cleared area is used to establish the percentage coverage.	
2	Snow	AWABS determines if snow is dry or wet on the basis of temperature. Snow is considered: • Wet when the temperature is 30° F (-1.1°C) or above • Dry when the temperature is below 30° F (-1.1°C) Note: A good operational test is: If a well compacted snowball can be made, the snow is wet; if the snowball falls apart, then the snow is dry.
3	A runway can be covered at varying depths over its length/width. When contaminant depths vary along the runway, a weighted average may be required. The contaminant depth along the runway where the aircraft will be at higher speeds should be weighed more heavily than at other points.	
4	A weighted average depth: • Less than or equal to 1/4 inch equates to QCTR, • Over 1/4 inch and up to 1/2 inch equates to HCTR Note: When the average depth exceeds 1/2 inch, takeoff will not be attempted.	
5	Grooved runways and runways with special porous overlays are designed to drain water from the runway surface in order to reduce the possibility of hydroplaning and increase the effective friction coefficient. Properly maintained runways with grooves or porous pavement have been shown to provide braking action approximately equivalent to a dry runway.	
6	A319, A320, A321, A330, B717, B737NG, B757-300, B767-400, and B777-200LR aircraft cannot consider a wet runway dry even if it is grooved or has a porous friction course overlay.	

Contaminant Millimeters to Inches Conversion

Use the following table for foreign stations that report runway clutter depth in millimeters (mm).

mm	0	6.35	12.7	25.4	50.8	101.6	152.4
Inches	0	1/4	1/2	1	2	4	6

Landing

- If FCTM, Quick Reference Landing Length chart does not apply, determine braking action. If braking action is less than good, accomplish an ACARS Landing Performance Request or refer to the ODM, Quick Reference Tab, Operational Landing Distance table.
- Do not land with a braking action report of NIL by any air carrier aircraft or airport operator in the landing or rollout portion of the runway.
- Do not land with standing water, slush, or wet snow in excess of one inch (2.5 cm) depth.
- Do not land in dry snow in excess of four inches (10 cm) depth.
- Consider using medium autobrakes for maximum stopping effectiveness.
- Land as early in the touchdown zone as possible.
- Do not assume the last 2,000 feet of the runway will have braking action as good as the touchdown zone.
- Avoid abrupt steering inputs.
- Use maximum allowable symmetrical reverse thrust.
- If side slipping off the runway, select reverse idle and release brakes to return to centerline.
- Aircraft will tend to drift off the runway nose first with forward thrust and tail first with reverse thrust.
- Be aware of the possibility of white out effect from reverse thrust use in dry snow.

Ground De/Anti-Icing Procedure

Pre-Gate Departure Communication

The captain can expect to talk to several different people during the deicing process, however, only two call signs are used.

- “Iceman” is a person who communicates with the captain via the VHF radio from a position within operations, the control center or the deice pad tower. This person will refer to the aircraft’s “Ship Number” in all communications.
- “Deicer/Coordinator” is the person who will be in direct control of the actual deicing operation on the aircraft. He/she will be plugged into the aircraft interphone system or on VHF radio and must be in direct communication with the captain at all times. This person will not know the flight number and will refer to the aircraft’s “Ship Number” in all communications.

The following communication procedures will be used:

PRE-GATE DEPARTURE COMMUNICATION	
CAPTAIN:	“This is ship #____, we will require deicing.”
ICEMAN:	“Ship #____, your aircraft will be deiced with the engines running.
	OR
	“Ship #____, your aircraft will be deiced____ (at the gate, off the gate, or at the remote) with the engines shut down.”
CAPTAIN:	“Roger, ship #____.”

Use the appropriate procedure for deicing at the gate or at the remote site with engines running or shut down.

Note: Advise deicer/coordinator if the APU will be running during de/anti-icing.

Note: Ensure engine inlets have been inspected and are clear prior to engine start.

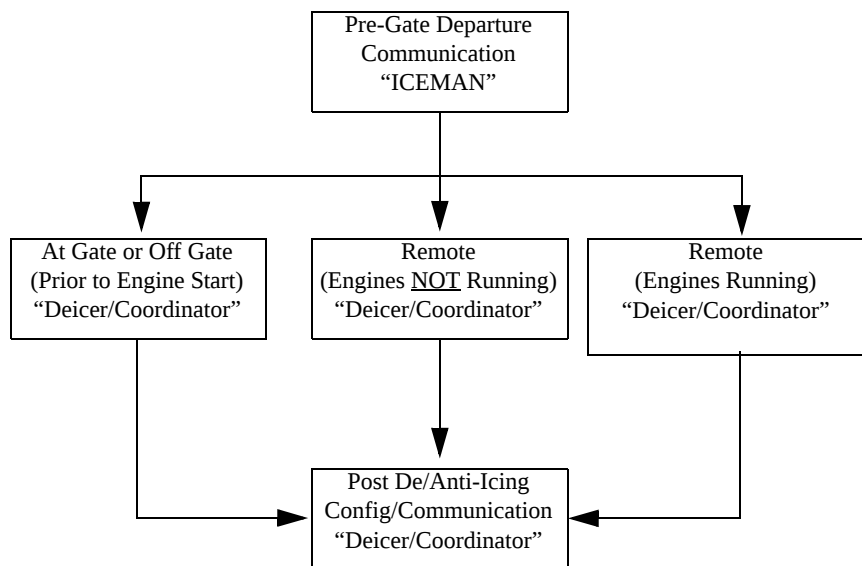
Aircraft Configuration and Communication

Prior to departure from the gate, when conditions warrant, the captain will contact “Iceman” and follow the Pre-Gate Departure Communication. The Iceman will describe one of three de/anti-icing scenarios:

- At Gate or Off Gate (Prior to Engine Start)
- Remote (Engines Not Running)
- Remote (Engines Running)

Follow the communication and configurations described in the appropriate procedure. Once complete, follow the Post De/Anti-Icing configuration and communication.

Note: If the APU is inoperative, advise Iceman.



At Gate or Off Gate (Prior to Engine Start)

Make a PA to the passengers regarding the deicing process.

Approximately one minute prior to deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required).”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____, ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.” OR “Negative, ship # ____, holdover time required.”
DEICER/COORD:	“Ship # ____, ready for deicing?” OR “Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing:

CAUTION: Snow, slush, or ice ingestion in the APU inlet duct while the APU is running can cause serious damage. Coordinate with ground personnel to ensure that APU inlet area is clear before starting APU. Ingestion of deicing fluid causes objectionable fumes and odors to enter the airplane.

APU or external power As required

HYD YELLOW ELEC PUMP pb ON

Flaps Extend

Extend the flaps to the anticipated takeoff position.

Note: Disregard any F/CTL SLATS FAULT message that disappears when slats reach selected position.

HYD YELLOW ELEC PUMP pboff

Ensure low pressure conditioned air is not in use.

ENG 1 and ENG 2 BLEED pbsOFF

APU BLEED pboff

CARGO HEAT HOT AIR pbOFF

PACK 1 and PACK 2 pbsOFF

DITCHING pb ON

View the ECAM PRESS page and ensure the VENT EXTRACT valve and the outflow valves are closed.

Reduces the possibility of fumes entering the air conditioning system.

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

CAPTAIN:	“Ship # ____, aircraft ready for deicing.”
----------	--

POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship #___de/anti-icing and aircraft inspection complete.” OR “Ship #___de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship #___Type I fluid application started ___ minutes ago. The freeze point is ___°C”. No Type II or IV was used.” OR “Ship #___Type II/IV fluid application with (fluid brand name) started ___ minutes ago.” OR for Non-US locations: “Ship #___Type II/IV fluid application (fluid brand name) started ___ minutes ago using a fluid mixture of ___ (% concentrate).”
CAPTAIN:	“Roger, ship #___Type I started ___ minutes ago. The freeze point is ___°C. No Type II or IV was used.” OR “Roger, ship #___Type II/IV (fluid brand name) started ___ minutes ago.” OR for Non-US locations: “Roger, ship #___Type II/IV (fluid brand name) started ___ minutes ago using a fluid mixture of ___ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: An All Clear salute is required to verify de/anti-icing procedures are complete.

Aircraft configuration post de/anti-icing:

RCDR GND CTL pb ON

Complete the Pushback procedure, if not already accomplished.

APU As required

Wait approximately 3 minutes after deicing is complete to restore bleed air for pack operation or engine start to ensure deicing fluid has been cleared from the engines and APU.

APU BLEED pb As required

Start the engines using the normal procedures except leave the packs and engine bleeds off.

Note: Disregard (clear) the AIR BLEED 1 OFF / AIR BLEED 2 OFF messages.

Note: Deicing fluid fumes can cause a false SMOKE (FWD/AFT) CRG SMOKE warning. Refer to QRH before discharging the agent.

Engine(s) Start

Accomplish the After Start procedure.

DITCHING pb off

Check the Outflow Valves are open (on the ECAM PRESS page).

ENG 1 and ENG 2 BLEED pbs on

CARGO HEAT HOT AIR pb on

PACK 1 and PACK 2 pbs on

Remote (Engines Not Running)

If remote deicing with engines not running is anticipated, the APU should be left operating. If the APU or a portion of the APU is inoperative, confirm that electric and/or air carts are available at the remote location before departing the gate.

CAUTION: Snow, slush, or ice ingestion in the APU inlet duct while the APU is running can cause serious damage. Coordinate with ground personnel to ensure that APU inlet area is clear before starting APU. Ingestion of deicing fluid causes objectionable fumes and odors to enter the airplane.

Approaching the icepad:

- Contact “Iceman”.
- Start the APU if it is not already operating.
- Make a PA to the passengers regarding the deicing process.

Just prior to entering the deicing area:

- Verify flaps are in the intended takeoff position.

When the aircraft is in position for deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required).”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____, ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.” OR “Negative, ship # ____, holdover time required.”
DEICER/COORD:	“Ship # ____, ready for deicing?” OR “Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing.

APU or external power As required
ENG 1 and ENG 2 ANTI ICE pbsoff
ENG 1 and ENG 2 BLEED pbs OFF
APU BLEED pboff
CARGO HEAT HOT AIR pb OFF
PACK 1 and PACK 2 pbs OFF
DITCHING pb ON

View the ECAM PRESS page and ensure the VENT EXTRACT valve and the outflow valves are closed.

Reduces the possibility of fumes entering the air conditioning system.

Engines Shut down

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

CAPTAIN:	“Ship # ____, aircraft ready for deicing.”
POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship # ____ de/anti-icing and aircraft inspection complete.” OR “Ship # ____ de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____ Type I fluid application started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Ship # ____ Type II/IV fluid application with (fluid brand name) started ____ minutes ago.” OR for Non-US locations: “Ship # ____ Type II/IV fluid application (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
CAPTAIN:	“Roger, ship # ____ Type I started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Roger, ship # ____ Type II/IV (fluid brand name) started ____ minutes ago.” OR for Non-US locations: “Roger, ship # ____ Type II/IV (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: Do not move aircraft until ATC taxi clearance and the All Clear Salute have been received.

Aircraft configuration post de/anti-icing:

RCDR GND CTL pb ON

APU As required

Wait approximately 3 minutes after deicing is complete to restore bleed air for pack operation or engine start to ensure deicing fluid has been cleared from the engines and APU.

APU BLEED pb As required

Start the engines using the normal procedures except leave the packs and engine bleeds off.

Note: Disregard (clear) the AIR BLEED 1 OFF / AIR BLEED 2 OFF messages.

Note: Deicing fluid fumes can cause a false SMOKE (FWD/AFT) CRG SMOKE warning. Refer to QRH before discharging the agent.

Engine(s) Start

Accomplish the After Start procedure.

DITCHING pb off

Check the Outflow Valves are open (on the ECAM PRESS page).

ENG 1 and ENG 2 BLEED pbs on

CARGO HEAT HOT AIR pb on

PACK 1 and PACK 2 pbs on

Accomplish the Taxi procedure.

Note: A flight control check is required even if already accomplished prior to deicing.

Remote (Engine(s) Running)

Note: Deicing with the engines running is authorized only at stations identified in the Company Pages.

Approaching the icepad:

- Contact “Iceman”
- Make a PA to the passengers regarding the deicing process.

Just prior to entering the deicing area:

- Verify flaps are in the intended takeoff position.

When the aircraft is in position for deicing:

PRE-DEICING COMMUNICATION	
DEICER/COORD:	“Ship # ____, brakes set, engines at idle?”
CAPTAIN:	“Roger, ship # ____, brakes set, engines at idle.”
DEICER/COORD:	“Ship # ____ Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required).”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____, ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

OR

PRE-DEICING COMMUNICATION USING FORCED AIR	
DEICER/COORD:	“Ship # ____, brakes set?”
CAPTAIN:	“Roger, ship # ____, brakes set.”
DEICER/COORD:	“Ship # ____, the final process used will be forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.” OR “Negative, ship # ____, holdover time required.”
DEICER/COORD:	“Ship # ____, ready for deicing?” OR “Ship # ____, Type II / IV with (fluid brand name) will be used for anti-icing (if anti-icing required). Ready for deicing?”
CAPTAIN:	“Stand by.” (Follow procedure below).

Prior to de/anti-icing:

Aircraft configuration for de/anti-icing:

- Thrust levers IDLE
- APU BLEED pb.....off
- APUoff
- CARGO HEAT HOT AIR pb OFF
- PACK 1 and PACK 2 pbs OFF
- ENG 1 and ENG 2 BLEED pbs OFF
- DITCHING pb ON

View the ECAM PRESS page and ensure the VENT EXTRACT valve and the outflow valves are closed.

Reduces the possibility of fumes entering the air conditioning system.

WARNING: Once the deicing operation begins, any aircraft movement or changes in configuration must be coordinated with the ground crew.

CAPTAIN:	“Ship # ____, aircraft ready for deicing.”
POST DE/ANTI-ICING COMMUNICATION	
DEICER/COORD:	“Ship # ____de/anti-icing and aircraft inspection complete.” OR “Ship # ____de/anti-icing and aircraft inspection complete. The final process used was forced air with Type I fluid (or forced air only) with no holdover time.”
CAPTAIN:	“Roger, ship # ____.”
DEICER/COORD:	“Ship # ____Type I fluid application started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Ship # ____Type II/IV fluid application with (fluid brand name) started ____ minutes ago.” OR for Non-US locations: “Ship # ____Type II/IV fluid application (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
CAPTAIN:	“Roger, ship # ____Type I started ____ minutes ago. The freeze point is ____°C. No Type II or IV was used.” OR “Roger, ship # ____Type II/IV (fluid brand name) started ____ minutes ago.” OR for Non-US locations: “Roger, ship # ____Type II/IV (fluid brand name) started ____ minutes ago using a fluid mixture of ____ (% concentrate).”
DEICER/COORD:	“Ship # ____, clear to start engines (when applicable). Do not move the aircraft under power until you have been given the all clear salute.”
CAPTAIN:	“Roger, ship # ____.”

Post de/anti-icing:

WARNING: Do not move aircraft until ATC taxi clearance and the All Clear Salute have been received.

Taxi may be commenced prior to restoring bleed air and pack operation.

Aircraft configuration post de/anti-icing:

Wait approximately 3 minutes after deicing is complete to restore bleed air for pack operation or to start the APU to ensure deicing fluid has been cleared from the engines and APU.

DITCHING pboff
Check the Outflow Valves are open (on the ECAM PRESS page).

ENG 1 and ENG 2 BLEED pbs on

CARGO HEAT HOT AIR pb on

PACK 1 and PACK 2 pbs on

Accomplish and complete Taxi procedure.

Note: A flight control check is required even if already accomplished prior to deicing.

Hot Weather Operation

During ground operation the following considerations will help keep the airplane as cool as possible:

- If a ground source of conditioned air is available, the supply should be plugged in immediately after engine shutdown and should not be removed until just prior to engine start.
- If a ground source of conditioned air is not available, both packs should be used (when possible) for maximum cooling.
- All doors, including cargo doors, and windows should be closed as much as possible.
- Electronic components which contribute to a high temperature level in the flight deck should be turned off while not needed.
- All flight deck air outlets should be opened.
- All passenger cabin gasper outlets should be opened and all window shades on the sun-exposed side of the passenger cabin should be closed.

During takeoff performance evaluation consider the following:

- High temperatures inflict performance penalties which must be taken into account on the ground before takeoff.
- Alternate takeoff procedures (APU code annotated on WDR, etc.)

After landing, consider the following:

- Arriving at high humidity airports with a cold soaked aircraft can result in numerous erroneous ECAM fault messages. Refer to the QRH, Computer Resets, NNOI.1, or contact the MCC to clear those faults.
- If the outside air temperature is 35°C or higher and the aircraft is not overnighing, leave the flaps at the Flaps 1 position to prevent nuisance AIR L (R) WING LEAK warnings.

CAUTION: Do not perform an ADIRS full alignment with the flaps extended, as damage to the Rudder Travel Limiter Unit (RTL) mechanical stop can result.

CAUTION: To retract the flaps, ensure the ground crew is clear of the aircraft prior to selecting the yellow electric hydraulic pump to ON. Selecting the yellow electric hydraulic pump powers both yellow and green systems. See SP.9.1.

Turbulence

During flight in light to moderate turbulence, the autopilot and/or autothrust may remain engaged unless airspeed, altitude or attitude deviations require use of manual control.

The turbulent air penetration speed provides ample protection from stall and high speed buffet, while also providing protection from exceeding the structural limit. Refer to the Limitations section for the turbulent air penetration speed.

Do not allow the airspeed to decrease and remain below the turbulence penetration speed as buffet margins will be reduced and considerable time will be required to regain speed. Sacrifice altitude if necessary and advise ATC.

- Passenger signs ON
- Advise passengers to fasten seat belts prior to entering areas of reported or anticipated turbulence. Instruct flight attendants to check that all passengers' seat belts are fastened.

Severe Turbulence

Severe turbulence should be avoided if at all possible. If severe turbulence cannot be avoided, an increased buffet margin is recommended. This can be obtained by descending approximately 4,000 feet below optimum altitude. The autothrust should be off in severe turbulence.

- ENG MODE selector IGN

Volcanic Ash Encounter

Ground Operations

Aircraft should not operate into or out of airports where there is falling ash and/or ash-covered runways/taxiways. If an airport's operational surfaces are contaminated with ash, the taxiways and runways to be used must be swept prior to use, and if possible, sprayed with water to minimize aircraft contamination from any remaining ash.

Restrict ground use of the APU to engine starts. Use ground starting air and electrical power, if available.

Do not use windshield wipers for dust removal. Coordinate with Maintenance to hose off ash deposits with water and wipe residue away with a soft cloth.

Avoid the use of air conditioning packs on the ground as long as recirculation fans will maintain adequate cabin comfort. If air conditioning is required, operate at full cold setting. Use preconditioned air at the terminal from a filtered ground cart, if available. If possible, keep engine bleeds off.

Remove ash deposits from exposed lubricated surfaces and other areas where ash could penetrate seals or enter ducts, inlets, probes, etc.

Inspect and clean engine inlets and have area within 25 feet of engine inlets cleaned of volcanic ash.

Dry crank engines for two minutes before start.

Avoid static operations of engines above idle power.

To prevent contamination of air conditioning system, consider a takeoff with packs off.

Use rolling takeoff procedures to minimize engine dust ingestion.

During landing, limit reverse thrust to avoid impairing visibility and minimize ingesting dust into the engines. Exercise caution as braking may be less effective than normal due to contamination on the runway.

In Flight

CAUTION: If volcanic ash is encountered in flight, refer to the QRH, section 0, Volcanic Ash.

Securing Aircraft

When securing aircraft, install engine inlet covers and other protective plugs/devices.

Use the DITCHING pb to close inlets/valves.

Operation in a Sandy or Dusty Environment

When operation at an airport contaminated by sand or dust is expected, based on their experience and the amount of contaminant, crews can consider applying most of the on-ground recommendations in order to help prevent contamination of aircraft systems.

Ground Operations at Airports Covered with Ash, Sand or Dust

Preparation of the flight deck

APU Do not use

Use the APU only to start the engines, and then only if ground power is not available, particularly in case of volcanic ash.

Request ground supply for air conditioning and for electricity.

Windshield wipers Do not use

Do not use windshield wipers to remove ash, or for anything else.

Brake performance Consider penalty

A layer of volcanic ash on the runway may degrade braking efficiency. Treat takeoff performance as if it is similar to that on a wet runway (dry ash) or on slush (wet ash).

Exterior Inspection

Surfaces and equipment Check free of deposits

Ground maintenance should remove ash, sand or dust that has settled on exposed lubricated surfaces and could penetrate seals or enter the engine gas path, air conditioning system, air data probes, access doors and panels and other orifices on the aircraft.

