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## Operations Manual

# ***Boeing 747-200/300***



TAXI, TAKEOFF, CLIMB, CRUISE, DESCENT & LANDING

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## Operations Manual

# Welcome Aboard

Thank you for purchasing Commercial Level Simulations Boeing 747 classic! We hope you enjoy flying the classic "Queen of the Sky". We're proud to present your our rendition of the Boeing 747 classic, featuring the -200 and -300 variants. We've invested a lot of hours to develop and to bring you a high quality rendition of the classic 747.

The Exterior Model is the most detailed Exterior Model we've ever built. It is an accurate and detailed rendition of the classic 747. All Engine Variants are modelled (GE, PW and RR) for both -200 and -300 Combi/Freighter/Pax. With 65 highly detailed liveries of all major real world operators past and present, you'll be sure to enjoy logging many flight hours either you fly as a pax pilot or a freighter pilot, it's entirely your choice! Than there is also the most detailed Virtual Cockpit we've ever built, based on the Tape Gauge version of the Boeing 747 classic cockpit. There is also INS for those who prefers to fly the Classic with a taste of classic navigation. You can also opted to fly with our famous F-Lite style FMC to fly the classic with modern taste.

The Flight Dynamics (FDE) are based on the real world and available data on the Boeing 747 classic. The exterior and interior sound have been specially developed and tuned to closely resembles the sound of a real Boeing 747 classic. There're different soundsets for all 3 engine variants (GE, PW and RR)

This Operation Manual have been put together with Essential and Necessary informations in order for you to properly control and fly the Boeing 747 classic.

We are certain and very positive that you will enjoy flying our Boeing 747 classic product! Once again thank you for your purchase!

Best Regards,

Commercial Level Simulations

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## Preface

This manual serves as a reference for operating procedures and training maneuvers. The flight profiles show the basic recommended configuration during flight.

The maneuvers should normally be accomplished as illustrated. However, due to airport traffic, ATC distance separation requirements, and radar vectoring, modifications may be necessary.

Exercise good judgment.

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### **Commercial Level Simulations – Boeing 747 Version 2008.2 (SP2)**

The visual model, 2D panel, virtual cockpit, virtual cabin, flight dynamics, and graphic art textures are based on photos, data currently obtainable from the internet, the FAA, and aircraft manuals.

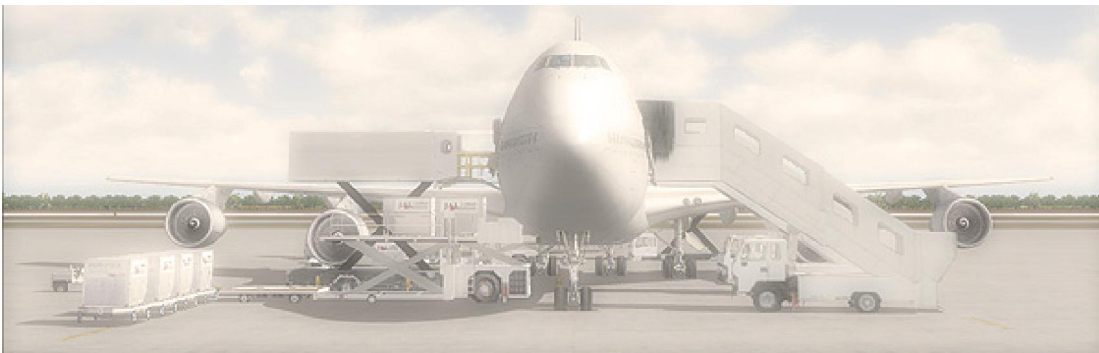
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### The Original "Queen of the Sky"

Boeing launched the "747" program in 1960s when the world economy was booming, there was a tremendous growth for Air Travel. Boeing 747 development was proposed by American's Pan Am airliner which at that time needed plane much bigger than the Boeing 707 which carried 120 passengers to handle increasing passengers. If Boeing can build a passenger jet that can carry 350 passengers at mach 0.9 trans-oceanic routes, Pan Am would buy it, Boeing then said to Pan Am, they got themselves a deal. To build the would be the World's Largest Jet, Boeing Company at that time didn't have a lot of space needed to build it, so the company purchased a 773 acres site in Everett, Washington.

