

AIRCRAFT OPERATIONS MANUAL

Boeing 737-700 for X-Plane Flight Simulator Version 6

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A NOTE TO PILOTS:

Much of the information contained within this manual is intended to simulate the calculations that a real Flight Management Computer (FMC) would perform. As X-Plane version 5.66 has no FMC, we have provided this information so that you, the X-Plane Pilot, may become your own FMC. Have a calculator close by!

Print this document for easy reference.

Boeing 737-700 for X-Plane Flight Simulator

Aircraft Operations Manual

STATISTICS

OEW:	84,100 lbs	Wing Span	112'7"
Max Fuel:	43,350 lbs	Overall Length	110'4"
Max Payload:	36,400 lbs	Tail Height	41'2"
MZFW:	120,500 lbs	Interior Cabin Width	11'7"
MTOW:	154,500 lbs		
MTW:	155,100 lbs		
MLW:	128,000 lbs		
Thrust:	22,700 lbs x 2 (CFM56-7B22 turbofan)		
Maximum Altitude:	41,000 ft		
Typical Cruising Speed:	Mach 0.785 / 450 knots		
Range with Max Fuel:	3,300 nm (6,054 km) -- Payload: 27,050 lbs		
Max Passengers:	126 (2-class) + 5-6 Crew		

LIMITATIONS

V _{LO}	215	(max speed gear Retraction)	
V _{LO}	260	(max speed gear Extension)	
V _{LE}	260	(max speed gear Extended)	
V _{NO} /M _{MO}	365 / 0.84	(max normal operation)	
V _{NE} /M _{NE}	392 / 0.87	(Never Exceed)	
V _A (MTOW)	280 / 0.75	(Turbulent Air Penetration Speed)	
V _{REF} (150K lbs)	255	<u>V_s</u>	<u>V_{so}</u>
V _{REF} (90K lbs)	200	154,000 lbs: 166	128
Tire Limit	198	120,000 lbs: 139	114
Max Flap Extended		95,000 lbs: 120	94
Altitude:	18,000 ft.		
Max Single Engine			
Altitudes:	21,000	@ 90,000 lbs @ 400 KTAS	
	17,500	@ 150,000 lbs @ 400 KTAS	
Max N1:	102 %		
Full Thrust Max			
Duration:	3 minutes		
Max Continuous			
N1:	97 %		
Max T/O Tailwind	15 knots		
Max Demonstrated			
Crosswind Landing:	35 knots	(Flap 30, V _{REF} + 5, Dry Runway)	
FLAP LIMIT SPEEDS:		<u>Flap</u>	<u>V_{FE}</u>
		1	250
		5	230
		15	210
		25	190
		30	180
		40	170

**** FLAP 40 PROHIBITED IN CROSSWINDS OVER 25 KNOTS ****

PERFORMANCE

TAKEOFF THRUST: **9 points** above **Cruise N1** at target altitude (ISA)
[See Fuel Consumption Table, Page 4]
Add **1 % N1** for every **2000' Above Sea Level**
Add **1 % N1** for every **20°C Above Standard**
Subtract **1 % N1** for every **20°C Below Standard**
Climb out at **V2 + 15 knots** until 1000' AGL / Published Flap
Retraction Altitude (Noise Abatement)

CLIMB THRUST: **4 points** above **Cruise N1** at target altitude
[See Fuel Consumption Table, Page 4]
Reduce to climb thrust upon retraction to **Flap 5**.
For **Flap 5** takeoff, reduce to climb thrust upon reaching
1000' AGL / Published Clearance Minima
Add **1% N1** for every **20°C Above Standard**
Climb at **280 KIAS / .75 Mach (250 KIAS below 10,000' MSL)**

REQUIRED FIELD LENGTH: (50ft. Obstacle Clearance / Calm Wind)

TAKEOFF Weight	Sea Level Field Length (feet) [Flap 15, Takeoff Thrust Procedures]		
	-5°C	15°C	35°C
154,000 lbs	5,170	5,730	6,575
143,000 lbs	4,740	5,255	6,040
132,000 lbs	4,305	4,780	5,505
121,000 lbs	3,875	4,305	4,975
110,000 lbs	3,355	3,770	4,350
99,000 lbs	2,835	3,230	3,725
88,000 lbs	2,315	2,690	3,100

Add **10 %** for every **2000' Above Sea Level**
Subtract **10 %** for every **10 knots headwind**
Add **10 %** for every **5 knots tailwind**
Add **15 %** for **Flap 5 Takeoff**

LANDING Weight	Field Length (feet) [Flaps 40, Max Braking, Max Reverse Thrust]			
	Sea Level	3,000' MSL	6,000' MSL	9,000' MSL
128,000 lbs	3,314	3,950	4,580	5,230
121,000 lbs	3,200	3,580	4,165	4,690
110,000 lbs	3,080	3,355	3,735	4,150
99,000 lbs	2,960	3,030	3,300	3,610
88,000 lbs	2,060	2,505	2,970	3,230

Add **5 %** for every **20°C Above Standard**
Subtract **5 %** for every **20°C Below Standard**
Subtract **10 %** for every **10 knots headwind**
Add **10 %** for every **5 knots tailwind**
Add **10 %** for **Flap 30**
Add **10 %** for Land and Hold Short Operations (LAHSO)

TAKEOFF SPEEDS: (Flap 15 / XP Default Trim)

Weight	V1	Vr	V2
154,000 lbs	136	140	145
143,000 lbs	130	134	140
132,000 lbs	124	128	135
121,000 lbs	118	122	130
110,000 lbs	117	119	125
99,000 lbs	106	108	120
88,000 lbs	100	102	115

For **Flap 5 Takeoff**, add 10 knots to all speeds, **Trim @ 8.5 units**.