Engine/APU inlets Check free of deposits

Inspect the inlets and order them cleaned of deposit. Have the area within 25 ft of the engine inlet cleaned of volcanic ash (as much as practical).

Engine Start

Use external pneumatic supply for starting the engines, if it is available.

Engine Crank

Before starting the engines, ventilate them by dry cranking at maximum motoring speed for two minutes. This will blow out any contaminant ash that may have entered the booster area.

Taxi

After releasing the brakes:

Thrust levers Advance smoothly then move to idle with rolling

Advance the levers smoothly to the minimum required for breakaway.

Avoid making sharp or high-speed turns.

ENG 1, ENG 2 BLEED OFF

Keep bleed valves closed for taxiing, particularly in volcanic ash.

In case of crosswind when performing a 180° turn on the runway, initiate this turn with the nose downwind in order to prevent ash, sand or dust ingestion.

Takeoff

Allow ash, sand and dust (if present) to settle on the runway before starting the takeoff roll.

Use the rolling takeoff technique if possible.

Adjust progressively engine power as for normal takeoff procedures.

To prevent contamination of air conditioning system, consider a takeoff with packs OFF.

Landing

Reversers Use as lightly as feasible
If it appears that maximum reverse thrust will be needed, apply reverse thrust when the main landing gear touches down. Limit the use of reverse thrust as much as possible, because reverse flow may throw up ash, sand, dust and impair visibility.

Note: The abrasive effect of volcanic ash on windshields and landing lights may reduce the pilot’s visibility for approach and landing significantly. Consider diverting to an airfield where it is possible to use autoland.

Brake performance Consider penalty
A layer of volcanic ash on the runway may degrade braking efficiency. Treat landing performance as if it is similar to that on a wet runway (dry ash) or on slush (wet ash).

Differences

Chapter DF

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Differences

Chapter DF

A319/320 Differences

Section 10

Aircraft General, Emergency Equipment, Doors, Windows

Item	A319	A320
Minimum Pavement Width for 180° Turn	68 ft	76 ft
Length	111 ft	123 ft 3 in
Emergency Equipment	Refer to Volume 2, chapter 1 for locations.	
Overwing Exit Doors	2 Doors	4 Doors
Slide/Raft Equipped	None	3139-3149, 3153, 3155, 3157-3161, 3164-3166, 3168-3171, 3209-3245, 3247-3252
VIP Charter Capable	3139 - 3146	None
European Charter Capable	3162	None
Accommodations in Non-VIP Charter Configuration	126 Total 12 First Class, 18 Economy Comfort, 96 Coach 2 Flight Deck and 4 FA Jumpseats	150 Total 12 First Class, 18 Economy Comfort, 120 Coach 2 Flight Deck and 5 FA Jumpseats
Marketing Identification	A319	A320 (CFM56-5-A1) A32R (CFM56-5-A3)
Maximum Takeoff and Landing Altitude	9,200 ft	8,000 ft

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Item	A319	A320
Weight Limits	MTW - 154,323 MTOW - 155,205 MLW - 134,481 MZFW - 125,663	MTW - 167,330 MTOW - 166,448 MLW - 142,198 3209 - 3250: MZFW - 133,379 3251 - 3278: MZFW - 134,481

Air Systems

Item	A319	A320
No significant operational differences.		

Automatic Flight

Item	A319	A320
No significant operational differences.		

Communications

Item	A319	A320
Single HF Radio	3139 - 3146	3218 - 3220, 3229
Dual HF Radios	3162	3213 - 3217, 3222 - 3225, 3240, 3243, 3244
8.33 kHz Compliant Radios	3162	Not installed
ACARS European Mapping	3162	Not Installed

Electrical

Item	A319	A320
No significant operational differences.		

A319/320/321 Operations Manual

Engines, APU

Item	A319	A320
Engines	CFM56-5-A5	3209 - 3233, 3277, 3278 CFM56 -5-A1 3234 - 3276 CFM56-5-A3

Flight Controls

Item	A319	A320
Speedbrakes	Full speed brakes available with AP ON or OFF. Note: Full speed brakes equates to half speed brakes on A320. (Refer to Vol. 2, ch. 27 for details.)	Speed brakes limited to half with AP ON. Full available with AP OFF.

Flight Instruments, Displays

Item	A319	A320
No significant operational differences.		

Flight Management, Navigation

Item	A319	A320
No significant operational differences.		

Fuel

Item	A319	A320
No significant operational differences.		

Landing Gear

Item	A319	A320
No significant operational differences.		



Warning Systems

Item	A319	A320
No significant operational differences.		

Differences

A321 Differences

Chapter DF

Section 11

Introduction

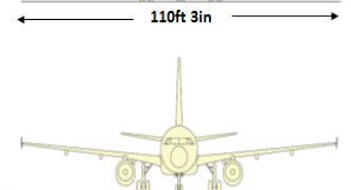
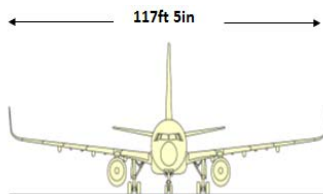
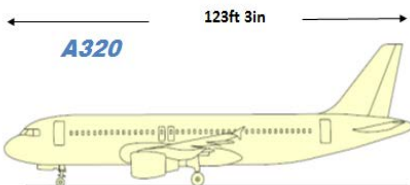
All of the aircraft in this group have essentially the same exterior and interior configuration.

Reference the information and graphics on the following pages of this Differences section for limitations, revised operating procedures, dimensions, turning radius, exterior doors, emergency doors, evacuation slides, exterior lighting locations, flight deck and cabin emergency equipment locations, and flight deck instruments and displays.

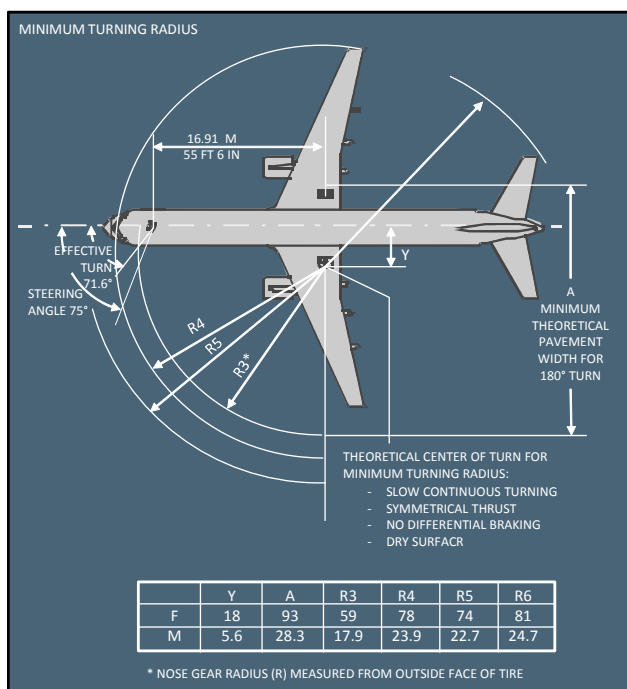
General

Dimensions

The A321 is 23 feet longer than the A320, and is equipped with sharklets, which are 8 feet in length.



The A321 requires a minimum pavement width of 93 feet to perform a 180° turn.



Cabin Seating

The A321 will be configured to carry a total of 192 passengers:

First	Economy Comfort	Coach
20	29	143

Air Conditioning/Press

Air Conditioning System Controllers (ACSC):

The pack regulators and the zone controller have been replaced with two dual-lane ACSC which control the operation of the following:

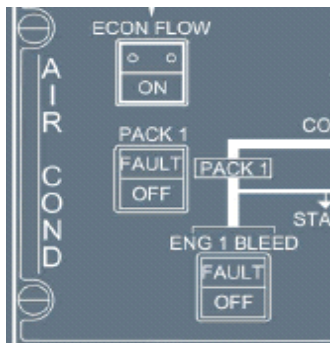
- ACSC 1 - Air conditioning pack 1 and flight deck trim air valve.
- ACSC 2 - Air conditioning pack 2 and the Fwd and Aft cabin trim air valves.

Note: Lanes are similar to Zone Regulator channels on the A320.

Air Conditioning System Controller (ACSC) lane failure:

- Single lane failure - Pack continues to operate normally, the other lane takes over.
- Dual lane failure - Results in complete pack failure, pack flow valve and associated trim air valve/s close.

Cabin Temperature control: Each cabin zone's (FWD and AFT) temperature selection made from the flight deck, can be slightly modified (+/-2.5°C) from controls on the cabin's Forward Attendant Panel.



ECON FLOW pb: Located on the overhead AIR COND panel.

•**ON** (white) - ECON flow is selected. System provides 80% of normal air flow. Air flow will automatically increase to 120% above normal during single pack operation or when APU bleed air is being used.

•**OFF** (light out) - A/C system provides normal air flow.

Residual Pressure Control Unit (RPCU): Automatically depressurizes the aircraft in case of abnormal residual pressure on the ground. It automatically opens the outflow valve when:

- The outflow valve is not fully open, and
- Both CPCs (Cabin Pressure Controllers) are failed, or manual mode is selected, and
- The aircraft is on the ground, and
- All engines are shutdown, or all ADIRS indicate an airspeed below 100 kts.

ECAM Messages

E/WD Indication and Condition	AURAL WARNING	MASTER LIGHT	Phases of Flight
COND CTL 1(2) - A(B) FAULT- Single ACSC lane failure	N/A	N/A	All
EXCESS RESIDUAL PR- Excessive cabin pressure after last engine shutdown	Single Chime	Master Caution	All

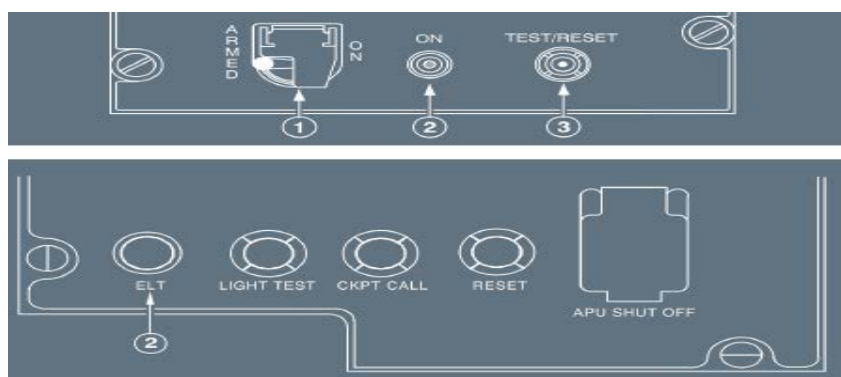
Communications

General: Like most Delta A320s, the A321s will not be equipped with HF radios. Radio communication and interphone system structure and operation are almost identical to the A320. One difference is VHF communications includes the now standard expanded 8.33 kHz (extra digit) capability.

RMP STBY NAV Selections: STBY NAV radio portion of the RMP includes a GLS selection key which is not functional at this time.



ELT Controller:



1 ELT Switch

The guard keeps this switch in the ARMED position.

ON: The ELT transmits an emergency signal.

ARMED: In the case of impact, the ELT transmits an emergency signal on 121.5, 243, and 406.025 MHz.

2 ON and ELT Light

These lights illuminate amber when the emergency signal is transmitted, or during ELT auto test.

3 TEST/RESET pb

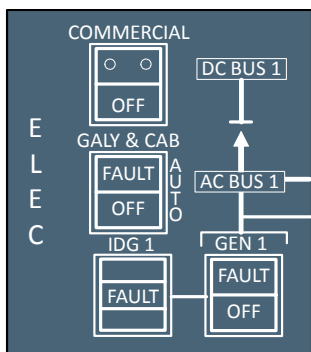
Pressing this pushbutton starts the ELT auto test.

Note: If the ELT is unduly triggered in ARMED mode (by external impact, hard landing, etc), select the TEST/RESET position to reset the ELT and stop signal transmission.

Electrical

Emergency Electrical Configuration: The lowering of the landing gear has no effect on the operation of the emergency generator. It will continue to supply power to the AC and DC ESS buses until the aircraft is on the ground and below 100kts.

GALY & CAB (Galley & Cabin) pb: Located on the overhead ELEC panel.



AUTO (Light Out) - Main and secondary galley buses, in-seat power supply and in-flight entertainment (IFE) systems are powered. Both galley buses are automatically depowered when:

On Ground: On single engine generator power.

Note: Both buses remain powered with either APU or EXT PWR when on the ground.

In-flight: On single generator (Engine or APU).

OFF (white) - Both galley buses, in-seat power supply and IFE are depowered.

FAULT (amber) - Illuminates whenever any engine generator is above 100% of its rated output.

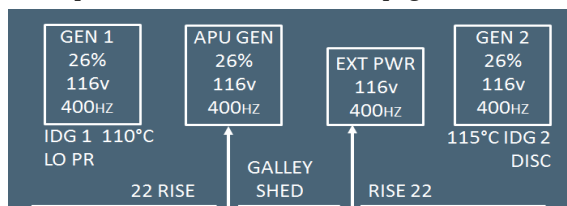
COMMERCIAL pb: Located on the overhead ELEC panel.

ON (light out) - Aircraft's commercial electrical buses are powered.

OFF (white) - Aircraft's commercial electrical buses are depowered to include:

- Galley (Main and Secondary) buses.
- In-flight entertainment (IFE) and in-seat power supply systems.

RISE Indication: Number displayed next to the word RISE on the left and right lower portion of the ECAM ELEC page.



Displayed in green, represents the temperature difference between an IDG's oil inlet and outlet.

Fire Protection

Cargo Compartment Smoke Detectors: Cargo compartment smoke detection and protection is identical to the A320 with the exception of the number of smoke detectors in each compartment:

- Forward cargo compartment has a total of 4 smoke detectors located in 2 cavities.
- Aft cargo compartment has 6 smoke detectors located in 3 cavities.

Flight Control

Flap configuration differences: The A321 is equipped double-slotted flaps versus single-slotted on the A320. This permits a slightly lower deck angle for takeoff and landing.

Flap/Slat Speeds Limits:

Configuration	A320 max (kts)	A321 max (kts)
1	230	235
1+F	215	225
2	200	215
3	185	195
FULL	177	190

Speed Brake Deployment: Speed brake deployment limits differ from the A320:

A320	A321
Only ½ speed brakes capable with AP on	Full speed brakes capable with AP on
Speed brakes inhibited in flight with FLAPS FULL	Speed brakes inhibited in flight with FLAPS 3 and FULL

Load Alleviation Function (LAF): The Load Alleviation Function (LAF) is designed to reduce wing loads during continuous turbulence or when G loads are predicted to exceed a predetermined limit. Available only in Normal Law, the LAF commands one the following depending on condition:

- Momentary upward deflection of both ailerons
- Momentary upward deflection of both ailerons and spoilers 4 and 5 of each wing.

Note: The LAF is completely automated with no indications or advisories to the pilot.

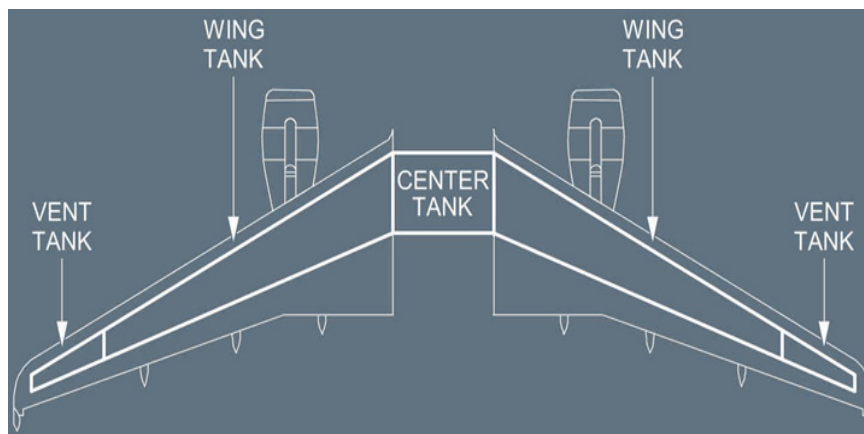
Spoiler Display on SD WHEEL page: Spoiler indications are at the top of the display versus the bottom as on the A320.



Fuel System

General Description

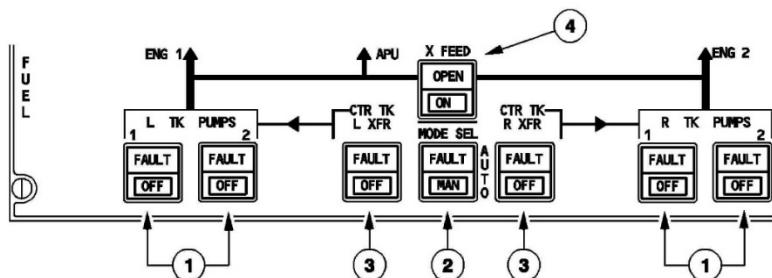
The A321's fuel system provides direct wing tank to engine fuel feeding. Center tank transfer valves and jet pumps transfer fuel from the center tank to each wing tank, either automatically by a Fuel Level Sensing Control Unit (FLSCU) or manually by pilot action. Fuel tank configuration consists of single compartment wing tank per wing, and a center wing tank. Wing tanks are not divided into outer and inner compartments like the A320.



FUEL CAPACITY: The A321 has a maximum fuel capacity of approx. 42,000 lbs.

FUEL FEED SEQUENCE: Unlike the A320, fuel is always consumed directly from the wing tanks. Fuel in the center tank transfers automatically into the wing tanks until the center tank is emptied.

Switch functions remain the same as the A320 with the following exceptions:



1 L/R TK PUMP pb

- Left and right tank pump switches. Operation is the same as the A320.

2 MODE SEL pb

- AUTO (Light Out): Fuel Level Sensing Control Unit (FLSCU) controls center tank fuel transfer valves automatically.
- MAN (white): Fuel transfer must be accomplished manually utilizing the CTR TK XFR pbs.

3 CTR TK L(R) XFR pb

- ON (Lights Out): The center tank transfer valves open and close as directed by the FLSCU when MODE SEL pb is in AUTO.
- OFF (white): The center tank transfer valves close.
- FAULT (amber): With MODE SEL pb in AUTO, indicates center tank has more than 550 lbs. and the left or right wing tank has less than 11000 lbs.

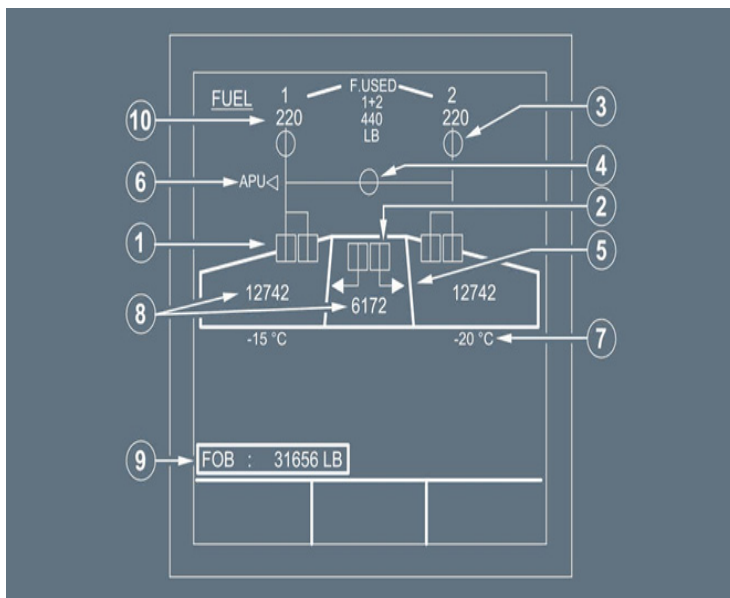
4 FUEL X FEED pb

- Fuel crossfeed pump switches. Operation is the same as the A320.

ECAM FUEL PAGE

ECAM appearance is altered from the A320.

Indications are the same as the A320 with the following exceptions:



1 Wing Tank Fuel Pump Indications

No significant operational differences.

2 CTR Tanks Valves

- **Inline - Green:** Center Tank Transfer valve is open.
- **Inline - Amber:** Transfer valve is open, although commanded closed in automatic or manual mode. (switch/valve disagree).
- **Crossline - Green:** Transfer valve is closed.
- **Crossline - Amber:** Transfer valve is closed, although commanded Open in automatic or manual mode. (switch/valve disagree).

3 Engine and APU LP Valve Indications

No significant operational differences.

4 Crossfeed Valve Indications

No significant operational differences.

5 Center to Inner Transfer Indications

- Green arrow when there is center to wing fuel transfer.
- Amber arrow when transfer valve is open when commanded closed, in AUTO or MAN mode (switch/valve disagree).

6 APU Fuel Indications

New location and display for the A321.

APU  APU is in white and the triangle is in green: the APU valve is open.