After a lot of development stages and manufacturing process, Boeing has built it's first ever Boeing 747 which was registered N747. On February 9 1969 the first built Boeing 747 had its first flight, at that time still, many people doubt that it'll ever fly. But their doubts have been answered when the 747 picked up its takeoff speed and gracefully lifted off to the sky. The first successful flight of the 747 then was followed by rigorous testing it has went through a lot of testing from striking the tail to a rejected take off test. All tests were conducted for Boeing 747 to gain its FAA certificate which is needed before it can start service, in December 1969, Boeing 747 received its FAA certificate, thus in January 1970, the Boeing 747 entered it's first commercial flight for Pan Am the launch customer flying non stop from New York to London vice versa.

The successful launch of the -100 prompted Boeing to develop a new version, thus the -200 was developed, it's structurally stronger version than the -100 came out in 1970. The -300 with its stretched upper body which carries 44 more passengers was debuted in 1982. Today's 747 generation is the -400 version a completely new version of the original 747 with its modern flight deck which just needed 2 crew to operate (Captain and F/O) instead of the 3 crew operation (Captain, F/O and Flight Engineer). Boeing 747 is not only for passenger use, it's also for a freighter use. Thus there are a complete 747 for freighter, there are also passenger and freighter combinations 747 known as "Combi". The latest version of the 747 today is the 747-400ER (Extended Range) which has further more range than the -400; it features a re-fined cockpit with its crystal clear LCD instrument system and also a Boeing 777 style cabin.

Today there are over 15 million flights on a 747 world wide. Although the Boeing 747 reign as the World's Largest Passenger jet was taken over by Airbus's A380, it is still the original "Queen of the Sky" which changed the air traveling forever.





## **Boeing 747-200/300 - PRINCIPLE DIMENSION AND AREAS**

Height	63 ft 5 In
Length	231 ft 10 In
Span	195 ft 8 In (211 ft 5 in, 213 ft – fueled)
Engine to Ground Distance	Minimum -- 3 ft and 9 in Maximum -- 4 ft and 6 in
Fuselage to Engine Distance	39 ft and 9 in (255 in)
Landing Gear	Track -- 12 ft 7 in (inner main gear) 36 ft 1 in (outer main gear) Wheelbase -- 84 ft and 0 in

## **Boeing 747-200 - PERFORMANCE SPECIFICATIONS**

Maximum takeoff weight	833,000 lb (374,850 KG)		
Range and Target Fuel Burn			
<b>Boeing 747-200</b>	<b>GE</b>	<b>PW</b>	<b>RR</b>
Fuel Burn - 4 Engines - PPH	23320	22628	22440
Range	6370 nm	6560 nm	6620 nm
GE = General Electric   PW = Pratt Whitney   RR = Rolls Royce			



Above: Garuda Indonesia Boeing 747-200 making a turn after takeoff

## **Boeing 747-300 - PERFORMANCE SPECIFICATIONS**

Maximum takeoff weight	833,000 lb (377.840 KG)		
Range and Target Fuel Burn			
<b>Boeing 747-300</b>	<b>GE</b>	<b>PW</b>	<b>RR</b>
Fuel Burn - 4 Engines - PPH	24192	23468	23620
Range	6140 nm	6330 nm	6290 nm
GE = General Electric   PW = Pratt Whitney   RR = Rolls Royce			