Wet Runway, Subtract 7 knots from V1; **Icy Runway**, Subtract 15 knots from V1.

FLAP RETRACTION SPEEDS: (Flap 15 Takeoff)

Weight	To Flap 5	To Flap 1	Flaps Up
154,000 lbs	185	209	223
143,000 lbs	180	205	224
132,000 lbs	175	201	220
121,000 lbs	170	197	216
110,000 lbs	165	192	213
99,000 lbs	160	187	210
88,000 lbs	155	182	207

FUEL CONSUMPTION (pph): Mach 0.785 (450 kts) (ISA)

Weight	FL290 / N1	FL310 / N1	FL330 / N1
150,000 lbs	5,840 @ 87.5	5,640 @ 87.5	5,540 @ 88.5
122,000 lbs	5,650 @ 86.5	5,100 @ 86	4,860 @ 86
95,000 lbs	5,500 @ 86	4,920 @ 85.5	4,520 @ 84.5

Weight	FL350 / N1	FL370 / N1	FL390 / N1	FL410 / N1
150,000 lbs	5,580 @ 89.5	5,740 @ 91.5	5,980 @ 93.5	N/A
122,000 lbs	4,640 @ 86.5	4,450 @ 86.5	4,500 @ 88	4,600 @ 90.5
95,000 lbs	4,340 @ 84.5	3,940 @ 84.5	3,580 @ 84.5	3,570 @ 85.5

MTOW Average Fuel Consumption: 4,770 pph (3,300 NM)

Add 8 % and 1.5 N1 to fuel consumption values for **Mach 0.80 (460 kts)**

Add 14 % and 2.5 N1 to fuel consumption values for **Mach 0.82 (475 kts)**

***** NOTE: Groundspeed INCREASES 1 knot for every 1°C Above Standard**
Groundspeed DECREASES 1 knot for every 1°C Below Standard***

LANDING SPEEDS:

Weight	Flap 30	Flap 40
128,000 lb	146	139
121,000 lb	142	137
110,000 lb	134	130
99,000 lb	127	123
88,000 lb	119	116

PERFORMANCE DATA WORKSHEET (For the Human FMC !!)

Departure Weather:

Temp _____ °C Headwind Component _____ kts ("-" for tailwind)
Crosswind Component _____ kts

Landing Weather:

Temp _____ °C Headwind Component _____ kts ("-" for tailwind)
Crosswind Component _____ kts

Field Data:

Departure Elevation _____ ft. Available Runway Length _____ ft.
Landing Elevation _____ ft. Available Runway Length _____ ft.

Payload Weights:

PAX _____ (+ 4 Crew) x 210 lbs = Payload _____ lbs ZFW _____ lbs

Compute Aircraft Weight using Fuel Consumption Table and Fuel Planning Form

Aircraft Weights:

Fuel on Board _____ lbs TOW _____ lbs
Est. Fuel Consumed _____ lbs ELW _____ lbs

Thrust Data:

Takeoff Thrust _____ %N1 Climb Thrust _____ %N1

Takeoff Data:

Required Field Length _____ ft. Runway Adequate? **Yes** **No**

V1 _____ kts. VR _____ kts. V2 _____ kts.

Flaps to 5 @ _____ kts. Flaps to 1 @ _____ kts. Flaps Up @ _____ kts.

Cruise Profile:

Preliminary Cruising Altitude: FL _____

Step Climb @ _____ lbs.

Final Cruising Altitude: FL _____

Airspeed: **0. _____ Mach**

Top of Descent Point: _____

Landing Data:

Required Field Length _____ ft. Runway Adequate? **Yes** **No**

VREF _____ kts. @ Flap _____

Trip Data:

Weight Off Wheels @ _____ GMT

ETA _____ GMT

Est. Fuel Consumed _____ lbs

ELW _____ lbs

Estimated Time En Route _____ hrs.

Actual Time of Arrival _____ GMT

Actual Fuel Consumed _____ lbs

Actual Landing Weight _____ lbs

TRIP FUEL PLANNING WORKSHEET (For the Human FMC !!)