APU  APU and solid triangle are in amber: the APU valve is open with the APU Fire pushbutton out, or the APU MASTER switch is OFF.

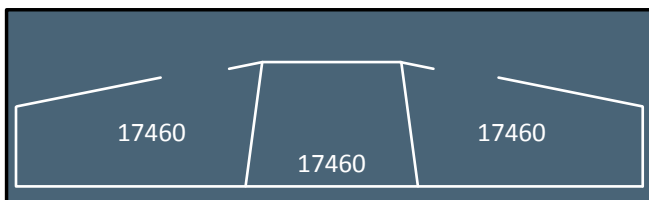
APU  APU is in amber: APU valve is closed and APU Fire pushbutton is out, or APU MASTER switch is ON.

APU  APU and triangle are in white: the APU valve is closed.

7 Fuel Temperature Indication

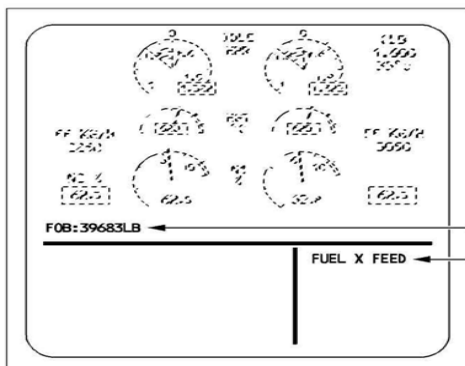
No significant operational differences.

8 Fuel Quantity Indication



- Indications are normally in green. The wing tank indication turns **amber** if a wing tank **overflows**.
- The center tank indication is boxed amber if both **transfer valves fail in the closed position**.
- An advisory appears during taxi and cruise when the difference between the fuel quantities in the two wings is greater than **3,300 lbs**. The indication for the wing with the **higher fuel level** pulses.

9 Fuel on Board (FOB) Indication



It is normally in green. The indication is half-boxed in amber if both center tank transfer valves fail in close position.

(Different location on ECAM from the A320). A half amber box appears around FOB when the displayed quantity is not all usable (both center tank transfer valves fail in the closed position).

FUEL SYSTEM MEMO DISPLAY - FOB BELOW 3T (3T = 3 Tons or 6,600 LBS) appears, when the fuel quantity in either wing is below 3,300 lbs.

Fuel System Warnings and Cautions

E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
AUTO TRANSFER FAULT CTR TK quantity > 550 lb and left or right wing tanks quantity < 11,000 lb	SINGLE CHIME	MASTER CAUTION	FUEL	MODE SEL FAULT Light
CTR L(R) XFR FAULT Either center transfer valve failed open or closed.	SINGLE CHIME	MASTER CAUTION	FUEL	NIL
CTR L+R XFR FAULT Both center transfer valves failed open or closed.	SINGLE CHIME	MASTER CAUTION	FUEL	NIL
CTR TANK XFR OFF Both CTR XFR pb-sw at OFF when in AUTO mode.	SINGLE CHIME	MASTER CAUTION	FUEL	NIL
F. USED/FOB DISAGREE (1)	SINGLE CHIME	MASTER CAUTION	FUEL	NIL
IDG 1(2) COOL FAULT Fuel Return Valve 1(2) has failed	NIL	NIL	NIL	NIL
INERTING SYS FAULT	NIL	NIL	NIL	NIL

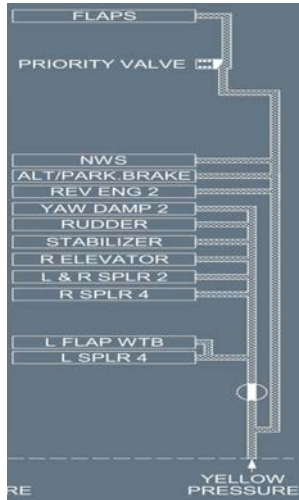
E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
L(R) WING TK HI TEMP Fuel Temperature above: 45°C on ground 54°C in flight	SINGLE CHIME	MASTER CAUTION	FUEL	NIL
L(R) WING TK LO TEMP Fuel Temperature <-44°C	NIL	NIL	FUEL	NIL
L(R) WING TK OVERFLOW	SINGLE CHIME	MASTER CAUTION	FUEL	L(R) CTR TK XFR FAULT light
LO LVL DET FAULT	NIL	NIL	NIL	NIL

(1) Inhibited, only if the APU has been running for more than 30 mins after takeoff.

Hydraulics

Yellow system powers Nose Wheel Steering (NWS). The A320 NWS is powered by the green hydraulic system.

Normal braking is powered by the green system.



Ice and Rain Protection

Unlike the A320, the A321 does not require continuous ignition when ENG AI is selected ON. Consequently, no IGNITION memo will be visible on the upper ECAM when ENG AI is selected ON.

Flight Instruments

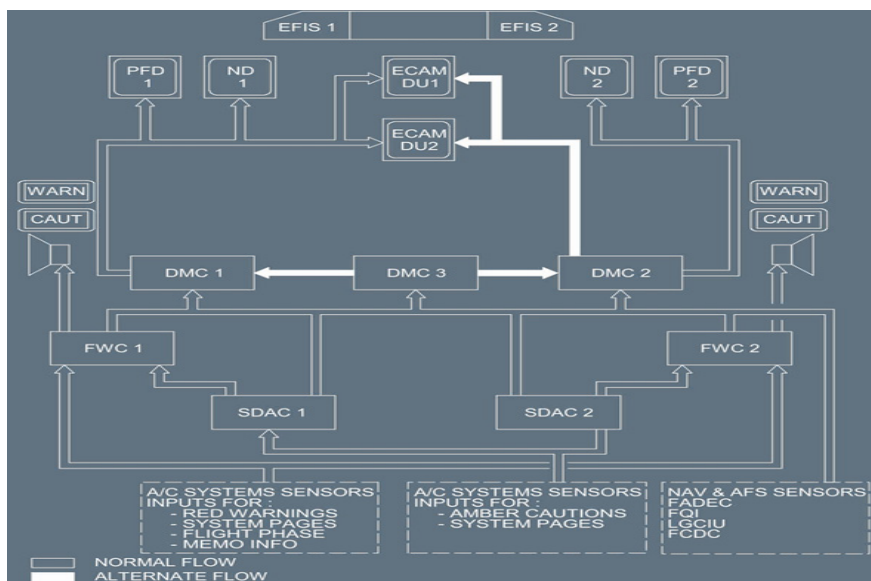
Display Unit (DU)

The instrument panels have six identical units. These DUs are full-color Liquid Crystal Displays (LCD).

DISPLAY MANAGEMENT COMPUTER (DMC)

Three identical Display Management Computers (DMCs) obtain data from the different sensors and computers, and send it to the display units. The display units then generate and display the applicable images. Each DMC has a single DMC channel, and can simultaneously supply one PFD, one ND and both ECAM display units (E/WD and SD).

EIS Information Flow Diagram



Reconfiguring the Display Management Computer (DMC)

In normal operation, each DMC drives the following Display Units:

- DMC 1 drives the CAPT PFD, CAPT ND and the ECAM DUs.
- DMC 2 drives the F/O PFD and F/O ND.
- DMC 3 is on standby, ready to drive any DU.

If DMC 1 or 2 fails (the INVALID DATA message is displayed on the DUs), the crew manually selects the DMC 3 source (CAPT 3 or F/O 3).

If DMC 1 fails (or DMC 3, if CAPT 3 was selected), DMC 2 automatically drives the ECAM.

EIS Re-Configuration

The following messages are displayed on either the EFIS or the ECAM Display Unit (DU) depending on the current EFIS or ECAM configuration.

Failure of a DU

If a DU fails, the flight crew may find one of the following displays:

- A blank screen with an F letter in amber
- A distorted display
- A blank screen with the INVALID DISPLAY UNIT message in amber

Feedback Messages

The DU displays the following messages in amber when the Display Management Computer (DMC) detects a discrepancy between the parameters obtained by the DMC and the operational parameters displayed on the DU:

- CHECK CAPT PFD (or CHECK F/O PFD) if the discrepancy concerns the PFD parameters.
- CHECK CAPT ND (or CHECK F/O ND) if the discrepancy concerns the ND parameters.
- CHECK EWD if the discrepancy concerns the E/WD parameters.
- CHECK SD if the discrepancy concerns the SD parameters.

In addition, if the aircraft is on ground, the DU NOT MONITORED message is displayed in amber when there is only one DMC (instead of two DMCs) that provides the affected DU with feedback information.

This message means that there is either a DMC test in progress or that there is an EIS failure. In the case of an EIS failure, a maintenance action is necessary.

CAPT/FO Discrepancy Messages

The DU displays the following messages along with a caution on the ECAM E/WD when there is a discrepancy between the parameters displayed on the Captain's EFIS and the First Officer's EFIS:

- Both PFDs display the message CHECK ATT if there is a discrepancy of at least 5° between the attitude values, pitch, and/or roll.
- Both PFDs display the message CHECK ALT if there is a discrepancy between the altitude values greater than 250 ft when the flight crew selects a QNH different from STD, or 500 ft when the flight crew selects a QNH STD.
- Both PFDs and NDs display the message CHECK HDG if there is a discrepancy of at least 5° between the heading values.

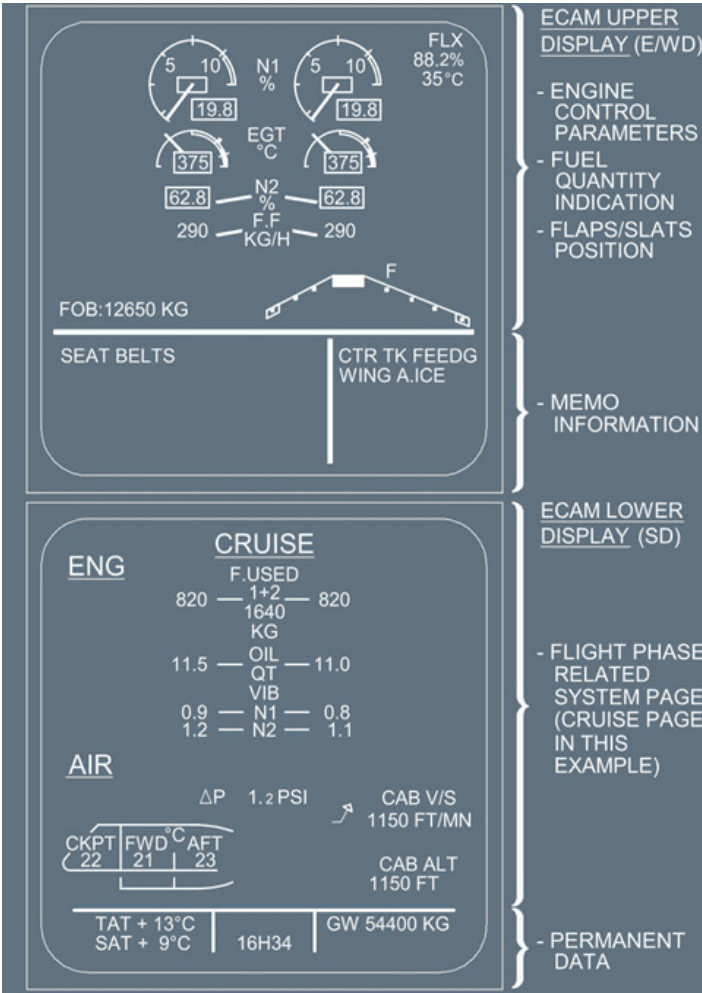
Note: The message CHECK HDG flashes for a few seconds on the NDs, and then it remains steady. If the flight crew selects the PLAN mode on the NDs the message CHECK HDG does not appear.

DU Reset

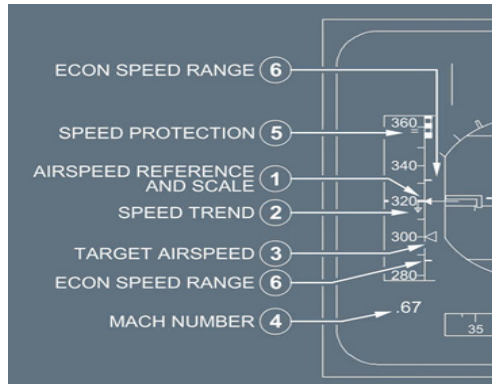
In the case of a DU reset, the message SELF TEST IN PROGRESS can be displayed in green and/or the message WAITING FOR DATA may be displayed in green during the EIS initialization.

Upper and Lower ECAM Displays

The A321 has a slightly different placement of Flap Indicator, FOB Indication on Upper ECAM. Lower ECAM items have slightly different placement of the CRUISE information displayed on the A320.



Primary Flight Display (PFD)

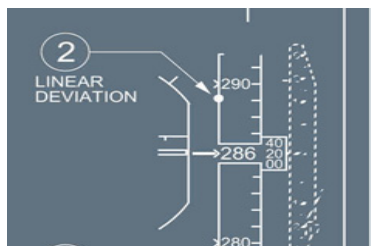


1-5

No significant operational changes.

6 ECON Speed Range (magenta)

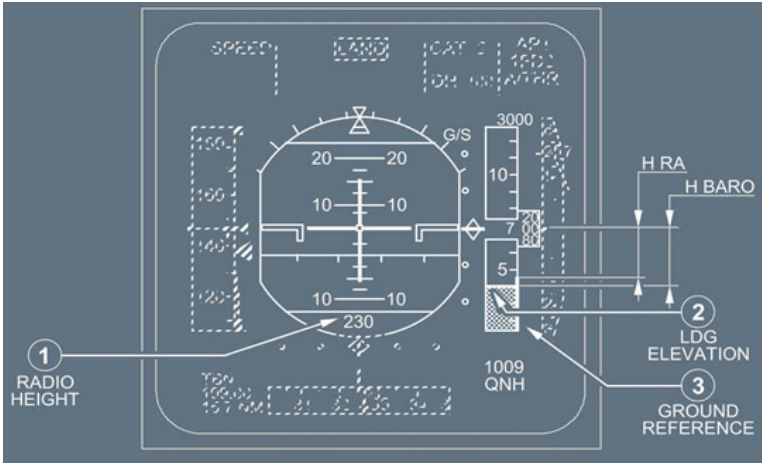
In descent mode with the ECON/AUTO SPD mode active, these two thick lines replace the selected speed symbol. It shows the upper and lower limits, calculated by the FMGC. On the A320, this was indicated by half triangles. The upper speed is target speed +20 kt, limited to VMAX or VMO -3 kt or MMO -0.006, whichever is lowest. If a speed limit or a speed constraint applies, the upper margin is limited to ECON SPD +5 kt. The lower speed margin is the target speed -20 kt, limited to green dot, F, S, or VLS, whichever is higher.



2 Linear Deviation (green filled circle)

This symbol appears next to the altitude corresponding to the theoretical vertical profile computed by the FMGC. It is displayed from the top of descent down to the MAP altitude. On the A320 this was represented by a magenta vertical deviation (VDEV) indicator donut. The flight crew can read the linear deviation directly from the altitude scale. The range is ± 500 ft. When the linear deviation value exceeds ± 500 ft, the symbol stays at the range limit but changes to a half filled circle and the PROG page displays the exact value.

Altitude Indication



1 Radio Height

No significant operational differences.

2 Landing Elevation

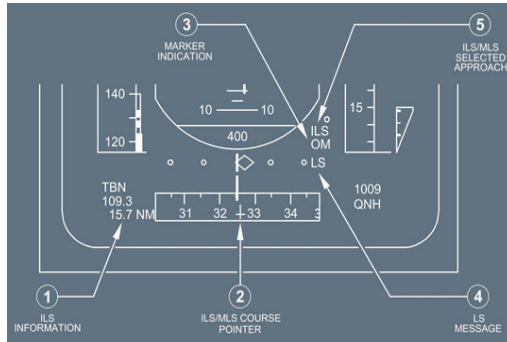
A red ribbon on the right of the altitude scale represents the field elevation. This ribbon, which is driven by the radio altimeter signal, is displayed below 570 ft. It moves up, as does the lower line of the attitude sphere, with the altitude scale as the aircraft descends. When the aircraft has touched down, the top of this ribbon is at the middle of the altitude window.

3 Ground Reference Indication

The top of the brown surface on the altitude scale represents the landing elevation at the flight planned destination.

It is displayed during flight approach and landing phases, and if the STD reference mode is not selected.

ILS/GLS Approach Indications



1-3

No significant operational differences.

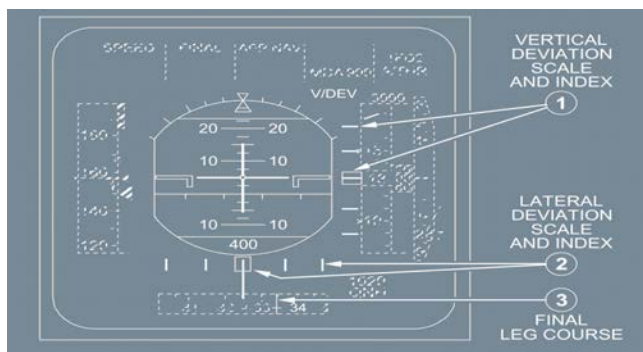
4 LS Message

This flashes amber, when the APPR mode is armed, but the LS pb has not been selected. The A320 indicates ILS.

5 Selected Approach

The ILS or GLS indication is displayed in magenta according to the approach selected by the crew. This is a new indication.

Non Precision Approach Indications



1

No significant operational differences.

2 Lateral Deviation Scale and Index

This is a new indication. The lateral deviation is displayed if:

- The LS pb is not pressed.
- GPS primary is installed.
- RNP “REQUIRED” value is equal or less than 0.3.
- LDEV suits to RNP AR operations.

Each lateral deviation scale graduation represents 0.1 NM, the range being + or - 0.2 NM on each side. An index represents the lateral deviation, when the value is less than 0.2 NM. When out of range, the index is replaced by a half index at the scale limit.

Note: The lateral deviation scale and index can also be displayed on takeoff and missed approach if the same conditions as above are met. (RNP 0.3 can occur automatically by NAV database for departure or an arrival/approach procedure or manually by the crew).

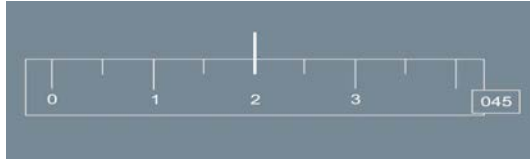
The lateral deviation is not displayed:

- If a hold is active.
- When the lateral deviation information provides a misleading indication of the direction to be followed to come back onto the Active F-PLN.
- In Done phase.



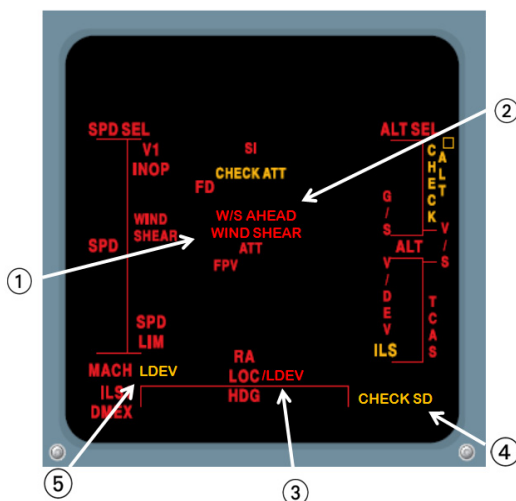
3 FINAL Leg Course

The inbound course of the last approach leg is displayed on the heading scale in magenta. When outside the range, the symbol is replaced by a digital value in magenta, and located at the limit of the heading area.



Note: If the LS pb is pressed, glide and LOC deviation has priority over vertical and lateral deviation information. As long as VDEV and L/DEV display conditions are met, and the LS pb is selected, an amber VDEV and L/DEV message flashes above the glideslope scale.

Flags and Messages Displayed on PFD



1 WINDSHEAR Warning (Red)

This message is displayed, when windshear is detected (reactive windshear warning) by the FAC. This message is in a new, centered location from previous versions.

2 W/S AHEAD

This message is displayed, when the predictive windshear system has detected windshear ahead of the aircraft. The message is in amber or red, depending on the alert level.

3 LDEV Flag (Red)

When the crosstrack error is not valid, a L/DEV flag is displayed in red instead of the lateral deviation scale. (LOC) appears in the same location for a LOC failure.

4 CHECK SD, CHECK CAPT (F/O) ND (Amber)

For more information: Refer to “EIS Re-Configuration - GENERAL” this Section.

5 L/DEV (Amber)

At the top left of the LOC scale, this message flashes when the FINAL mode is armed/engaged, and the LS pb is selected during APP NAV.