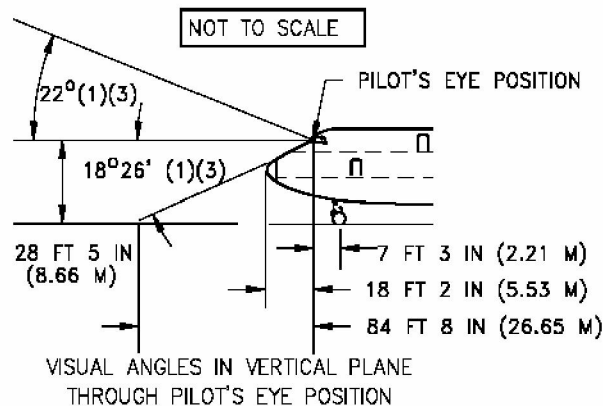


Above: Cathay Pacific Boeing 747-300 taking off



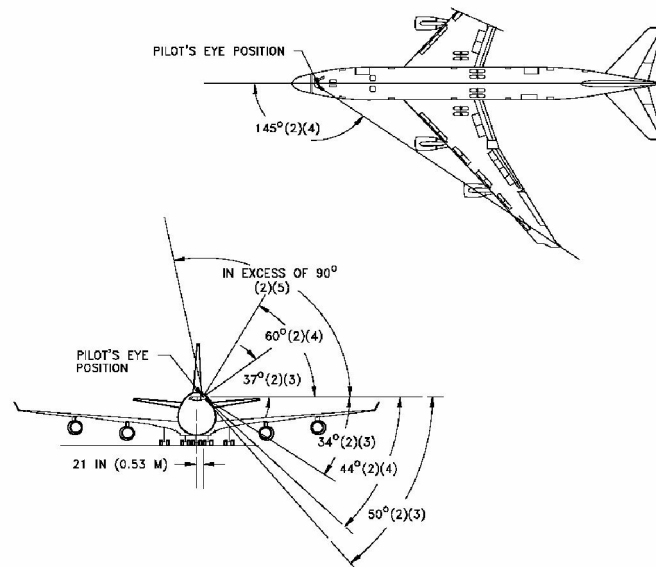
## Basic Pilot Information

**Use caution while taxiing** - Pilot's view reference point is approximately 18.26 feet from the ground, with ground visibility limited to 28.5 feet looking down at an angle of 22 degrees:



Above: Pilot's eye position diagram 1 – Diagram A

For proper engine and aircraft operations, the captain must view the EICAS as the engines and wings **are not** visible from the flight deck. Pilot's rearward view is based on the captain's eye reference point with 145 degrees of travel.



Above: Pilot's eye position diagram 2 – Diagram B



Above: Qantas Boeing 747-300 taxiing for takeoff

## **TAXI – Part 1**

- 1) The nose wheel steering and the engine thrust are used to taxi the airplane.
- 2) Be sure that you have the necessary clearance when you go near a parked airplane or other structures.
- 3) Set takeoff flaps. CLS recommended setting is Flaps 10, or Flaps 20, weight dependent. See speed reference charts.
- 4) When the APU in the taxi airplane or the parked airplane is on you must have a minimum clearance of 50 feet between the APU exhaust port and the adjacent airplane's wingtip (fuel vent).
- 5) The taxi speed must not be more than approximately 30 knots. Speeds more than 30 knots added to long taxi distances would cause heat to collect in the tires. Recommended speed is 20 knots. Beware of changing GS numbers due to tailwinds during taxi.
- 6) Before making a turn, decrease the speed of the airplane to a speed of approximately 8 to 12 knots. Make all turns at a slow taxi speed to prevent tire skids.
- 7) Do not try to turn the airplane until it has started to move.
- 8) Make sure you know the taxi turning radius.
- 9) Monitor the wingtips and the horizontal stabilizer carefully for clearance with buildings, equipment, and other airplanes.



## **TAXI – Part 2**

10) When a left or right engine is used to help make a turn, use only the minimum power possible.

11) Do not let the airplane stop during a turn.

12) Do not use the brakes to help during a turn. When you use the brakes during a turn, they will cause the main and nose landing gear tires to wear.

13) When it is possible, complete the taxi in a straight-line roll for a minimum of 10 feet.

NOTE: This will remove the torsional stresses in the landing gear components, and in the tires.

14) Use the Inertial Reference System (IRS) in the ground speed (GS) mode to monitor the taxi speed.