Trip Distance: _____ nm True Airspeed _____ Mach Est. Ground Speed: _____ kts

Groundspeed increases/decreases 1 knot for every 1°C Above/Below Standard

Distance ÷ Ground Speed = Est. Time En Route: _____ hrs

Est. Time En Route + 1.6 (taxi, climb, reserves) = Required Endurance: _____ hrs

Est. Time En Route + 0.6 = Est. Endurance Used: _____ hrs

Payload + Empty Weight = Zero Fuel Weight: _____ lbs

Req. Endurance x 4,770 = Trip Fuel: _____ lbs

Zero Fuel Weight + Trip Fuel Weight = Gross Take Off Weight: _____ lbs

4,770 x Est. Endurance Used = Est. Fuel Consumed: _____ lbs

Subtract Est. Fuel Consumed from GTOW = Est. Landing Weight: _____ lbs

For departures ABOVE 150,000 lbs, use the ABOVE VALUES, Mach 0.785 cruise.

(Preliminary Altitude is FL330 [eastbound], FL350 [westbound]. Step Climb 4000' @ 130,000 lbs)

For Departures BELOW 150,000 lbs, Consult FUEL CONSUMPTION TABLE:

(Preliminary Altitude per Fuel Flow Chart. Step Climb if necessary per Fuel Flow Chart)

Subtract table weight Below GTOW from table weight Above GTOW = _____ lbs ("A")

Subtract table weight below GTOW from GTOW = _____ lbs ("B")

"B" ÷ "A" = 0. _____ (GTOW Factor)

Find Fuel Flow Values at Preliminary Cruising Altitude

Subtract Fuel Flow Below GTOW from Fuel Flow Above GTOW = _____ lbs ("C")

GTOW Factor x "C" = _____ lbs ("D")

"D" + Fuel Flow Below GTOW = _____ pph (F.F. #1)

Subtract table weight Below ELW from table weight Above ELW = _____ lbs ("E")

Subtract table weight below ELW from ELW = _____ lbs ("F")

"F" ÷ "E" = 0. _____ (ELW Factor)

Find Fuel Flow Values at Final Cruising Altitude

Subtract Fuel Flow Below ELW from Fuel Flow Above ELW = _____ lbs ("G")

ELW Factor x "G" = _____ lbs ("H")

"H" + Fuel Flow Below ELW = _____ pph (F.F. #2)

F.F.#1 x 2 = _____ pph ("X")

F.F.#2 x 3 = _____ pph ("Y")

"X" + "Y" = _____ pph ("Z")

"Z" ÷ 5 = _____ pph Revised Average Fuel Consumption [RAFC]

Re-compute all weights using RAFC value:

Req. Endurance x RAFC = Revised Trip Fuel: _____ lbs

Zero Fuel Weight + Revised Trip Fuel = Revised GTOW: _____ lbs

RAFC x Est. Endurance Used = Revised Est. Fuel Consumed: _____ lbs

Subtract Rev. Est. Fuel Consumed from Revised GTOW = Revised ELW: _____ lbs

CHECKLISTS (Normal Operation)

BEFORE TAKEOFF:

Fuel	Calculated and Loaded
ATIS	Logged
Runway Length	Adequate
Altimeter	Set
Nav Frequencies	Set
Takeoff / Climb Thrust Calculated	Yes
V Speeds Calculated	Yes
Anti-Ice	Off
Speedbrake	Off
Flaps	Set
Trim	Set
Autopilot Vertical Profile	Set
Autopilot Heading	Set
Landing Lights	On

AFTER TAKEOFF:

Gear	Up and Locked
Flaps	Up
Anti-Ice	As Needed
Landing Lights	Off
Altimeter	29.92/1013 above FL180

CRUISE:

Anti-Ice	Off
True Airspeed	As Planned
N1 %	Within +/- 1 point
Groundspeed	As Filed
Fuel Consumption	As Planned
Step Climb	As Filed

*****If groundspeed differs from estimate by more than +/- 10 knots, recalculate fuel consumption / range / landing weight*****

DESCENT:

Anti-Ice	As Needed
Airspeed	M0.780 / 280 KIAS
Flaps	As Needed

BEFORE LANDING:

Anti-Ice	As Needed [Clean Only]
Nav Frequencies / Radials / ILS	Set
Landing Lights	On
Flaps	As Needed

FINAL APPROACH:

Anti-Ice	Off
Autopilot Go-Around Altitude / Vertical Speed	Set
Speedbrakes	Armed
Landing Gear	Down / 3 Greens
Flaps	Set
Airspeed	Slow to VREF

MISSED APPROACH:

Speedbrakes	Off
Flaps	Set to 15
Landing Gear	Up and Locked
Anti-Ice	As Needed [Clean Only]

AFTER LANDING:

Thrust Reverser	Disengaged
Speedbrakes	Off
Flaps	Up
Landing Light	Off

Speed Bug "Quick Guide"

Fold this sheet and set it in front of your monitor. Create these "Bugs" for yourself like a real glass cockpit would!

(Fold or Cut Here)

Takeoff Thrust _____ **N1**

Climb Thrust _____ **N1**

V1 _____ **kts**

VR _____ **kts**

V2 _____ **kts**

To Flap 5 @ _____ **kts**

To Flap 1 @ _____ **kts**

Flaps Up @ _____ **kts**

(Fold or Cut Here)

VREF _____ **kts @ Flap** _____