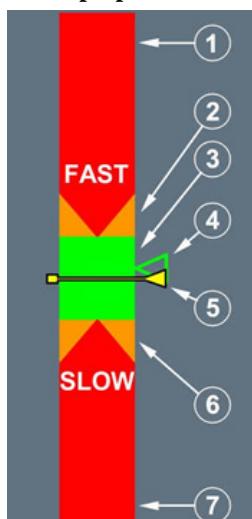
Backup Speed/Altitude Scale

General

A backup speed scale and a backup altitude scale replace simultaneously the normal speed and altitude scales when all the three ADRs are switched OFF. This enables the flight crew to fly at a safe speed and altitude in case of an unreliable speed/altitude indication. This is a new system not on previous versions of the aircraft.

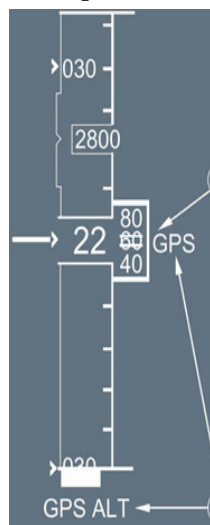
The backup speed scale information is based on the angle-of-attack, and depends on the slat/flap configuration. The backup altitude scale displays the GPS altitude.

Backup Speed Scale



1. **Red FAST area:** This red area indicates excessive speed range.
2. **Amber area:** This amber area indicates excessive speed range while keeping an appropriate margin to the maximum structural speeds.
3. **Green area:** The green area indicates the safe speed range.
4. **Target speed (Green):** This symbol indicates the optimum target speed.
5. **Actual Speed Reference Line (Yellow):** This fixed reference line, next to a yellow triangle, indicates the aircraft's current speed.
6. **Amber area:** This amber area indicates too low speed while keeping an appropriate margin to the stall speed.
7. **Red SLOW area:** The red SLOW area indicates the speeds that are lower than the stall speed.

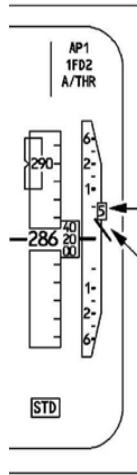
Backup Altitude Scale



GPS ALT and GPS flags (White): These flags appear to highlight the fact that the barometric altitude is replaced by the GPS altitude.

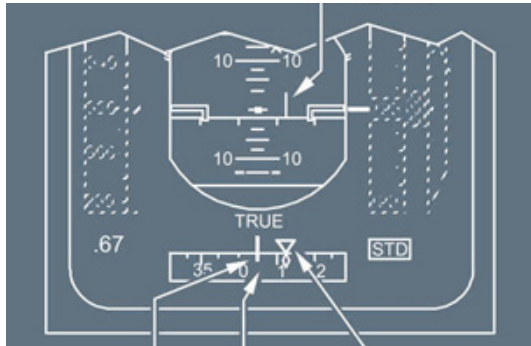
Altitude indication: Amber dashes appear over the last two digits to indicate a degraded altitude display mode.

Vertical Speed Indication



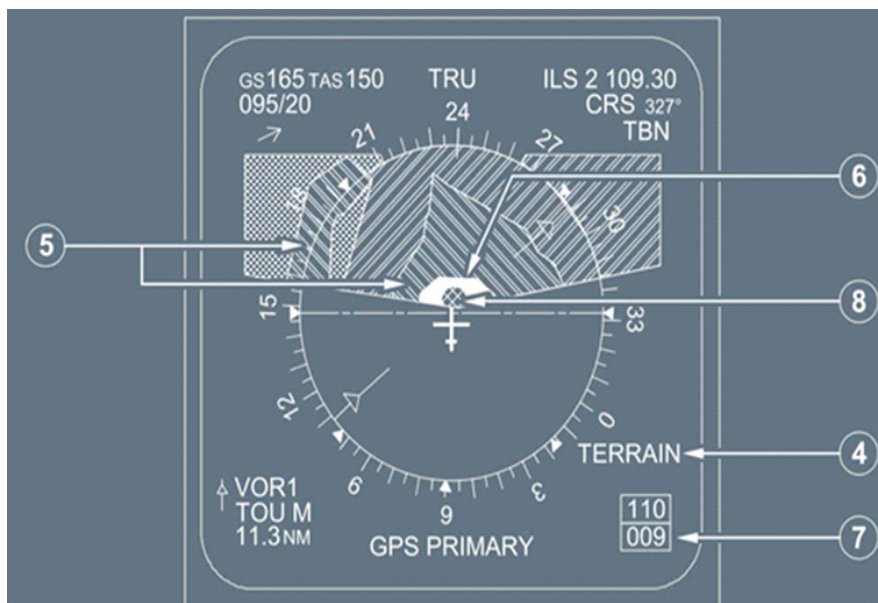
Digital Vertical speed indication has a window (box) surrounding the vertical value. On the A320 the value is embedded within the vertical speed scale.

Heading



TRUE appears at six o'clock position of PFD when the display indicates the true heading, rather than the magnetic heading (latitude above 73 ° North or below 60° South). On the A320, TRUE was indicated at the four o'clock position.

EGPWS



4-6

No significant operational differences.

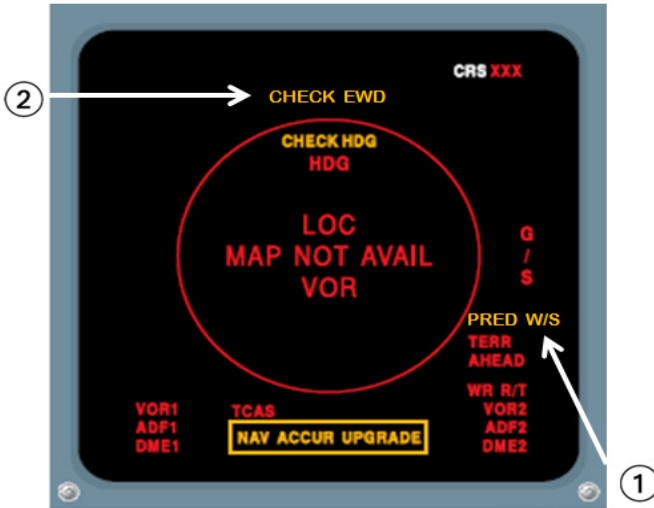
7 Lowest and Highest Elevations

Minimum and maximum elevations encountered ahead of the aircraft, within the selected ND Range (ROSE or ARC mode). The color code of the elevation figures is the same as for the GPWS terrain picture. The A320 displays the highest terrain value with the map display.

8

No significant operational differences.

Flags and Warnings on the ND



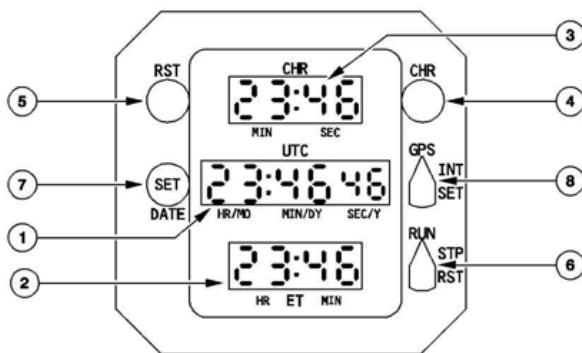
1 PRED W/S Flag (Amber)

The WINDSHEAR sw on the weather radar panel is set to AUTO, and a Predictive System fault is detected. This message appears on ground, or when flaps and slats are extended. It is associated with a single chime. The radar image remains available, provided that the fault does not affect the radar mode. This is a new indication.

2 CHECK EWD, CHECK CAPT (F/O) PFD, CHECK SD, CHECK CAPT (F/O) ND (amber)

For more information: Refer to EIS Re-Configuration - GENERAL this Section.

Clock - Controls and Indicators



1 UTC (GMT) counter

This counter displays the present time in 24 hour format from 0 to 23 hours 59 minutes 59 seconds.

2 Elapsed Time (ET)

This counter registers the elapsed time up to 99 hours and 59 minutes.

3 Chrono (CHR) Counter

This Counter registers elapsed time from 0 to 99 minutes 59 seconds. It is controlled by the CHR pushbutton.

4 CHR Pushbutton

First push: starts the CHR counter

Second push: stops the CHR counter, keeps the display at its last indication.

5 Reset (RST) Pushbutton

When pressed, the CHR counter restarts from 0 if the chrono is running.

6 ET Selector

RUN: The ET counter starts

STP: The ET counter stops counting

RST: The ET counter is blanked. The selector returns to its STP position when the selector is released.

Note: A cumulative elapsed time can be realized by alternatively setting this switch in RUN and STP position.

7 DATE/SET Pushbutton

First push: sets the clock to date mode. The UTC time display is replaced by the date (day month year).

Second push: sets the clock to time mode. The date display disappears.

Note: In order to select the date mode, the UTC selector must be set on GPS or INT position. UTC selector.

8 GPS

Time (or date, if selected) is displayed, and this data is synchronized on GPS information.

Note: If the signal between the GPS and the clock is not detected, dashes are displayed. Only the INT and SET positions are then available. If the signal is detected, but GPS data is invalid, the clock automatically runs on its internal time. The clock will automatically resynchronize on the GPS information, as soon as the GPS data becomes available.

INT: internal time (or date, if selected) is displayed.

Note: The clock's internal time is initialized with the latest valid GPS information. If there is no valid GPS information at power up, the internal time will be 00:00:00, until the clock is initialized

Internal Time and Date Initialization

Set the UTC selector on SET. The minute digits flash, and the seconds' digits are blank. To increase data, turn the DATE/SET button clockwise. To decrease data, turn the DATE/SET button counterclockwise.

1. Push on DATE/SET: To set the hour.
2. Push on DATE/SET: To set the year.
3. Push on DATE/SET: To set the month.
4. Push on DATE/SET: To set the day.

Switch the UTC selector to the INT position, and the clock starts with the seconds' digits at 00.

Note: This process must be completed in less than one minute. Otherwise, it will be necessary to reset the CFDS in order to synchronize the lower ECAM time display with the cockpit clock display. Resetting the CFDS is a maintenance operation.

ECAM Audio Indicators

Audio Indicators	Meaning	Duration	Audio Indicator Cancellation
“Go Around Windshear Ahead” (Synthetic voice)	Windshear ahead detected during the landing phase.	Permanent	Nil
“Windshear” (twice) (Synthetic voice)	Windshear detected during the takeoff phase.		
“Monitor Radar Display” (Synthetic voice)	Windshear ahead detected caution message	Permanent	Nil
Auto Call Out	Height announcement at 2500’ AGL	Permanent	Nil
“Pitch, Pitch” (Synthetic voice)	Aircraft pitch attitude is becoming excessive during the flare and landing	One Time	Nil
“Stop Rudder Input” (Synthetic voice)	Inappropriate rudder pedal inputs detected in cruise at high speed	Message repeated at least TWO TIMES	Nil

The pilot can cancel any audio indicator, by pressing:

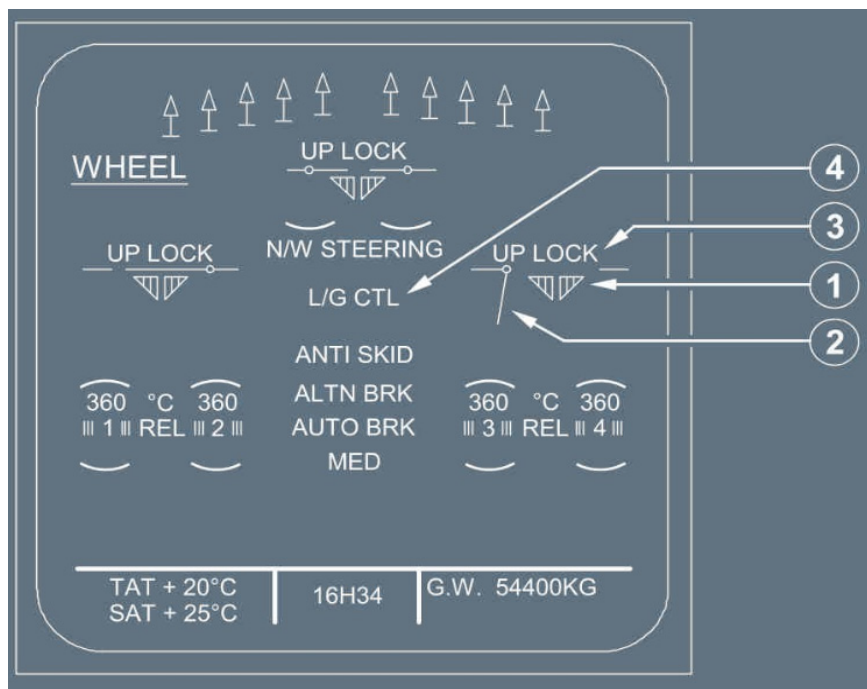
- The EMER CANC pb on the ECAM control panel.
- The MASTER WARN pushbutton, except for OVERSPEED or L/G NOT DOWN warnings.

Landing Gear

ECAM Wheel Page

Items on the Wheel Page are placed differently from the A320.

Spoiler indication is now at the top of the page, and slight differences in the representation of landing gear indications.



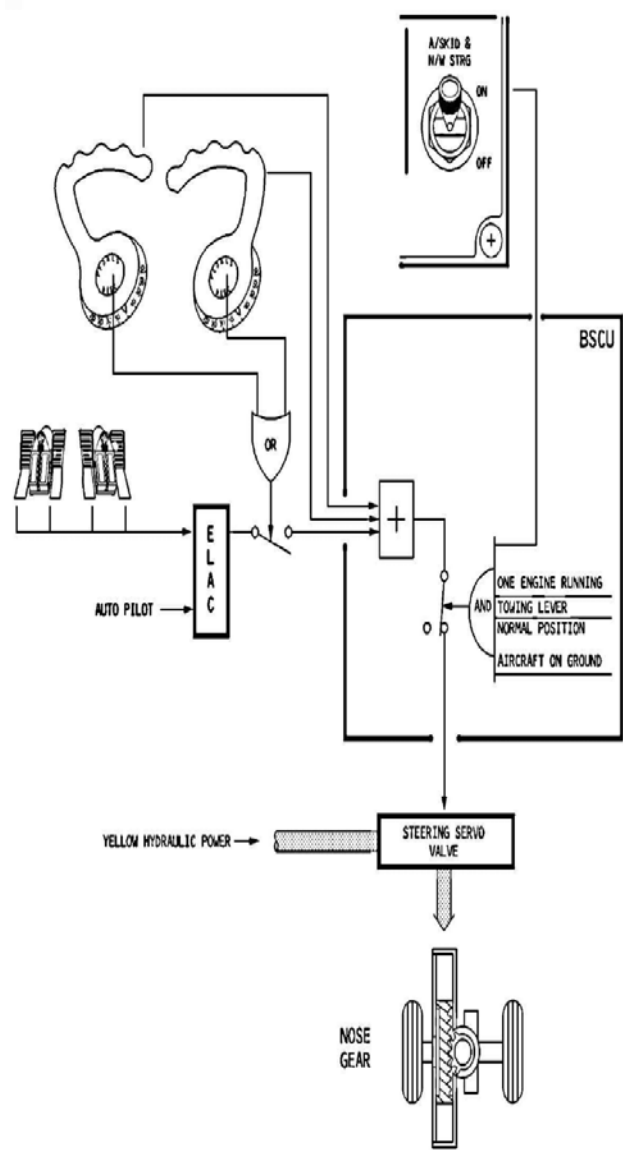
1 Landing Gear Position Indication

- The landing gear positions are indicated by 2 triangles for each gear. Triangles are side by side as opposed to one in front of the other on previous versions.
- A green triangle indicates that one LGCIU detects a landing gear downlocked.
- A red triangle indicates that one LGCIU detects a landing gear in transit.
- No triangle indicates that one LGCIU detects a landing gear uplocked.
- Amber crosses will replace the right triangle to indicate that LGCIU 1 or LGCIU 2 has failed.

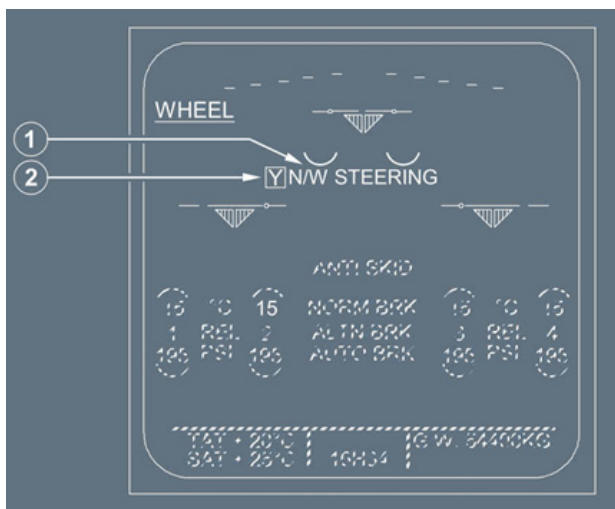
Note: Only one green triangle on each landing gear strut is sufficient to confirm that the landing gear is downlocked.

Nose Wheel Steering - Description

A hydraulic actuating cylinder steers the nose wheel. The yellow hydraulic system, versus green hydraulic system on the A320, supplies pressure to the cylinder, and electric signals from the Brake and Steering Control Unit (BSCU) control it.



ECAM Wheel Page - NWS Indication



1 N/W STEERING Label

It appears in amber, when nosewheel steering is lost, due to failure of the nosewheel steering system, or of both BSCU channels, or in case of a yellow hydraulic system low pressure, or if the A/SKID & N/W STRG switch is OFF.

2 N/W STEERING Hydraulic Supply Indication

Only when the N/W STEERING label is displayed:

Y is displayed in green in case the yellow hydraulic system is not failed.

Y is displayed in amber in case of yellow hydraulic system low pressure

Brakes and Anti-skid - Description

The normal system uses green hydraulic pressure, and the alternate system uses the yellow hydraulic system backed up by the hydraulic accumulator, similar to the A320.

In normal operation, a dual channel Brake and Steering Control Unit (BSCU) controls normal braking and antiskid. Depending on the failure, braking may revert to:

Alternate braking with antiskid:

This braking mode is controlled by the Alternate Braking Control

Unit (ABCU). The antiskid is controlled by the BSCU. Autobrake is inoperative. Braking uses this mode when green hydraulic pressure is insufficient, and:

- Yellow hydraulic pressure is available.
- The A/SKID & N/W STRG switch is ON.
- The parking brake is not ON.

Braking inputs are made by the brake pedals and sent to the ABCU. Taking into account the brake pedal input, the ABCU:

- Energizes the alternate brake selector valve to pressurize the yellow hydraulic circuit.
- Electrically controls the Alternate Servo Valve to obtain the correct pressure for the related brakes.

Antiskid is controlled by the BSCU. Brake pressure, as well as accumulator pressure, are indicated on a triple indicator located on the center instrument panel.

Alternate Braking without Antiskid:

This braking mode is fully-controlled by the ABCU. Autobrake and antiskid are inoperative.

The antiskid system is deactivated:

- Electrically (A/SKID & N/W STRG switch OFF, or power supply failure, or BSCU failure), or
- Hydraulically (Y + G system low pressure, the brakes are supplied by the brake accumulator only).

Depending on the brake pedals' demand, the ABCU controls the alternate brake selector and the alternate servo-valves. Brake pressure and accumulator pressure are indicated on a triple indicator, located on the center instrument panel. To avoid wheel locking and limit the risk of tire burst, brake pressure is automatically limited to 1,000 PSI.

Alternate Braking without Antiskid on Accumulator:

This braking mode is fully controlled by the ABCU. Accumulators are designed to supply at least seven full brake applications. All the normal and alternate braking components are fully-monitored. Any detected failure is signaled to the crew via ECAM warnings.