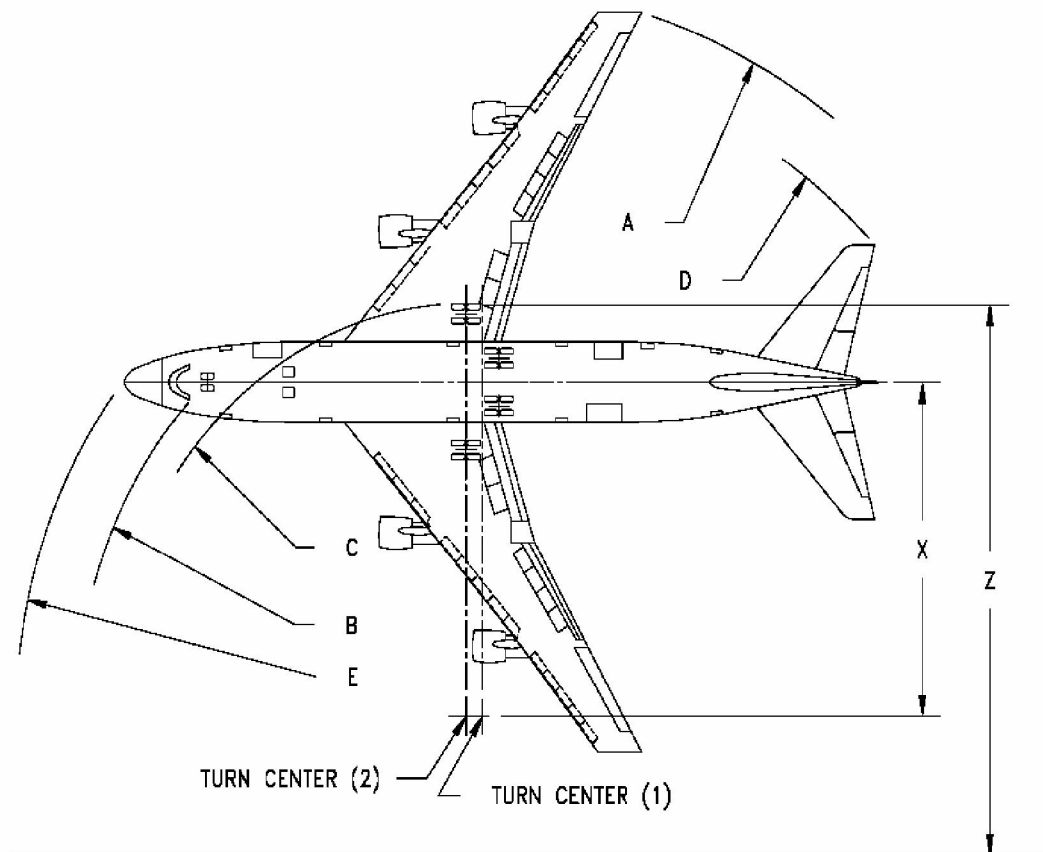
15) If the airplane taxi speed is too fast (with the engines at idle), operate the brakes slowly and smoothly for a short time. NOTE: This will decrease the taxi speed.

16) If the taxi speed increases again, operate the brakes as you did in the step before.

17) Always use the largest radius possible when you turn the airplane. NOTE: This will decrease the side loads on the landing gear, and the tire wear will be decreased.

### TAXI – Part 3

18) **Extra care must be given to turn the aircraft due to the fuselage length and wingspan.** A minimum distance from the edge of the pavement must be maintained to reverse the aircraft's direction. Minimum distance is 113 FT. of pavement.



Above: Turning a Boeing 747 diagram – Diagram C

19) Operate the brakes to stop the airplane.

20) Set the parking brake after the airplane has stopped.