The BSCU performs the following secondary functions:

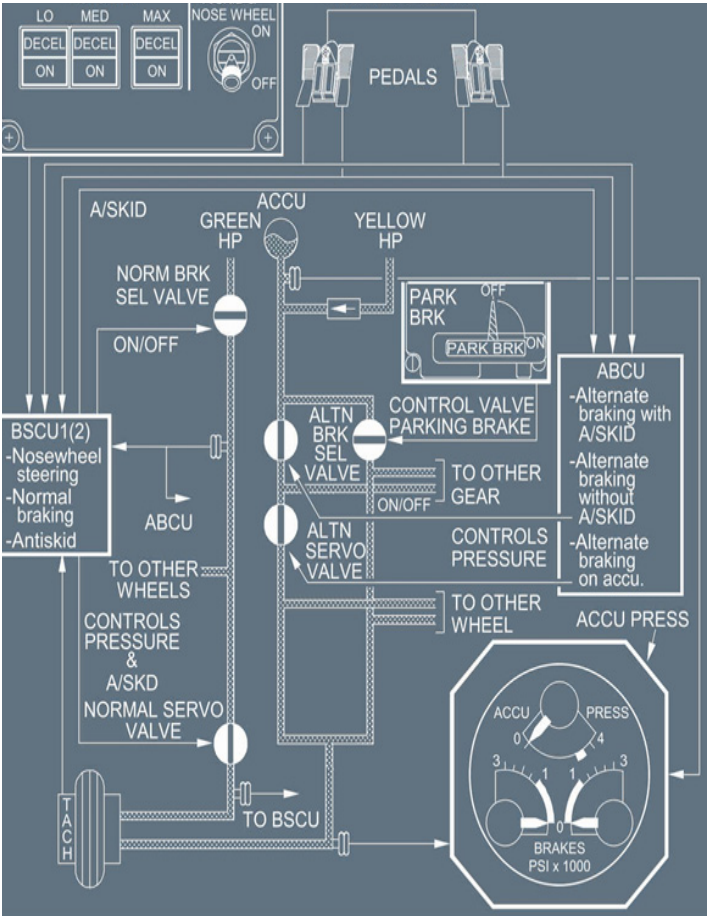
- It checks the residual pressure in the brakes.
- It monitors the brake temperature.
- It provides discrete wheel speed information to other aircraft systems.

A changeover between the two BSCU channels takes place at each DOWN landing gear lever selection, or in case one channel fails. The main gear wheels are fitted with fusible plugs which protect against tire burst, in the event of overheating. Main gear wheels are also equipped with brake cooling fans which permit a high speed cooling of brakes.

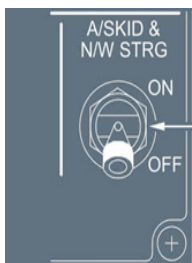
Parking Brake

Brakes are supplied by the yellow hydraulic system, or by accumulator pressure via the parking brake control valve, which opens allowing full pressure application on the main gear wheel brakes. The accumulator maintains the parking pressure for at least 12 hours. If the parking brake is activated and no yellow hydraulic or accumulator brake pressure is available, then the normal braking system can be applied via the brake pedals. Yellow accumulators can be pressurized by pressing the yellow electrical pump switch. Brake pressure and accumulator pressure are indicated on a triple indicator, located on the center instrument panel.

Braking Schematic



A/Skid and N/W STRG Switch



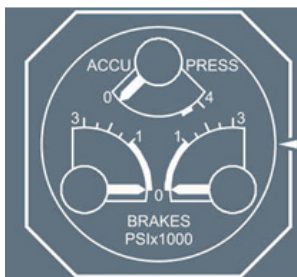
ON:

If green hydraulic pressure is available, then antiskid is available. If green hydraulic pressure is lost then yellow hydraulic pressure automatically takes over to supply the brakes. Antiskid and nosewheel steering remain available. NWS available with a failure of the green hydraulic system is a new capability not available on the A320. The triple indicator shows yellow system brake pressure.

OFF:

The yellow hydraulic system supplies pressure to the brakes. Antiskid is deactivated. The pilot must refer to the triple indicator to limit brake pressure and avoid locking a wheel. Nosewheel steering is lost. Differential braking remains available through the pedals. The triple indicator displays yellow system brake pressure.

BRAKES and ACCU PRESS Indicator



Brake pressure is indicated only when the yellow hydraulic system controls the brake pressure, which means when the alternate braking system is activated, or when the parking brake is applied

ACCU PRESS: Indicates the pressure of the yellow brake accumulator.

BRAKES: Indicates the yellow pressure delivered to the left and right brakes, as measured upstream of the alternate servo valves.

ECAM WHEEL PAGE - Anti Skid and Brake Indications

ANTI SKID Indication



A ANTISKID Label

It appears in amber, along with an ECAM caution, in case of a total BSCU failure, when the A/SKID & N/W STRG switch is OFF, if the BSCU detects an ANTI-SKID failure, or in case of normal braking and yellow hydraulic system low pressure. It appears in green in case of autobrake, normal braking, or alternate braking failure, and antiskid is still available.

B BSCU Channel Indication

When ANTISKID label is displayed, the number of the failed system(s) is (are) displayed in amber, if any.

NORMAL BRK Indication



A NORM BRK Label

This indication appears in green when autobrake or alternate braking is failed, and normal braking is still available. The legend appears in amber when normal braking is failed due to total BSCU failure, or to the loss of the green hydraulic pressure, or to the loss of antiskid.

B NORM BRK Hydraulic Supply Indication

G is displayed when the NORM BRK label is displayed. It is green when green hydraulic pressure is available and amber, in case of green hydraulic low pressure.

ALTN BRK Indication



A ALTN BRK Label

This indication appears in green, if the braking system is in alternate mode and not failed, or in case autobrake or normal braking is failed and alternate braking is still available. This indication appears in amber when alternate braking is failed.

B ALTN BRK Hydraulic Supply Indication

Y is displayed when the ALTN BRK label is displayed. It is green when yellow hydraulic pressure is available and amber, in case of yellow hydraulic low pressure.

C ACCU PRESS Label

Appears only when ALTN BRK LABEL appears

ACCU PRESS/ACC ONLY Label



(*) Appears in green, when the ALTN BRK label is displayed, and the yellow hydraulic pressure is available. Appears in amber, with no arrow, when the yellow hydraulic system and the accumulator are in low pressure.

(**) Appears in green when the alternate braking is pressurized by the yellow accumulator.

BRK Fan Indication



ON: The brake fans run if the lefthand main landing gear is down and locked.

OFF: The brake fans stop.

Hot It: This amber light comes on when the brakes get too hot. (A caution also appears on the ECAM).

Warnings and Cautions

E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
PARK BRK ON Parking Brake is ON during flight	Single Chime	Master Caution	WHEEL	Nil
BRAKES HOT It is triggered when one brake temperature is higher than 300°C and off when the highest brake temperature is lower than 290°C.	Single Chime	Master Caution	WHEEL	HOT It on BRK FAN pb sw
RELEASED Brake of one wheel is released. It is detected when the landing gear is downlocked and, at least one engine is running, and normal braking is active.	Single Chime	Master Caution	WHEEL	Nil
NORM BRK FAULT Normal braking function is lost.	Single Chime	Master Caution	WHEEL	Nil
ALT BRK FAULT Alternate Braking Function is lost	Nil	Nil	WHEEL	Nil
ALTN L(R) RELEASED Brakes of one gear is released. It is triggered when the landing gear is downlocked, and at least one engine is running, and alternate braking is active.	Single Chime	Master Caution	Nil	Nil

E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
NORM + ALTN FAULT Normal and alternate functions are lost, Parking brake available.	Single Chime	Master Caution	WHEEL	Nil
BRK Y ACCU LO PR The yellow accumulator is in low pressure	Single Chime	Master Caution	WHEEL	Nil
PARK BRK LO PR The yellow accumulator and hydraulic system pressures are low with parking brake on	Single Chime	Master Caution	WHEEL	Nil
BRAKES-NWS MINOR FAULT Single system failure, loss of redundancy	Nil	Nil	Nil	Nil
PARK BRK FAULT Discrepancy between the position of the parking brake handle and the parking brake pressure applied.	Single Chime	Master Caution	Nil	Nil

Memo Display - BRK FAN appears in green, if the BRK FAN pb is ON.
This is a new A321 capability.

Lighting

The Main Instrument Panel Flood Light on the Captain's side is powered only by the Essential DC bus. The A320 has Hot Bus backup power for this Flood Light. (This Main Instrument Panel Flood Light is powered during the emergency electrical configuration).

LED technology is introduced in the following areas:

Full color LED lighting in cabin

Flight Deck:

- Dome Light
- Consoles Light
- MAP Light
- MIP Light
- Reading Light
- Pedestal Light

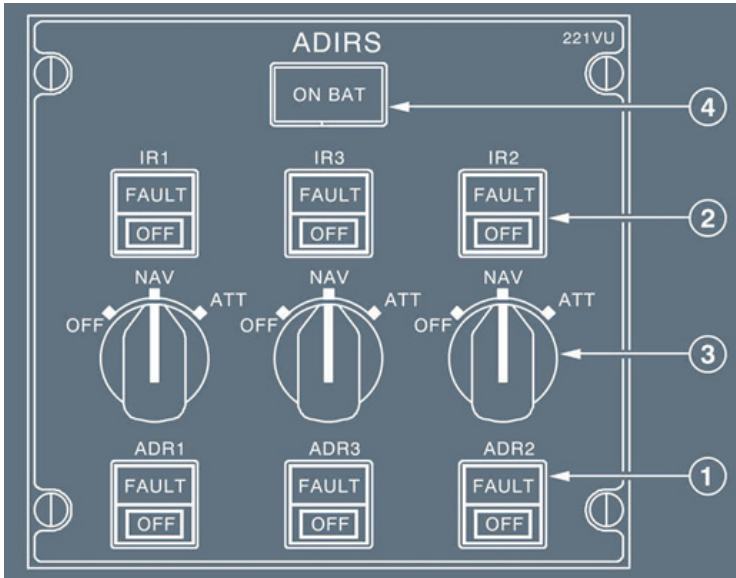
Exterior Lights:

- Rearward facing navigation light
- Landing lights
- Runway turnoff lights
- Taxi light
- Take-off light
- Logo lights
- Anti-collision lights
- Wing and engine scan lights

There are no over-wing emergency escape route lights on the A321.

Navigation

ADIRS Control Panel



1 ADR pb

No significant operational differences.

2 IR Indicator Lights

No significant operational differences.

3 ATT

IR mode supplying only attitude and heading information if the system loses its ability to navigate. The heading must be entered through the MCDU and has to be reset frequently (about every 10 min).

4 On BAT Light

No significant operational differences.

ADIRS - Warnings and Cautions

These are new warnings not included on the A320.

E/WD FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING	FLT PHASE INHIB
ADR 1+2+3 FAULT	CRC	MASTER WARN	NIL	NIL	3 to 10
L(R) CAPT (FO) STATIC FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL	3 to 10

Memo Section Messages

- IRS IN ALIGN X MN
 - Prior to engine start, appears in green when at least one active IRS is being aligned.
 - Prior to application of T/O power, during IRS alignment.
 - X MN indicates the number of minutes remaining (between 1 to 10 minutes), until NAV mode is reached.
 - Pulses in green if the alignment of one IRS is faulty (This is a new memo).
 - After one engine is started, IRS IN ALIGN X MN memo appears in amber during IRS alignment.
- If the alignment of one IRS is faulty, IRS IN ALIGN X MN memo is replaced by the IR NOT ALIGNED ECAM caution.
- IR IN ATT ALIGN appears in green during the IR alignment in attitude mode.

Navigation Backup Mode (NAV B/UP)

The Navigation Backup Mode (NAV B/UP) allows limited managed navigation capability, which can be used when normal FMGC operation has been lost. NAV B/UP mode does not provide:

- TMPY and SEC flight plans
- Access to the navigation database
- Auto-tuning of radio Nav aids
- Computation of lateral trajectory and managed modes
- Vertical related functions (VDEV)
- Performance management and full predictions
- ND information selected via EFIS Control Panel p/bs (e.g. ARPT, CSTR, VOR).

Note: When one or both MCDUs are selected to NAV B/UP, they operate independently.

Backup navigation for each FMGC is selected via the SELECT NAV B/UP prompt (1R) from the MCDU MENU page. The prompt changes to DESELECT NAV B/UP after selection and a second activation of the 1R prompt deselects NAV B/UP for that FMGC.

After backup navigation is selected, pushing F-PLN key displays the B/UP FPLN page.

F-PLN (With Backup Nav Active)

Bearing

The bearing between each set of waypoints is displayed between the associated waypoint lines.

TTG

The TTG field displays the time-to-go between the two related waypoints.

DIST

The DIST field displays the distance between the two related waypoints.



E340297a

DEST

The DEST field displays the destination airport identifier and its associated latitude/longitude. The distance to the destination is the computed distance from the present position to the active waypoint and then along the flight plan route.

Time to go to the destination is the distance to the destination divided by the current ground speed.

Back Up Flight Plan DIR TO

When backup nav is enabled, the DIR key displays the B/UP FPLAN page with a direct-to prompt.

DIR (With Backup Nav Active).



The backup direct to function allows the selection of direct to the selected waypoint. The waypoint may be selected from the flight plan or manually entered via the scratch pad using either of the following formats:

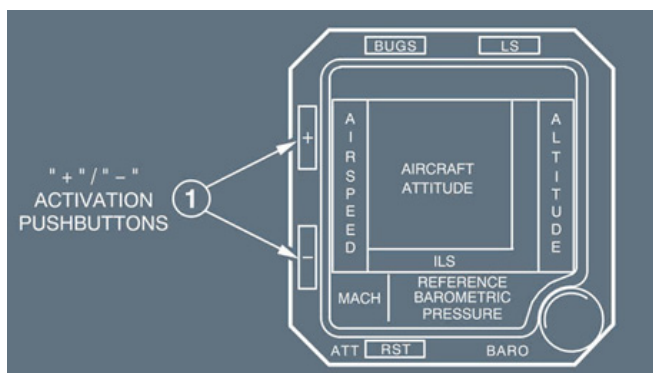
- IDENT/LAT/LONG: CRK/5150.4N/00829.7W
- LAT/LONG: 5150.4N/00829.7W

Including the waypoint name and its lat/long allows display and reference to the waypoint by name.

Example: Entering CRK/5150.4N/00829.7W displays the waypoint name CRK in the left column. CRK can then be used for waypoint name entries such as DIR TO. If 5150.4N/00829.7W was reentered instead, the resulting waypoint name would be NLL01, which may be difficult to distinguish from other similar appearing waypoint names.

Abeam and radial intercept functions are not available.

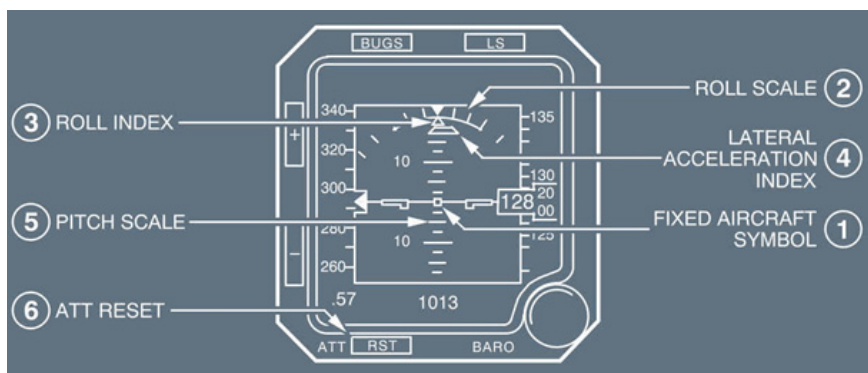
Brightness Adjustment of ISIS



1 "+" "-" Activation Pushbuttons

- Two pushbuttons labeled "+" and "-" are used to adjust the level of brightness.
- The brightness of the screen automatically adjusts after power-up tests. This is because of the photosensitive cell located on the surface of the ISIS system display. The "+" and "-" pushbuttons then allow this initial brightness to be manually adjusted and changed.

ISIS Attitude Display



1 Fixed Aircraft Symbol

The fixed aircraft symbol is in black, and outlined in yellow.

2 Roll Scale

The roll scale is in white. The markers are at 0 (small yellow triangle), 10°, 20°, 30°, 45°, 60 ° of bank.

3 Roll Index

The roll index indicates the bank angle. It is in black, and outlined in white.

4 Lateral Acceleration Index

Lateral acceleration index indicates the aircraft's lateral acceleration. It is represented by a trapezoidal index that moves beneath the roll index.

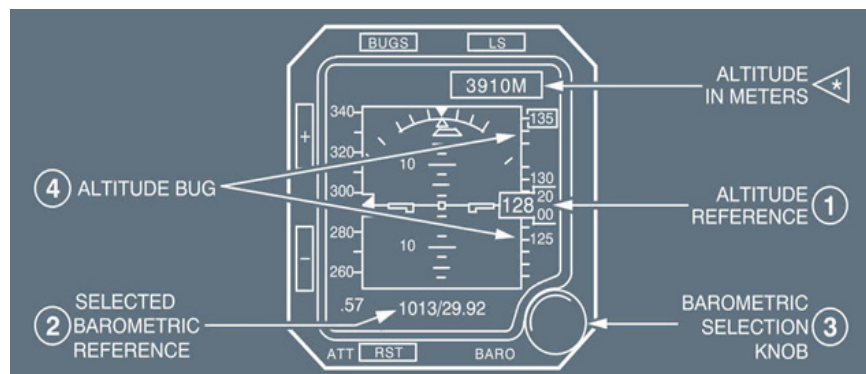
5 Pitch Scale

The pitch scale indicates the aircraft attitude, and it is in white. The scale has markers every 2.5 °, between 30 ° nose up and 30 ° nose down. If the pitch exceeds 30 °, large (V-shaped) red arrowheads indicate that the attitude is excessive. They also indicate the direction to follow, to resume normal attitude. The minimum displayed pitch scale is -17.5 ° +15 ° at 0 ° pitch.

6 ATT RST Pushbutton

Attitude indication is reset, by pressing ATT RST for at least 2 s. The aircraft must be level during this procedure. During the reset time (approx. 10 s), the ATT 10 S message is displayed on the screen. ATT RST is also used to realign the system, if excessive aircraft movement is detected during the alignment phase, or after 350 hours of continuous electrical supply.

ISIS Altitude Indication



1 Altitude Indication

The altitude indication is given as a white moving scale and a green digital readout on a gray background. The altitude scale ranges from -2000 to 50000 ft, every 100 ft, with altitude digital indications every 500 ft. NEG appears in white in the negative altitudes window. Also, the altitude box changes to cyan when it corresponds to a bug value.

2 Barometric Reference

The barometric reference pressure is displayed in cyan. It is indicated in both hecto Pascals (hPa) and inches of mercury (Hg).

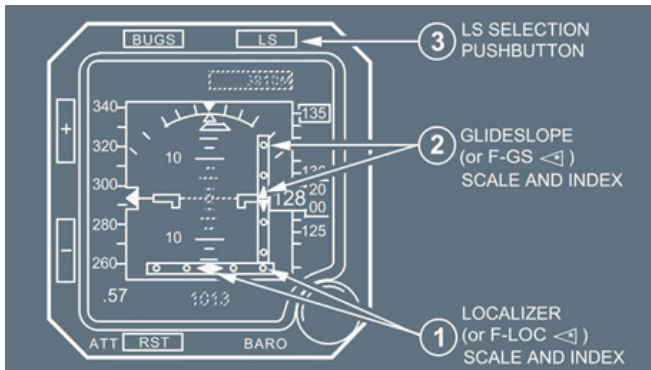
3 Barometric Selection Knob

It enables the selection of a barometric pressure, setting a variation of 10 hPa per rotation of the knob. The standard barometric pressure can be selected by pressing the barometric knob. STD is then displayed in place of the pressure value. Pressing the knob again will display the selected barometric pressure.

4 Altitude Bug

When an altitude bug is entered through the bugs function, the corresponding altitude mark is indicated by a cyan dash, or a cyan box, when the dash covers the digital indication on the scale.

ISIS Landing System Function



1 Localizer/scale and index

2 Glideslope/scale and index

When the LS pb is pressed, the deviation scales are displayed. When deviation scales are displayed and the LS deviations are valid, the indexes appear.

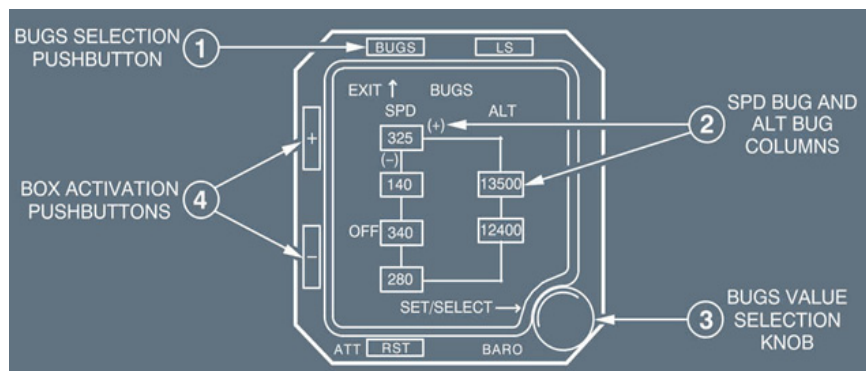
The LS deviations that are displayed correspond to the LS approach selected on the MCDU or tuned on the RMP

Note: The LS approach corresponds to either ILS approach, or GLS approach.

3 LS Selection Pushbutton

Pressing the LS pb will display the LS scales. Pressing the LS pb again will remove the LS scales.

ISIS Bugs Functions



Note: Use of the ISIS bugs function is not recommended for normal conditions because, in the event that both PFDs are lost in flight when the ISIS bugs were previously set for takeoff then set for the approach, the bugs would remain at the takeoff characteristic speed settings.

1 BUGS Function Selection Pushbutton

Pressing the BUGS pushbutton will activate the BUGS function and display the bug values to be selected.

2 SPD BUG and ALT BUG Columns

The SPD BUG column gives four speed values (in knots) that can be selected by the crew. The ALT BUG column gives two altitude values (feet) to be selected by the crew.

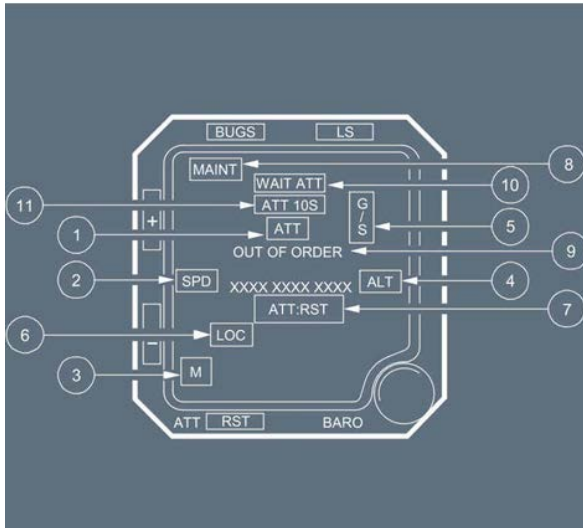
3 BUGS Value Selection Knob

It allows the bug value to be set by rotating the BARO knob. This value cannot be lower than 30 kt for a speed bug, or a negative value for an altitude bug. Pressing the BARO setting knob, once a bug value box is activated, will deselect the bug value. The OFF label comes on close to the activated box. The entered values are memorized by the system, when exiting the screen, by pressing the BUGS pushbutton (1), or after 15 seconds without any pilot action.

4 “+”/”-” Box Activation Buttons

Access from one box to another is obtained by pressing the “+” or “-” pushbutton. When a bug value is entered, access to the next box is obtained by pressing the “-” pushbutton. The box becomes active and flashes. The “+” pushbutton can be used to return to a previous box.

ISIS Flag Indications



1 ATT Flag (Red)

When attitude data is lost, the red ATT flag appears.

2 SPD Flag (Red)

When airspeed data is lost, the red SPD flag appears.

3 M Flag (Red)

When Mach number is lost, the red M flag appears.

4 ALT Flag (Red)

When altitude data is lost, the red ALT flag appears.

5 G/S Flag (Red)

When glideslope information is lost, the red G/S flag appears.

6 LOC Flag (Red)

When localizer data is lost, the red LOC flag appears.

7 ATT: RST (Yellow)

The ATT: RST flag appears: When excessive aircraft movement is detected during the alignment phase, or after 350 hours of continuous electrical supply, or when the WAIT ATT flag is displayed during more than 10 seconds. In both cases, press the ATT RST pb to reset/realign and recover the attitude indication.

8 MAINT Flag (White)

Maintenance required. This MAINT flag does not affect ISIS operation.
Displayed only on ground phase (speed < 60 kt).

9 OUT OF ORDER (White)

When an internal failure of the ISIS indicator occurs, the OUT OF ORDER message appears, accompanied by a fault code.

10 WAIT ATT Flag (Yellow)

If the ISIS loses attitude data, its entire sphere is cleared to display the WAIT ATT flag. If the WAIT ATT flag is displayed for less than 10 seconds, a normal operation is recovered. If attitude data is lost for more than 10 seconds, the WAIT ATT flag is then replaced by the ATT: RST flag.

11 ATT 10 s Flag (Yellow)

This countdown flag appears, when the flight crew press the ATT RST pb in order to indicate that the attitude reset function is in progress.

GLS (GNSS Landing System) (This is a new system for the A321)

The aircraft has two GLS receivers. Each GLS receiver is integrated in a modular avionics unit called MMR (Multi Mode Receiver) (GLS1 receiver in MMR1, GLS2 receiver in MMR2).

- PFD1 and ND2 display GLS1 information.
- PFD2 and ND1 display GLS2 information.
- The flight crew can put the same GLS information on each PFD by pressing the LS pb on the EFIS control panel (the green bars appear).
- The NDs display GLS information, if the flight crew selects the ROSE LS mode on the EFIS control panel.
- There is a new GLS selection button on the RMP.

Navigation Warnings and Cautions

E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
GLS 1(2)(1+2)	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND
LS (1)(2) FAULT ILS 1 and GLS 1, or ILS 2 and GLS 2, or ILS 1, ILS 2, GLS 1, GLS2 are faulty	SINGLE CHIME	MASTER CAUT	NIL	Flag on PFD and ND
LS TUNING DISAGREE Tuning discrepancy between MMR 1 and MMR 2	SINGLE CHIME	MASTER CAUT	NIL	NIL

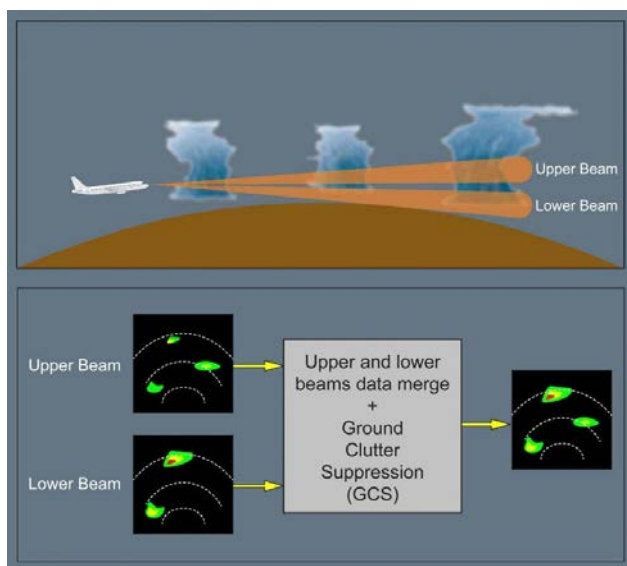
PREDETERMINED CALLOUT

"2500" is now included in the aural callouts on the approach.

Weather Radar - System Description

The A321 is fitted with a single Multi-scan weather radar system with a Predictive Wind Shear (PWS) function and a weather hazard prediction function.

Multiscan Principle



The flight crew can use the radar in the following modes:

Multi-scan Automatic mode: MULTISCAN sw set to AUTO (recommended).

When in Multi-scan Automatic mode:

- The radar alternatively scans at two antenna tilt settings. The weather radar image that is displayed is the result of the stored and combined information from each beam.
- When the gain selector is set to the Calibrated position (CAL), the radar automatically adjusts the gain based on various parameters (aircraft altitude, geographical area, season, time of the day) to obtain the best weather display.

To prevent unnecessary clutter display, the "Quiet and Dark cockpit" philosophy removes the weather that:

- Is not on the aircraft flight path
- Is not a threat to the aircraft (post convective cell).
- The Ground Clutter Suppression (GCS) function removes the ground returns from the ND.

Manual mode: MULTISCAN sw set to MAN

When in Manual mode:

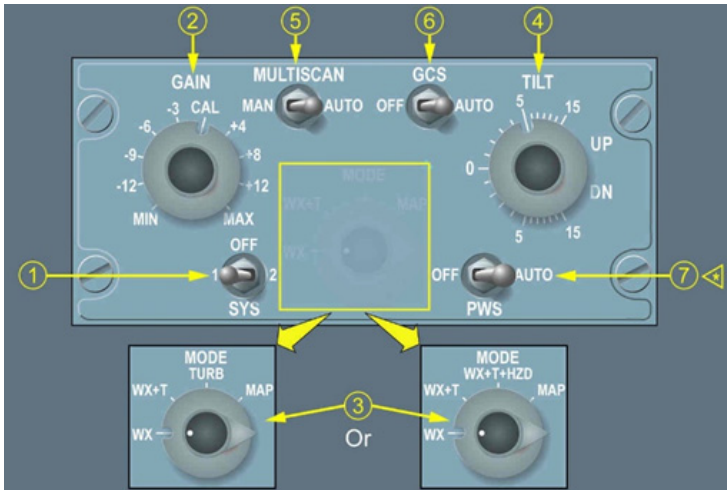
- The flight crew can adjust manually the antenna tilt settings, and can adjust gain either automatically or manually using knobs located on the radar control panel.

The GCS function is not available:

- When the gain selector is set to CAL, there is no automatic gain adjustment based on altitude, geographical area, season and time of the day. As a consequence, when the flight crew switches from the Multiscan Automatic mode with CAL gain to the Manual mode with CAL gain, the weather displayed on the ND may be significantly different.

Weather Radar Controls and Indicators

Radar Control Panel



1 Radar SYS sw

This switch sets radar to ON or turns radar to OFF.

Note: As only one radar is installed on the aircraft, either:

- An "INOP" or "DEACT" sticker replaces the "2", or
- An "ON/OFF" Radar sw replaces the "1/OFF/2" Radar sw.

Note: As only one radar is installed on the aircraft, no weather image is displayed on the Navigation Display (ND) when the "1/OFF/2" SYS sw is set to "2."

2 Gain Knob

CAL is the normal position of the knob. When in Multiscan Automatic mode and gain set to CAL, the radar automatically adjusts the gain according to various parameters (aircraft altitude, geographical area, season, time of the day) to obtain the best weather display. When in Manual mode and gain set to CAL, the radar adjusts the gain to a calibrated setting.

3 Display MODE Selector

- **WX:** Weather mode: Colors indicate the intensity of precipitation (black for the lowest intensity, green, amber and red indicate progressively higher intensity).
- **WX+T:** Weather and Turbulence mode: The ND indicates precipitation and turbulence areas. Turbulence areas are displayed in magenta (within 40 NM).
- **TURB:** Turbulence mode: The ND only displays turbulence areas in magenta (within 40 NM).
- **WX+T+HZD:** Weather, Turbulence and Hazard mode (recommended position).
 - The ND indicates precipitation, turbulence areas in magenta (within 40 NM range) and hazard prediction risk areas.
 - Hazard prediction function is only available when the MULTISCAN sw is set to AUTO.

Note: When MULTISCAN sw is set to MAN, WX+T+HZD mode is equivalent to WX+T mode.

- **MAP:** Map mode - The radar operates in ground mapping mode: black indicates water, green indicates the ground, and amber indicates cities and mountains.

4 TILT Knob

This knob adjusts the antenna tilt when MULTISCAN sw is set to MAN. Zero indicates the horizon reference provided by the IRS.

5 MULTISCAN sw

- **AUTO:** Activates Multiscan mode Multiscan controls the tilt automatically and combines two scans done at different tilt angles to optimize weather detection and minimize ground clutter.
- **MAN:** When set to MAN, the crew can manually adjust the tilt by using the TILT knob.

6 GCS sw

The Ground Clutter Suppression (GCS) switch is spring-loaded to the AUTO position.

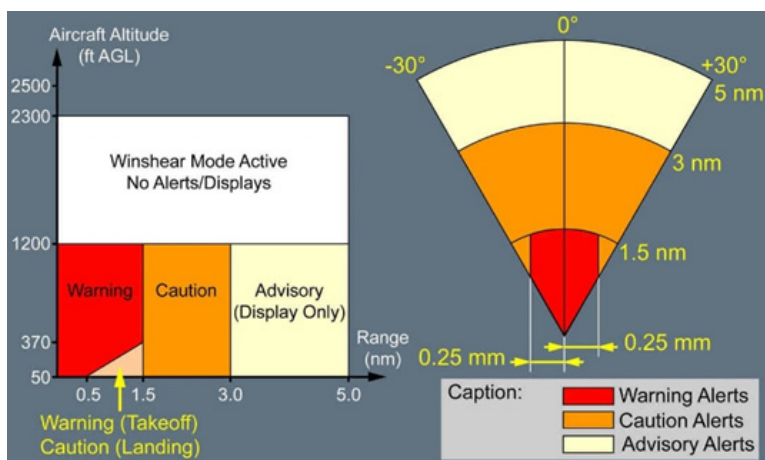
- If MULTISCAN sw is set to AUTO, the radar is in normal use. Ground clutter is not displayed on the screen. If MULTISCAN sw is set to MAN, the GCS sw has no utility. Ground clutter is displayed on the screen.
- If in the OFF position, ground clutter is displayed on the screen.

7 PWS sw

- **AUTO:** Activates the Predictive Windshear function in accordance with activation conditions.
- If in the OFF position, the Predictive Windshear function is off.

Weather Radar - Predictive Windshear

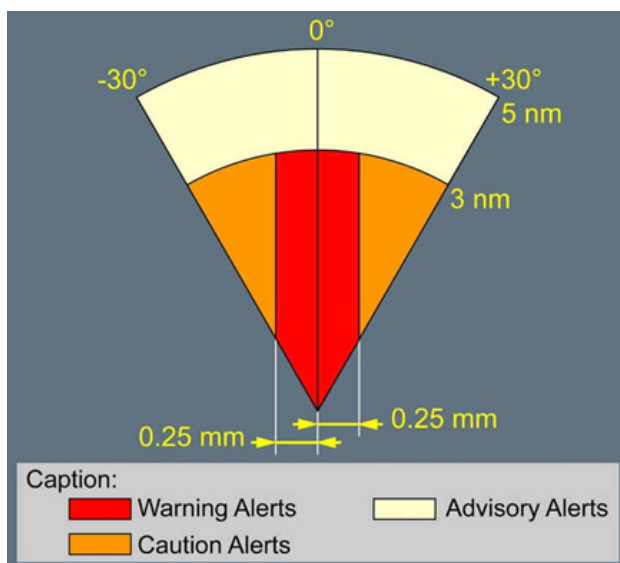
The weather radar has a Predictive Windshear System (PWS) that operates when the PWS switch is in the AUTO position, and the aircraft radio height is below 2300 ft, and Weather radar is ON (Radar sw on position 1).



PWS additionally operates when weather radar is OFF, and:

- At least one engine is running
- Aircraft ground speed is greater than 30 kt, or Aircraft longitudinal acceleration is above a given threshold during at least 0.5s.

Windshear Alerts During Takeoff up to 100 Knots



During the takeoff roll, up to 100 kts, both warnings and cautions are available within a range of 3NM. Advisories are available within 5NM.

Note: This is also applicable during taxi when weather radar is set to ON.

Windshear Alerts Above 50 Feet AGL

During final approach, the visual and aural warning alerts are downgraded to caution alerts between 370 ft AGL and 50 ft AGL, and range between 1.5 NM and 0.5 NM.

Windshear Alerts Inhibition

At takeoff, alerts are inhibited above 100 kts and up to 50 ft AGL.

During landing, alerts are inhibited below 50 ft AGL.

The aural alerts of the Predictive Windshear System (PWS):

- Have priority over TCAS, GPWS, and other FWC aural warnings.
- Are inhibited by reactive windshear detection and aural messages of stall warnings.

Alert Level	Aural Warning	PFD	ND
Warning (Approach)	"GO AROUND WINDSHEAR AHEAD"	W/S AHEAD (RED)	Windshear Icon
Warning (Takeoff)	"WINDSHEAR AHEAD" (twice)	W/S AHEAD (RED)	Windshear Icon
CAUTION	"MONITOR RADAR DISPLAY"	W/S AHEAD (AMBER)	Windshear Icon
Advisory	NIL	NIL	Windshear Icon

The system scans the airspace for windshear within a range of 5 NM ahead of the aircraft.

Below 1200 ft, when the system detects windshear, a windshear symbol (red and black symbol and two yellow radials) and appears on the ND.

Predictive windshear warnings and cautions are associated to an aural alert and to a red (warning) or amber (caution) "W/S AHEAD" message on the PFD.

Windshear advisories are only displayed on the ND (by the Windshear symbol) without a message on the PFD.

Procedure if PWS Warning or Caution occurs

Prior to V1

Predictive windshear caution alert ("MONITOR RADAR DISPLAY" aural):

- Reject takeoff.

Predictive windshear warning alert ("WINDSHEAR AHEAD, WINDSHEAR AHEAD" aural):

- Reject takeoff. (The aural warning is inhibited at speeds greater than 100kts).

After Takeoff

Predictive windshear caution alert ("MONITOR RADAR DISPLAY" aural):

- Ensure maximum takeoff thrust is set (normal power). Maneuver as required to avoid the windshear.

Predictive windshear warning alert ("WINDSHEAR AHEAD, WINDSHEAR AHEAD" aural):

- Perform the Windshear Escape Maneuver.

On Approach

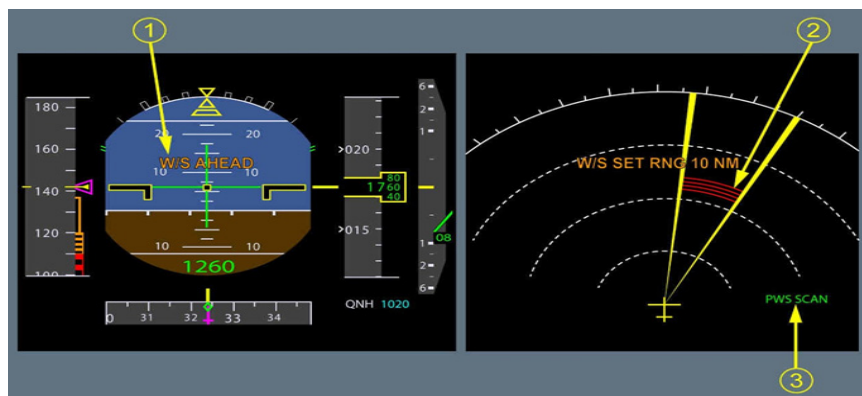
Predictive windshear caution alert ("MONITOR RADAR DISPLAY" aural):

- Perform the Windshear Escape Maneuver, or, at pilot's discretion, perform a normal go-around

Predictive windshear warning alert ("WINDSHEAR AHEAD, WINDSHEAR AHEAD" aural):

- Perform the Windshear Escape Maneuver, or, at pilot's discretion, perform a normal go-around.

PWS Indication on PFD and ND



1 W/S AHEAD Message on the PFD

This message is displayed, when the Predictive Windshear system detects windshear ahead of the aircraft. The message is in amber or red, depending on the level of the alert.

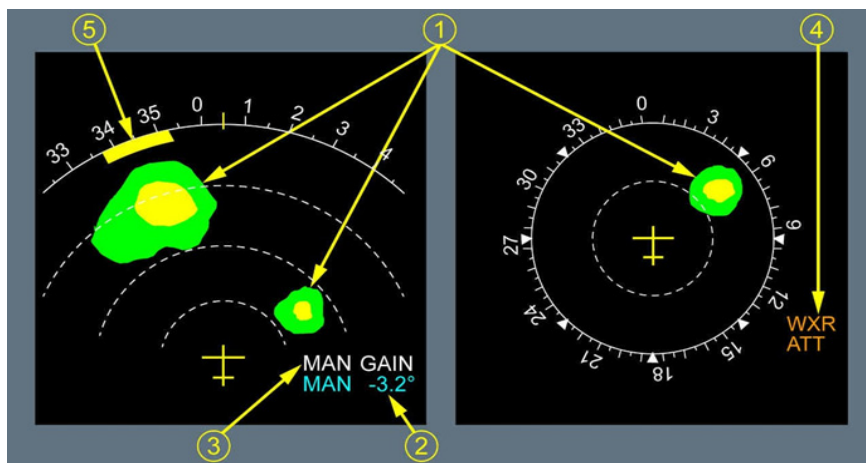
2 Predictive WindShear area Indication (PWS Symbol)

A red and black symbol and two yellow radial lines indicate the predicted windshear area. Windshear indication is available in ARC and ROSE ND modes. When the radar detects a windshear event and the ND range is set above 10 NM, a W/S SET RNG 10 NM (Windshear, set range to 10 NM) message appears. This message requests the flight crew to adjust the range on the corresponding ND. Depending on the windshear alert level, ND indication may be associated with an aural message and a PFD message.

3 PWS SCAN message on the ND

If the Radar sw is set to OFF and the PWS sw is set to AUTO, the ND displays a PWS SCAN message when the PWS is active. In this mode, when the radar detects a windshear event, a windshear symbol and the weather returns appear automatically on the ND.

Radar Indication on ND



1 Weather Radar Picture

- When the radar is operating, and when the ND is not in PLAN mode, the ND displays the weather radar picture.
- The weather echoes appear in different colors, depending on the precipitation rates (black, green, yellow, red or magenta for turbulence).
- The selected ND range will determine how often the image is refreshed.