Above: Malaysia Boeing 747-200 powerful takeoff

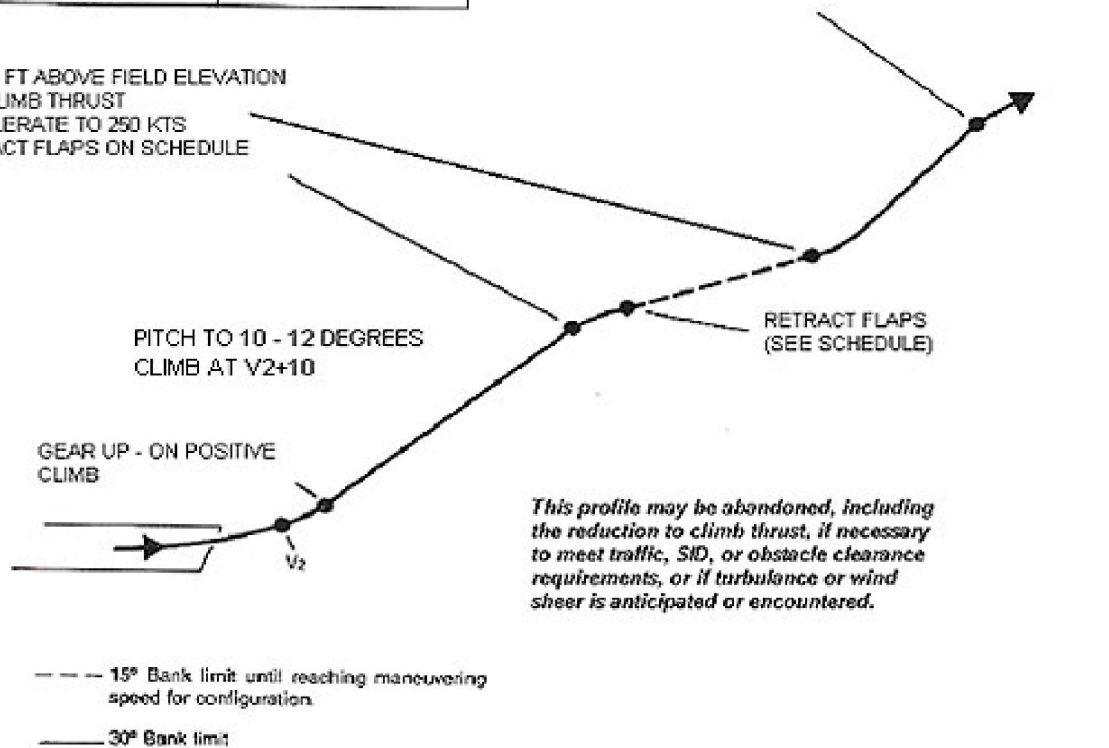
### **TAKEOFF – Part 1**

- 1) Please ensure that you have the correct trim setting (see diagram F). If you are using non EZ FDE please see diagram G. Align aircraft with runway centerline.
- 2) Increase power to approximately 60% N1, pause briefly to verify that engines have stabilized.
- 3) Watch EICAS indicator for engine problems or aircraft alarms.
- 4) Increase power smoothly to pre-determined N1 speeds based on aircraft takeoff weight, (85% - 105% N1). This can either be done manually or using the autothrottle with the autopilot engaged.
- 5) At Vr, smoothly rotate aircraft 8 degrees upwards at a pitch rate of 2 – 3 degrees per second. **DO NOT rotate more than 8 degrees to avoid tail strike. Tail strike will occur at 11 degrees rotation.**
- 6) Hold nose at +10 - 12 degrees after positive rate of climb is confirmed, then raise landing gear after V2.

## TAKEOFF – Part 2

TAKEOFF FLAP RETRACTION SCHEDULE WHILE ACCELERATING	
AT	SELECT FLAPS
230	20
240	10
250	5

AT 1000 FT ABOVE FIELD ELEVATION  
- SET CLIMB THRUST  
- ACCELERATE TO 250 KTS  
- RETRACT FLAPS ON SCHEDULE



### NORMAL TAKEOFF FLAPS 10 - 20

Above: Takeoff Diagram – Diagram D



### **TAKEOFF – Part 3**

- 7) Set initial climbout speed to V2+10 KTS.
- 8) Maintain +10 - 12 degrees climb to 1500 FT, or obstacle clearance, whichever is higher. +10 degrees climb after 1500 FT.
- 9) At 1500 FT above field elevation, begin slat retraction per retraction table. Maximum slat speed limits are:

<b>Slat Position</b>	<b>Max Speed</b>
1	280
5	260
10	240
20	230
25	205
30	180

Diagram E

- 10) Increase speed to 230 – 250 in accordance with ATC instructions (max 250 KTS below 10,000 FT).
- 11) For full maneuverability beneath 10,000 FT, slats must be fully retracted with aircraft at minimum safe airspeed.

## TAKEOFF Reference Chart – Part 1

# STAB TRIM SETTING

GROSS WEIGHT 1000 KG	CG & MAC																																	
	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33									
STABILIZER TRIM UNITS FOR TAKEOFF																																		
360 & ABOVE	9 1/2	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4
340	9 1/4	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	
320	9	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4
300	8 3/4	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2
280	8 1/2	8 1/4	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4
260	8	7 3/4	7 1/2	7 1/4	7	6 3/4	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	1/8	
240	-	-	-	-	6 1/2	6 1/4	6	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	1/8	1/16		
220	-	-	-	-	5 3/4	5 1/2	5 1/4	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	1/8	1/16	1/32	1/64	1/128		
200	-	-	-	-	5	4 3/4	4 1/2	4 1/4	4	3 3/4	3 1/2	3 1/4	3	2 3/4	2 1/2	2 1/4	2	1 3/4	1 1/2	1 1/4	1	3/4	1/2	1/4	1/8	1/16	1/32	1/64	1/128	1/256	1/512	1/1024		

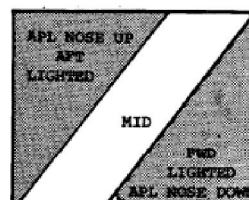
NOTE: IF INTERPOLATION RESULTS IN A SETTING WHICH IS ON A MID BAND BOUNDARY, SELECT THE ADJACENT APL NOSE DOWN OR APL NOSE UP GREEN BAND.

GREEN BAND  
SELECT SWITCH  
POSITION

The diagram is a square divided into four quadrants by a diagonal line from the top-left to the bottom-right. The top-left quadrant is labeled 'APL NOSE UP' and 'AFT LIGHTED'. The top-right quadrant is labeled 'MID'. The bottom-left quadrant is labeled 'FWD LIGHTED'. The bottom-right quadrant is labeled 'APL NOSE DOWN'.