2 Tilt Angle

- The multiscan function of the weather radar alternatively scans at low and high beam, and automatically sets the tilt of these beams to optimize the weather radar detection. The displayed weather radar picture is the result of the storing and merging of the information from each beam.
- The value of the tilt angle is in degrees, and quarters of a degree. It appears in the lower right corner of the screen:
 - In green, when the MULTISCAN sw is set to AUTO. This value represents the average of the lower and the upper beam tilts.
 - In blue, next to the blue "MAN" indication, when the flight crew sets the MULTISCAN sw to MAN. The tilt angle is the angle between the horizon and the radar beam axis.
 - When the multiscan function is lost, the tilt value is dashed and the NO AUTO TILT message appears in amber on the ND, until the flight crew sets the MULTISCAN sw to MAN.

3 Gain Mode

MAN GAIN appears in white, when the flight crew selects the manual gain mode.

4 Failure Messages

The ND lists the detected failures. If the message is in red, the ND does not display a radar image. If the message is in amber, the image is not affected.

NO WXR (red): Radar System failure.

WXR RT (red): Radar transceiver failure.

WXR ANT (red): Radar antenna failure.

WXR CTL (red): Radar control unit failure.

WXR RNG (red): Range error.

WXR WEAK (amber): Calibration failure.

WXR ATT (amber): Attitude control failure.

WXR STAB (amber): Antenna stabilization failure. PRED W/S (amber):

NO AUTO TILT (amber): PWS function failure

Radar System test: Automatic tilt adjustment failure WXR TEST (amber)

5 PAC Alert

When the flight crew sets the display mode selector to WX or WX+T, or WX+T+HZD and sets the gain to CAL, and when the aircraft is within 80 NM of a storm cell, the Path Attenuation Compensation (PAC) alert is available. The PAC alert displays a yellow arc on the outermost scale of the ND, when an intervening rainfall creates an attenuated area behind a storm cell (also called a radar shadow or attenuation effect).

Note: The PAC alert is only available when the MULTISCAN sw is in the AUTO position.

Weather Prediction Function Indication

The Weather, Turbulence and Hazard mode (WX+T+HZD) enables the flight crew to have the following information displayed on the ND:

- The weather returns that appear in different colors, depending on the precipitation rates (black, green, yellow or red).
- The turbulence areas in magenta (within 40 NM).
- The weather hazard predictions computed by the weather radar.

For the weather hazard predictions:

- The weather radar computes an automatic threat assessment of the lightning, hail and convective activity in a storm cell and in the area near the storm cell (Core Threat Assessment and Associated Threat Assessment).
- The weather radar is also able to alert the flight crew of storm cells that may rapidly build below the aircraft flight path (Predictive Overflight).

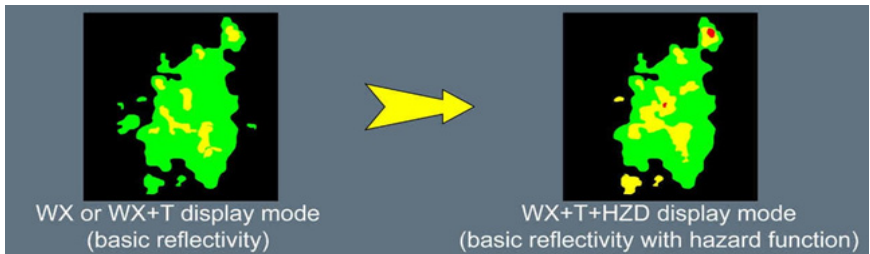
Note: The hazard predictions are only available when the Multiscan mode is in AUTO.

Core Threat Assessment

The Core Threat Assessment function operates when the weather radar determines that lightning, hail, or turbulence may occur in a given cell up to the maximum range of 320 NM.

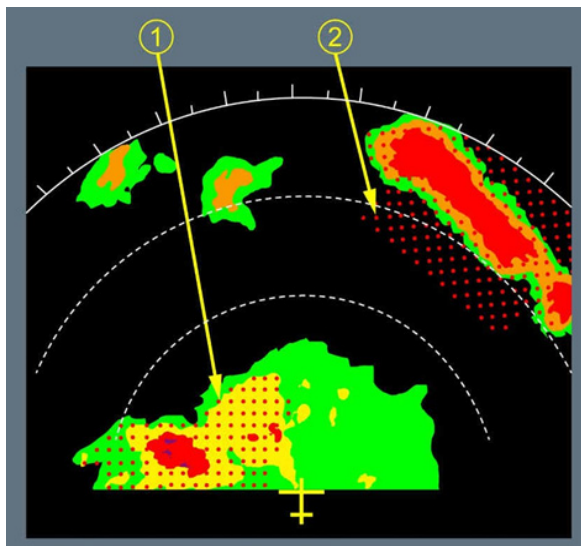
Native reflectivity color of the weather is increased in order to better reflect the threat associated with a cell core.

The adjustment can go up to a color level (green cells may become yellow, yellow cells may become red).



Associated Threat Assessment

Associated threats are represented by red dots on the ND and can be within the cell boundary or outside. Two types of indications can be displayed:



1

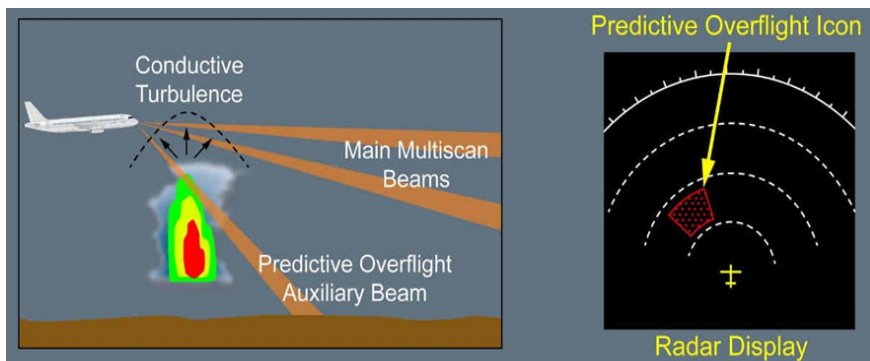
The first type of indication is represented by red dots in the area of potential lightning and icing found in precipitation around the freezing level. This information is available only when the aircraft is below the freezing level or up to 6,000 ft above the freezing level.

2

The second type of indication is represented by red dots in a rectangular shape on top of a storm cell displayed on the ND. The dotted rectangle above a storm cell indicates a potential of icing, hail and/or lightning. This information is available at all altitudes. The rectangle may extend beyond the storm cell to indicate potential threats that can not be seen by the basic reflectivity function of the weather radar.

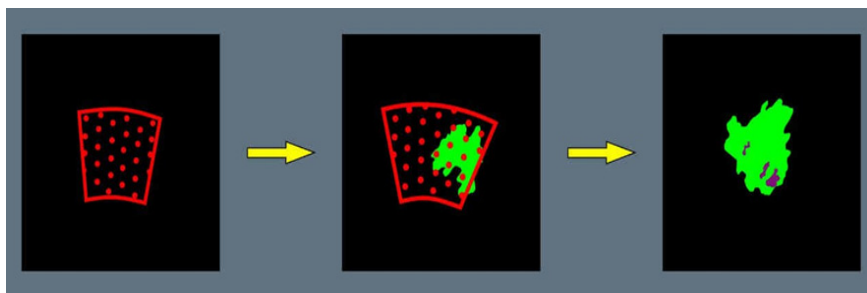
Predictive Overflight Function

The predictive overflight function is active above 25,000 ft and operates up to 40 NM. Its aim is to indicate risk constituted by cells growing rapidly underneath main radar beams. For this purpose, an auxiliary beam with very low tilt searches for growing cells. When a conflict between a fast growing cell and the aircraft flight path is detected, a Predictive Overflight icon is displayed. The Predictive Overflight icon is represented by an area of red dots with red boundaries. As it is based on actual convection measurement, the flight crew should avoid predictive overflight areas.



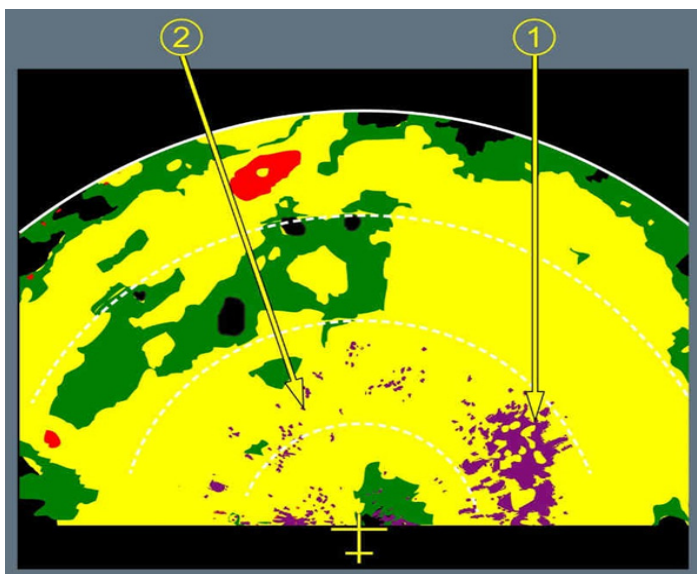
First, the icon is displayed alone over black when the concerned cell can not be displayed (the cell is much lower than aircraft flight level). Then, when cell reach aircraft flight level, the icon and the reflectivity are displayed together. Finally, the icon is removed 1 min after cell ceases to be considered as a threat by the weather radar or when the relevant depiction (i.e. at least red core) for the cell is displayed on ND.

Predictive Overflight Icon Evolution



Note: Avoidance of the detected weather always has priority over avoidance of the predicted hazards. The flight crew must apply standard storm avoidance recommendations in priority, and hazard areas should be avoided as much as possible.

Severe and Moderate Turbulence Display



1 Basic plain magenta

Indicates potential severe turbulences (available in WX+T or WX+T+HZD display mode).

2 Speckle magenta

Indicates potential moderate turbulences that could decrease passenger comfort (available only in WX+T+HZD display mode).

EGPWS - Description

The Ground Proximity Warning System (GPWS) is embedded in the T3CAS system (traffic and terrain integrated surveillance system) and generates aural and visual warnings, when one of the following conditions occurs between radio heights 10 ft and 2450 ft.

- Mode 1: Excessive rate of descent.
- Mode 2: Excessive terrain closure rate.
- Mode 3: Altitude loss after takeoff, or go-around.

-
- Mode 4: Unsafe terrain clearance when not in landing configuration.
 - Mode 5: Too far below glideslope.

In addition to the basic GPWS functions, the GPWS provides predictive functions. The predictive functions are based on a worldwide terrain (and obstacle) database, and on the modeling of the climb performance capability of the aircraft.

The altitude used by the GPWS is computed based on the barometric altitude, the radio altitude and the GPS altitude in order to reduce baro setting errors.

GPWS - Predictive Functions

The GPWS system:

- Correlates the current aircraft position to terrain (and obstacle) and airport database.
- Computes a caution and a warning envelope ahead of the aircraft. This includes the determination of the climb prediction envelope for terrain (and obstacle) avoidance, using the modeled climb capability of the aircraft.
- Displays the terrain (and obstacle) hazards along the projected flight path ahead of the aircraft.
- When the predictive functions of the GPWS are operative, mode 2 of the GPWS is inhibited.
- If the predictive GPWS functions fail or if there is significant difference between the radio height and the altitude computed by the TCAS, the basic GPWS Mode 2 is reactivated.

EGPWS Warnings

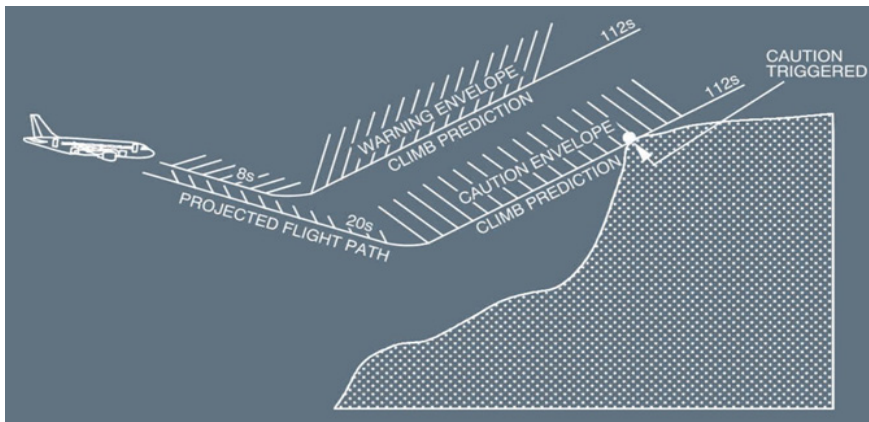
Depending on the aircraft position and performance, in relation to the terrain, the GPWS triggers:

Alert Level	Aural Alert	ND	Local Alert
Warning	TERRAIN TERRAIN, PULL UP	• Automatic terrain display • Solid Red areas • TERRAIN (red)(1)	The GPWS/PULL UP pb light comes on, on each pilot's instrument panel
	OBSTACLE OBSTACLE, PULL UP	• Automatic obstacle display (1) • Solid Red Areas • OBST (red)	
	AVOID TERRIAN	• Automatic terrain display (1) • Red/Black crosshatched areas • TERRAIN (red)	
	AVOID OBSTACLE	• Automatic obstacle display (1) • Red/Black crosshatched areas • OBST (red)	
Caution	CAUTION TERRAIN	• Automatic terrain display (1) • Solid Yellow areas • TERRAIN (amber)	The GPWS light of the GPWS/PULL UP pb light comes on, on each pilot's instrument panel
	CAUTION OBSTACLE	• Automatic obstacle display (1) • Solid Yellow areas • OBST (amber)	

(1) When the TERR ON ND pb is set to ON, and ARC or ROSE mode is selected, the ND displays the terrain (and obstacle) memorized in the database, depending on the aircraft's position. The terrain (and obstacle) are displayed in various densities of green, yellow, red, or magenta, depending on the threat. If an alert is generated (caution or warning), and TERR ON ND is not selected, the terrain (and obstacle) are automatically displayed, and the ON light of the TERR ON ND pb comes on.

If case of low accuracy of the aircraft position computed by the TCAS, the predictive functions of the GPWS are automatically deactivated. The 5 GPWS basic modes remain active.

EGPWS Vertical Envelope



Caution Envelope

The caution envelope extends along the flight path from a distance of 20 seconds in front of the aircraft to a constructed climb path, at a distance of 132 seconds in front of the aircraft.

If there is a conflict between the terrain caution envelope and the terrain data stored in the database, one of the following cautions is triggered:

- A CAUTION TERRAIN caution, if the terrain conflict is ahead of the aircraft.
- A TOO LOW TERRAIN caution, if the terrain conflict is below the aircraft, instead of ahead of the aircraft.

Warning Envelope

The warning envelope extends along the flight path from a distance of 8 seconds in front of the aircraft to a constructed climb path, at a distance of 120 seconds in front of the aircraft.

In a Mountainous Approach Area (MAA: Existence of terrain more than 2,000 ft above the runway and within 6 NM of this runway), this distance is linearly reduced to 30 seconds to prevent nuisance alerts during low altitude maneuvers.

If there is a conflict between the terrain warning envelope ahead of the aircraft and the terrain data stored in the database, one of the following warnings is triggered:

- A TERRAIN TERRAIN PULL-UP warning if the aircraft can climb over the terrain.
- An AVOID TERRAIN warning if the aircraft cannot climb over the terrain with sufficient safety margin.

Horizontal Envelope



During turns, the sensor opens up into turns to determine if there are possible terrain conflicts (up to 90 °).

Convergence Envelope

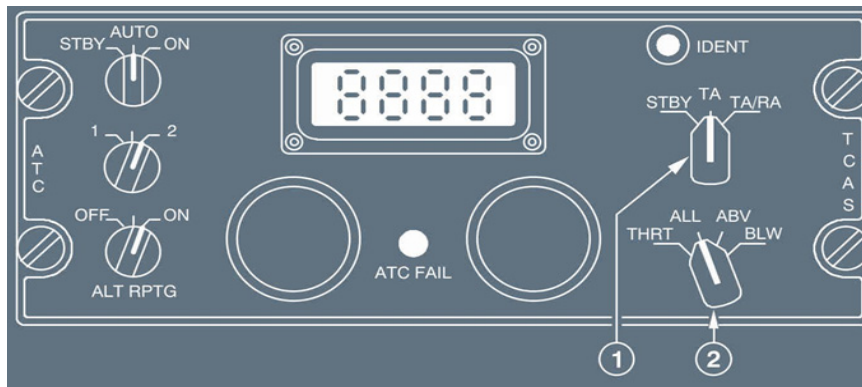
When the aircraft enters the approach sector (approximately 2.7 NM or 5 km from the runway threshold), the system computes runway convergence criteria in order to inhibit the Terrain Awareness and Warning System (TAWS) predictive alerts.

GPWS Controls and Indicators

To differentiate between the terrain and the weather display the TERR indication, instead of the TILT indication, comes on in the lower right corner of the ND.

TCAS System

TCAS Controls and Indicators



1 Mode Selection Switch

No significant operational changes.

2 Traffic Selector

THRT: Proximate and other intruders are displayed only if a TA or a RA is present at the same time.

ALL: The other and proximate intruders are displayed even if no TA or RA is present at the same time (full time function).

ABV: The other intruders are displayed within 9 900 ft above the aircraft and 2 700 ft below.

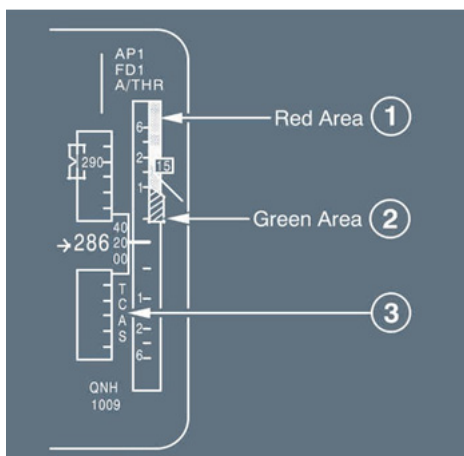
BLW: The other intruders are displayed within 9 900 ft below the aircraft and 2 700 ft above.

ATC - Warnings and Cautions

E/WD: FAILURE Condition	AURAL WARNING	MASTER LIGHT	SD PAGE CALLED	LOCAL WARNING
ATC/XPDR 1(2) FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL
ATC/XPDR 1+2 FAULT	SINGLE CHIME	MASTER CAUT	NIL	NIL
ATC/XPDR STBY	SINGLE CHIME	MASTER CAUT	NIL	NIL

TCAS PFD Indications

In case of RA detection, the vertical speed scale becomes rectangular and the PFD presents vertical orders on the vertical speed scale. The vertical speed scale background is normally gray, but may be partially replaced by green and/or red areas.



1 Red Area

Indicates the vertical speed range when there is a high risk of conflict.

2 Green Area

Indicates the recommended vertical speed range. It is wider than the red area.

Note: The aircraft can also fly in the gray vertical speed range, without the risk of conflict (preventive RA). The color of the digits corresponds to the appropriate area. In case of RA detection, the vertical speed needle that is normally green becomes white.

3 TCAS Failure Indication

No significant operational changes.

TCAS AURAL Messages

TCAS messages remain the same as the A320 with the following exception:

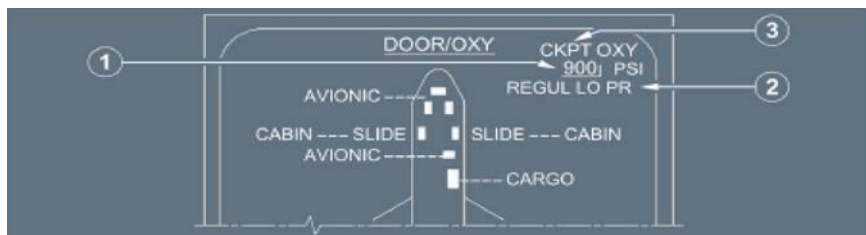
"LEVEL OFF, LEVEL OFF" Respond by setting (flying) the vertical speed to 0.

TCAS Warnings and Cautions

On the MEMO section of the ND, TCAS STBY the A321 will also display during a triple ADR failure.

Oxygen

Crew Oxygen Indication: The oxygen information display in the upper right hand corner of the DOOR/OXY systems display has different features and indications from the A320.



1 OXY Pressure Indication

- Green when > 600 PSI
- Pulses green < 600 PSI and door/oxy SD page is automatically displayed
- Amber < 300 PSI
- On ground, an amber half frame appears when oxygen pressure is < 1000 PSI

2 REGUL LO PR Indication

No significant operational changes.

3 CKPT OXY Indication

- Normally white
- Becomes amber when:
 - Pressure goes below 300 PSI.
 - Low oxygen pressure is detected.
 - The OXYGEN CREW SUPPLY pb on the overhead panel is OFF.