NOTE: IF INTERPOLATION RESULTS IN A SETTING WHICH IS ON A MID BAND BOUNDARY, SELECT THE ADJACENT APL NOSE DOWN OR APL NOSE UP GREEN BAND.

GREEN BAND  
SELECT SWITCH  
POSITION



Above: Stab Trim setting diagram – Diagram F



Above: if you are not using EZ FDE, your Trim for takeoff when full heavy should be 4 1/2 degrees nose up. If you are using EZ FDE, it will not be required to set trim – Diagram G

## TAKEOFF Reference Chart – Part 2

### MAX TAKEOFF N1

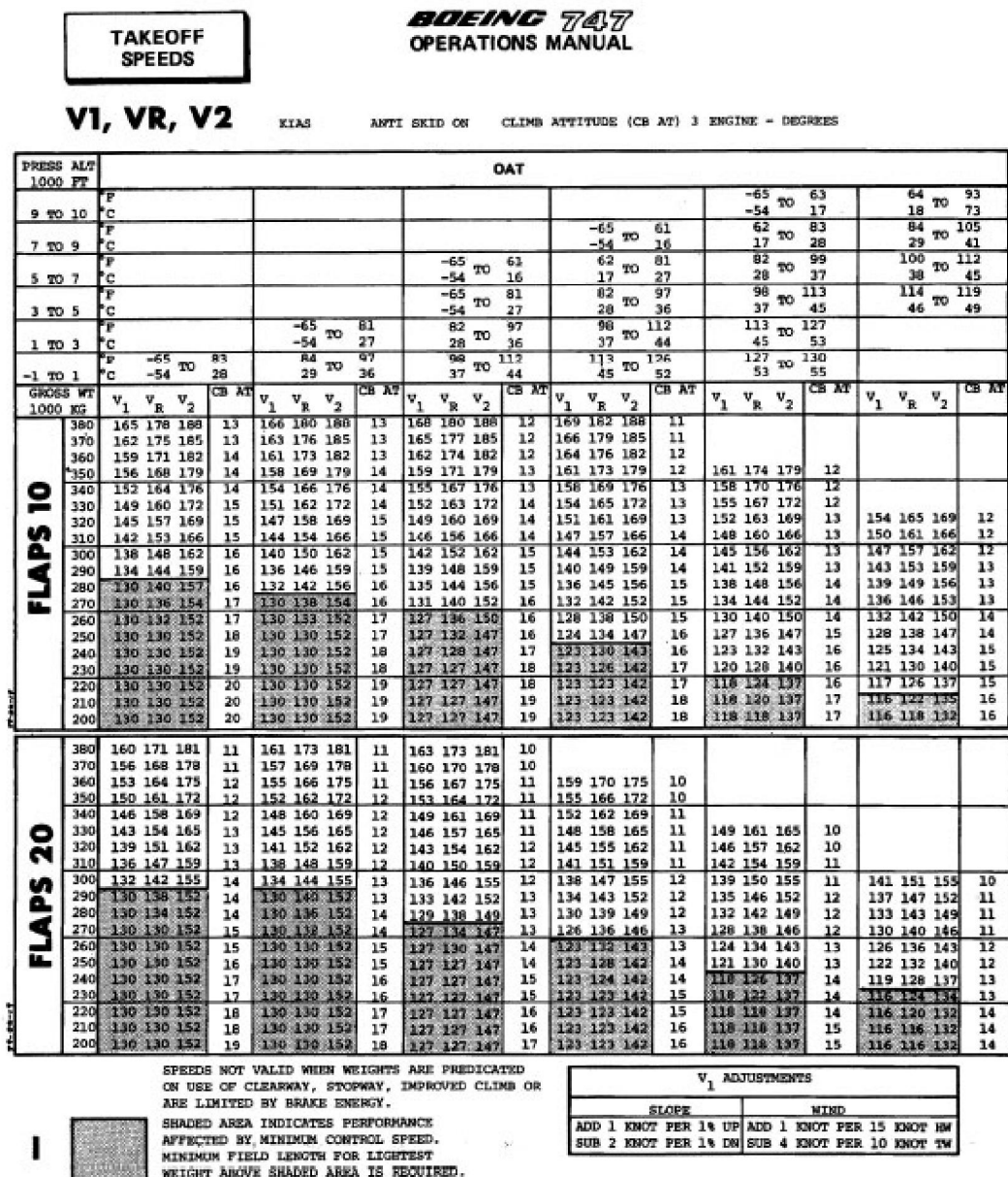
40 TO 80 KNOTS

4 BLEEDS ON, 3 PACKS ON

AIRPORT	°F	-58	-40	-22	-4	14	32	41	50	59	68	77	86	95	104	113	122	130
O A T	°C	-50	-40	-30	-20	-10	0	5	10	15	20	25	30	35	40	45	50	54
AIRPORT PRESSURE ALTITUDE FEET	-1000	96.3	98.3	100.4	102.4	104.4	106.4	107.4	108.3	109.3	110.2	111.2	112.1	112.5	111.3	110.2	108.9	107.8
	0	97.6	99.7	101.7	103.8	105.8	107.8	108.8	109.8	110.7	111.7	112.6	113.5	112.5	111.3	110.2	108.9	107.8
	1000	98.3	100.4	102.5	104.5	106.5	108.6	109.6	110.6	111.6	112.5	113.5	113.5	112.5	111.3	110.2	108.9	107.8
	2000	99.0	101.1	103.2	105.3	107.4	109.4	110.4	111.4	112.4	113.3	114.3	113.5	112.5	111.3	110.2	108.9	107.8
	3000	99.7	101.8	104.0	106.1	108.1	110.2	111.2	112.2	113.1	114.1	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	4000	100.4	102.6	104.7	106.9	108.9	111.0	112.0	113.0	114.0	114.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	5000	101.1	103.3	105.5	107.6	109.7	111.7	112.8	113.8	114.8	115.8	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	6000	101.8	104.0	106.2	108.4	110.5	112.5	113.6	114.6	115.6	115.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	7000	102.5	104.7	106.9	109.1	111.2	113.3	114.3	115.4	116.4	115.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	8000	103.2	105.5	107.7	109.9	112.0	114.1	115.1	116.1	116.9	115.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	9000	103.6	105.9	108.1	110.2	112.3	114.4	115.4	116.5	116.9	115.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8
	10000	104.0	106.2	108.4	110.6	112.7	114.8	115.8	116.7	116.9	115.9	114.7	113.5	112.5	111.3	110.2	108.9	107.8

Above: Max Takeoff N1 chart – Diagram H

## TAKEOFF Reference Chart – Part 3





## CLIMB – Part 1



Above: Japan Airlines Boeing 747-300 climbing

- 1) Select highest CLB N1 setting. Once climb thrust or airspeed is set, the autopilot will compensate for environmental condition changes automatically during the climb.
- 2) It is recommended that the aircraft be flown manually up to 15,000 FT, weather and ATC traffic conditions permitting. However, in high traffic conditions, to ease the workload of the pilot, the autopilot MCP altitude intervention may be engaged above a minimum altitude of 80 FT with the landing gear up.
- 3) Climb settings use a 10 – 20% derate of thrust up to 10,000 FT, then increases linearly to max thrust at 30,000 FT.
- 4) For **enroute climb**, climb at a rate of 1800 - 3000 FPM, pursuant to ATC and traffic conditions. If there are no altitude or airspeed restrictions, accelerate to the recommended speed. The sooner the aircraft can be accelerated to the proper climb speed, the more fuel and time efficient the flight.
- 5) As **engine and wing icing** may occur during the climb and descent, the engine anti-icing system should be in the AUTO or ON position whenever icing is possible. NOTE: Failure to do so may result in engine stall, overheating, or engine damage.
- 6) For **normal economy climb**, follow ATC speed restrictions of 250 KTS below 10,000 FT. If permitted by ATC and no speed restriction below 10,000 FT, increase speed to 290 KTS. Above 10,000 FT, climb at 330 KTS or .85 MACH. Climb speed table is as follows – See Diagram J