Pneumatics

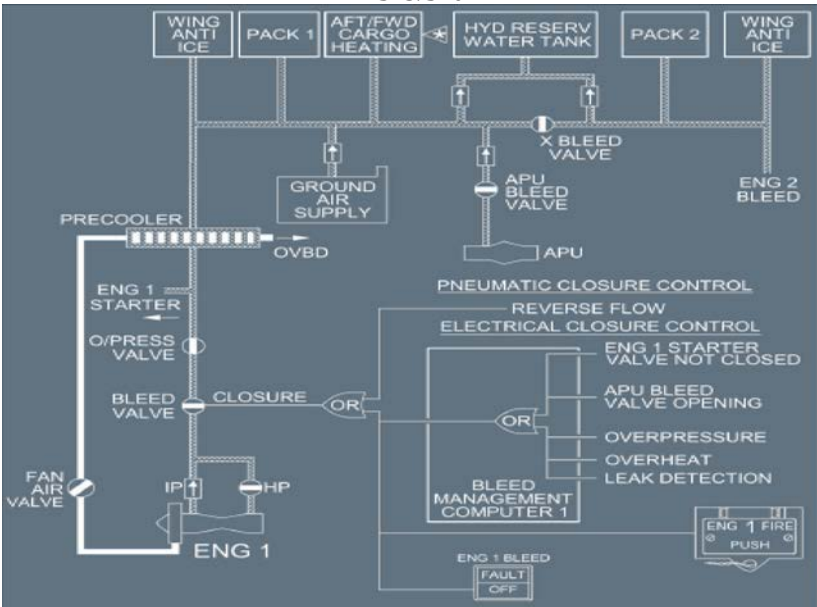
ECAM BLEED Page:

- There is no line between the ENG 1 Bleed valve and precooler inlet and outlet temperatures. Operation remains the same as on the A320.
- GND HP ground connection indication appears while on the ground but is in white rather than green. Operation remains the same.

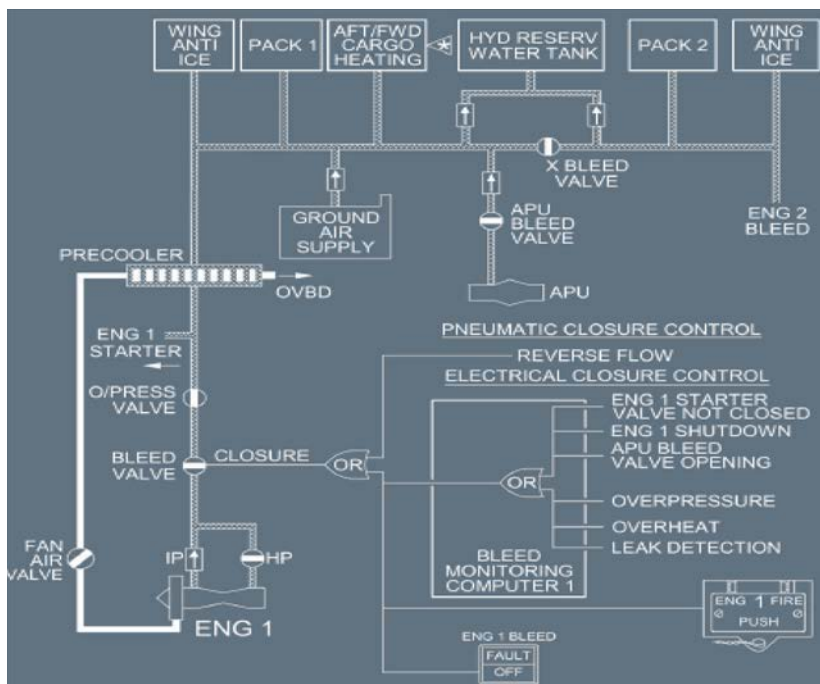
NEW ECAM Messages:

E/WD Indication and Condition	AURAL WARNING	MASTER LIGHT	Phases of Flight
ENG 1(2) BLEED HI TEMP • The precooler outlet temperature exceeds 240 C within 2 min after X BLEED valve opening	Single Chime	N/A	All except: Taxi out, cruise and taxi in until 2nd engine shut down.
ENG 1(2) LEAK DET FAULT • Detection loop inop in pylon	N/A	N/A	Takeoff power to 80kts on touchdown

A319/320



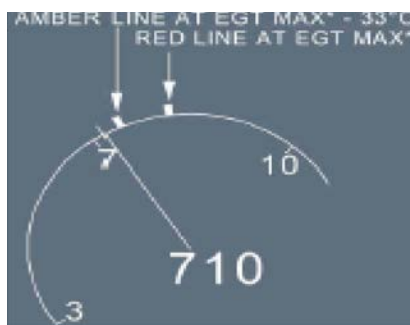
A321



APU

APU page: While ADIRS 2 supplies bleed pressure information for the A320, ADIRS 1 supplies this information for the A321. Therefore, amber XXs will be displayed on the APU in place of the PSI indication when ADIRS 1 (rather than 2) is unavailable.

APU EGT

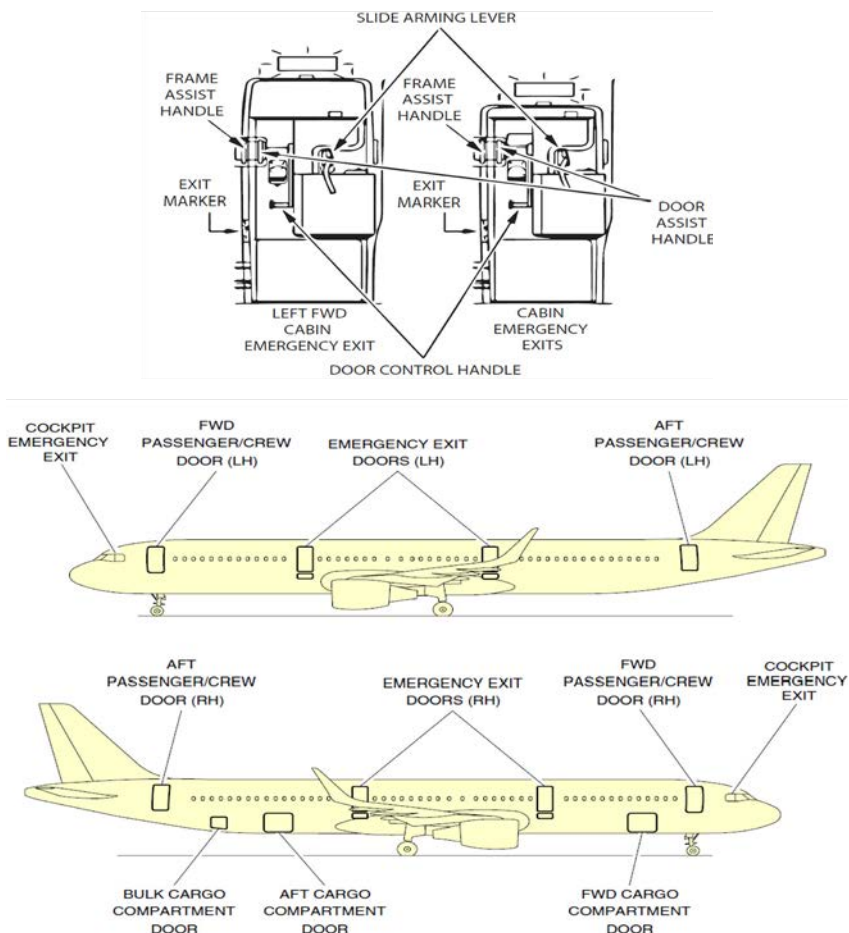


- Actual APU EGT limitations differ by a negligible amount.
- On the A320, the amber EGT MAX indication will pulsate during the APU start. On the A321, it remains steady.

Doors

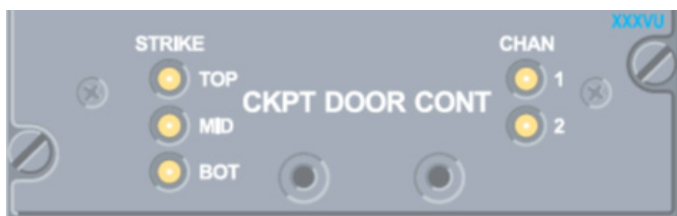
Emergency Exits: The A321 has four emergency exits. Variations from the A320 include:

- One emergency exit is ahead of the wing and the other is behind the wing on both sides of the aircraft.
- These emergency exits are plug type doors that open outward and forward. Operation is similar to that of the main passenger doors.
- Each emergency exit has an escape slide/raft stowed in a compartment below the cabin floor.
- One additional life raft is located in an overhead bin near the right aft emergency exit.



Flight Deck Door: The A321 Flight Deck door has 3 additional security features.

- **Additional Deadbolt:** This deadbolt is installed level with the center latch and bolts from the flight deck side, allowing an extra layer of security in the event that more than one locking latch strike failure or in the case of total locking system failure.
- **Secondary CKPT DOOR CONT BKUP panel:** identical secondary CKPT DOOR CONT panel located on the right hand side of the overhead panel.



Primary CKPT DOOR CONT panel - Left side overhead panel



Secondary CKPT DOOR CONT panel - Right side overhead panel

CKPT DOOR BKUP panel: An additional CKPT DOOR BKUP panel, which is composed of the LKG SYS switch and a OPEN/FAULT control pushbutton.



1 LKG SYS toggle switch

- **NORM:** The primary system has no failure; normal control is operative.
- **BK UP:** The normal control is deactivated, and backup control is activated.
- **OFF:** The Cockpit Door Locking System is deactivated. Both normal and backup controls are inoperative. Therefore, the door is unlocked. It can be pushed open from the cabin side.

2 CTL pb

- **OPEN PB:** Pressing the pushbutton unlocks the door. Keep the pushbutton pressed until the door is pushed open.
- **OPEN light ON:** The door is not closed or the door is not locked.
- **FAULT light ON:** Backup system failure has been identified. The inoperative item can be identified by checking the strikes or pressure sensor status lights on the secondary CKPT DOOR CONT panel.

The backup control unit is a backup for locking/unlocking the door by flight crew action, and for unlocking the door in case of decompression. **The backup control may only be used when the normal control unit has failed or when the two pressure sensors have failed.**

When using the backup control unit, both the lock/unlock toggle switch and the keypad are inoperative. In this condition:

- The cabin crew must use the interphone to perform any cockpit access request.
- The flight crew must use the OPEN/FAULT CTL P/B located on the CKPT DOOR BKUP overhead panel to unlock the door when access to the cockpit is authorized.
- **No emergency access from the cabin to the cockpit is available.**

Emergency Equipment

A321

Emergency Light Switch

- Flight deck
- Fwd FA panel

Exit Seats (shaded)

- 13 ABC/EF
- 26 BC/DEF, 27 ABC

Flashlights

- Near each FA seat

Flotation

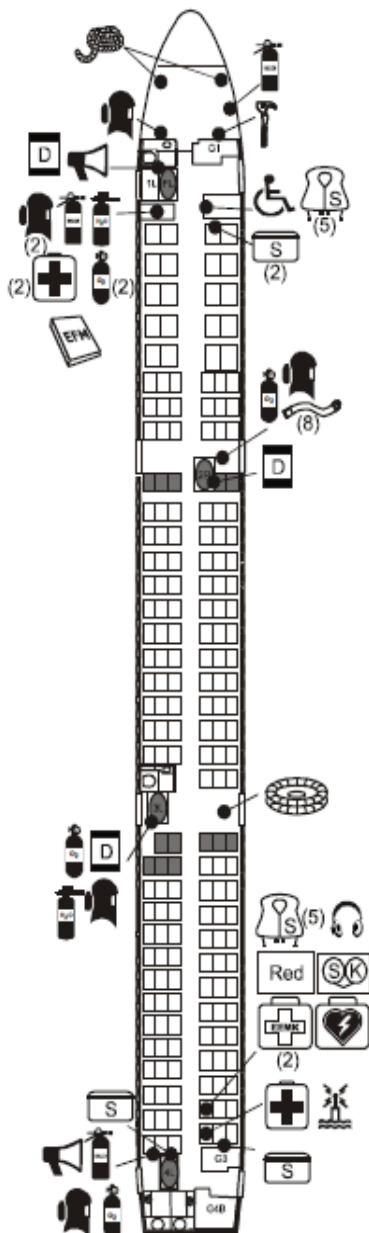
- Life vest at each crew and passenger seat
- Inflatable slide at all doors

NOTE: Seat bottom cushions may not be used for flotation.

Minimum Crew: 4

NOTE: Shaded positions denote FAA minimum crew.

Seating Capacity
192 (20/172)



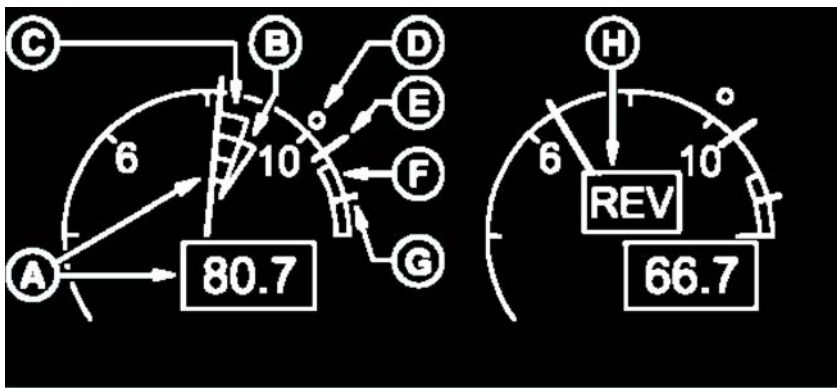
Engines

Engine Type: The A321 has a CFM 56-5B high bypass ratio turbofan engine. The CFM 56-5B is largely similar to the A320 engines, minor differences are noted below:

- Low speed rotor (N1) consists of a front fan (single stage) and a four-stage LP compressor connected to a four-stage LP turbine.

FADEC: On the A321, continuous ignition is not required during ENG AI operation and is therefore not automatically selected ON

Engine/Warning Display Indications



A Actual N1 (No Changes)

B N1 Command (N1 trend)

- FADEC commanded N1 is shown as a green needle. Additionally, the smaller green triangle indicates the tendency of N1 command. These indications are only shown when A/THR is active.

C Transient N1

- 'Wedge' indication shows the difference between the N1 commanded and actual N1 when Autothrust is active. Replaces blue arc that indicates the same on the A320.

D N1 TLA (blue circle)

- N1 corresponding to thrust lever position (on the A320, this circle is shown in white)

E Max N1 (No Changes)

F **Max permissible N1**

- Indication for max permissible N1 has not changed. Actual limit increases a negligible amount.

G **N1 Exceedance (No Changes)**

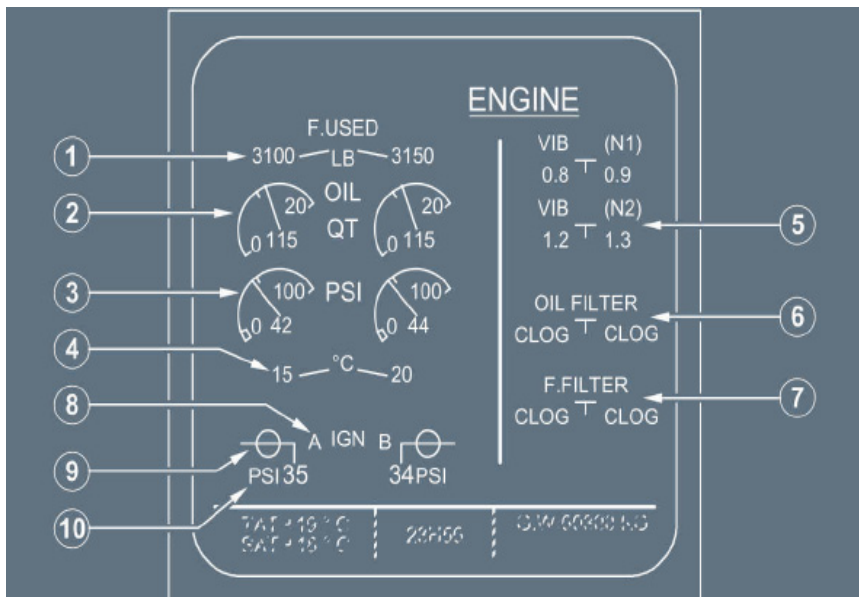
H **REV (No Changes)**

EGT Indications

- Maximum EGT for the A321 is slightly increased and indications have been adjusted to reflect the higher limitation.

Engine Systems Display Indications

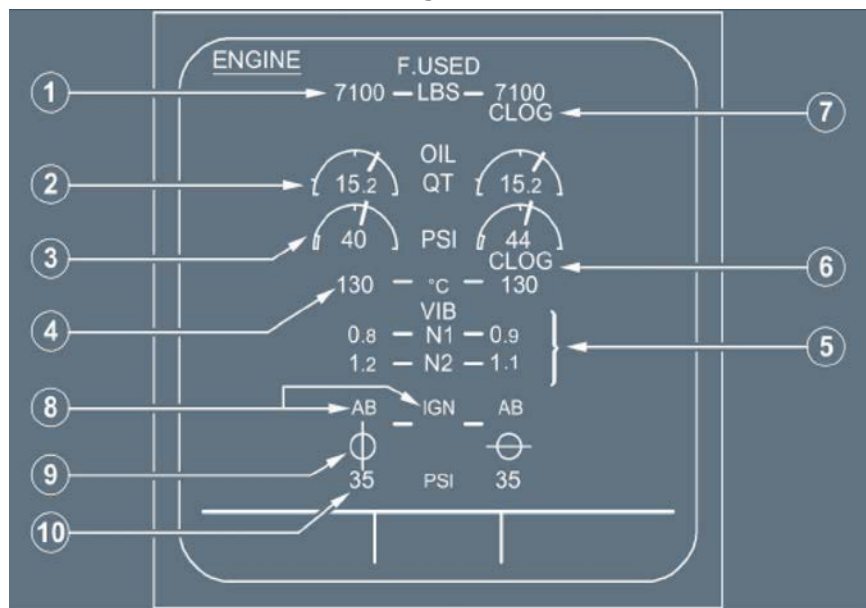
A320



- 1 Fuel Used
- 2 Oil Quantity
- 3 Oil Pressure
- 4 Oil Temperature
- 5 VIB
- 6 Oil Filter Clog
- 7 Fuel Filter Clog
- 8 Ignition
- 9 Start Valve Position
- 10 Engine Bleed Pressure

Engine Systems Display Indications

A321



- 1 Fuel Used**
- 2 Oil Quantity**
- 3 Oil Pressure**
- 4 Oil Temperature**
- 5 VIB**
- 6 Oil Filter Clog**
- 7 Fuel Filter Clog**
- 8 Ignition**
- 9 Start Valve Position**
- 10 Engine Bleed Pressure**

New ECAM Messages

E/WD Indication and Condition	AURAL WARNING	MASTER LIGHT	Phases of Flight
ENG 1(2) THR LEVER ABV IDLE - One thrust lever is above idle while the other thrust lever is in the reverse detent at landing. - One thrust lever is above idle while the other thrust lever is at idle, at reverser deselection during landing roll.	RETARD	MASTER WARNING	All phase of flight except touchdown and taxi in
ENG THR LEVERS NOT SET - Replaces msg 'ENG FLEX TEMP NOT SET' - The levers position does not correspond to TO power mode.	Single Chime	MASTER CAUTION	- Power established - 80kts on TO to 80kts on Landing - Engine shutdown
ENG 1(2) REV ISOL FAULT	Single Chime		Takeoff to Touchdown
ENG SAT ABOVE FLEX TEMP	Single Chime	MASTER CAUTION	All phases
ENG 1(2) REV INHIBITED	N/A	N/A	Takeoff to Touchdown

Adjusted ECAM Messages

Message	Difference
ENG 1(2) START FAULT	- Triggered for all A320 conditions - Additionally triggered if Thrust Levers not at Idle
ENG 1(2) THR LEVER DISAGREE	- A320 only has message enabled on takeoff from 80kts to 1500ft. - A321 additionally enables message during rollout phase of flight (touchdown to 80kts).
ENG THRUST LEVER FAULT	On the A321 this message is enabled on liftoff up to 1500ft (as on the A320) and additionally on takeoff roll after 80kts.
ENG 1(2) N1 or N2 or EGT OVER LIMIT	Trigger limits have been adjusted to reflect new limitations on the A321.
ENG 1(2) FUEL FILTER CLOG ENG 1(2) OIL FILTER CLOG ENG 1(2) OVSPD PROT FAULT	- These messages will now be enabled from the time takeoff power is set through 80kts during touchdown. - On the A320, these messages are enable from 80kts on takeoff to 80kts on landing.

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