## CLIMB – Part 2

ALTITUDE	SPEED
Sea Level to 10,000 FT	250 KTS
Above 10,000 FT	330 KTS/.85 MACH

Above: Climb Speed table - Diagram J

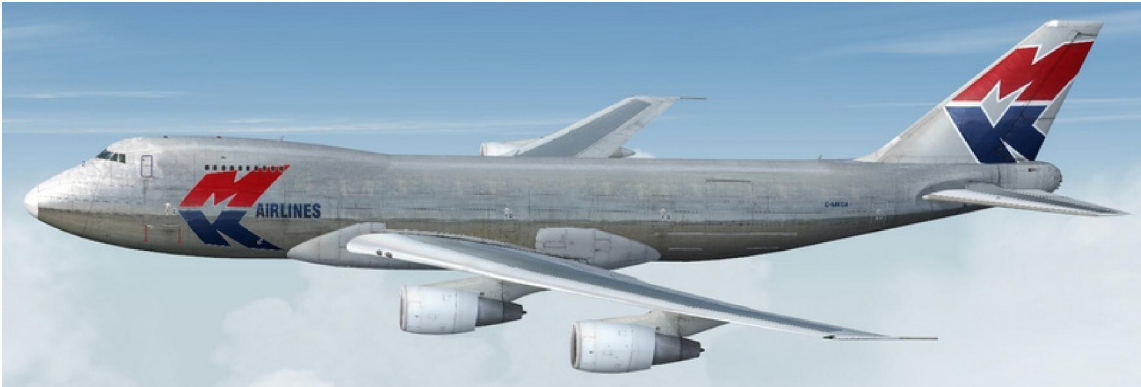
- 7) **Max climb speed** is 330 knots until reaching .85 MACH at initial cruise altitude.
- 8) **For engine out climb**, speed and performance varies with gross weight and altitude, however 260 knots at 1000 – 1500 FPM may be used.
- 9) Set **standard barometer** above airport transition level (depends on local airport geography).

## MAX CLIMB N<sub>1</sub> 250/280/.80

FLIGHT LEVEL	SPEED IAS/MN	TOTAL AIR TEMPERATURE (TAT) °C															
		-20 OR COLDER	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55
350	280/.80	112.0	113.1	112.0	111.0	110.3	109.8	109.2	108.4	107.7	107.0	106.2	105.5	104.8	104.2	103.6	103.2
330	280/.79	110.3	111.4	110.3	111.1	110.3	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
310	280/.76	109.4	110.4	111.5	111.1	110.3	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
290	280/.73	108.5	109.5	110.5	111.1	110.3	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
270	280/.70	107.7	108.7	109.7	110.7	110.3	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
250	280/.67	106.9	107.9	108.9	109.9	110.3	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
200	280/.61	104.6	105.6	106.6	107.6	108.6	109.6	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
160	280/.56	102.9	103.9	104.9	105.9	106.9	107.9	108.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
140	280/.54	101.9	102.9	103.9	104.9	105.9	106.9	107.9	108.0	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
120	280/.52	100.8	101.8	102.8	103.8	104.8	105.8	106.8	107.8	107.1	105.9	104.3	103.0	102.0	101.3	100.9	100.5
100	250/.45	100.7	101.8	102.8	103.7	104.7	105.6	106.6	107.5	106.8	105.7	104.3	103.2	102.3	101.5	101.0	100.6
050	250/.41	97.0	98.0	98.9	99.9	100.8	101.7	102.6	103.5	104.4	105.1	103.9	102.7	101.9	101.1	100.6	100.4
0	250/.38	93.3	94.2	95.1	96.0	96.9	97.8	98.7	99.6	100.5	101.3	102.1	102.8	101.4	100.8	100.2	100.0

N <sub>1</sub> CORRECTION FOR A/I ON	
NACELLE ONLY	-.5
WING ONLY	-.5
NACELLE + WING	-1.0

Above: Max Climb N<sub>1</sub> – Diagram K



Above: MK Airlines Boeing 747-200 cruising the sky

### **CRUISE – Part 1**

- 1) **Cruise** at 84 - .85 MACH.
- 2) **Headwinds** will increase engine power, reduce cruise speed and decrease range.
- 3) **Tailwinds** will decrease engine power, increase cruise speed and increase range.
- 4) Follow previously entered FMC waypoints.
- 5) **Fuel Freeze** -- Extended operation at cruise altitude will lower fuel temperature. Fuel cools at a rate of 3 degrees C per hour, with a max of 12 degrees C in extreme conditions. Fuel temperatures tend to follow TAT (total air temperature). To raise fuel temperature/TAT, a combination of factors can be employed:
  - Descend into warmer air.
  - Deviate to warmer air.
  - Increase Mach speed.

An increase of 0.01 MACH will increase TAT by 0.5 – 0.7 degrees C.

## CRUISE – Part 2

- 6) **Increased fuel burn** can result from:
  - High TAT
  - Lower cruiser altitude than originally planned.
  - More than 2,000 FT above the optimum calculated altitude.
  - Speed faster or slower than .85 MACH cruise.
  - Strong headwind.
  - Unbalanced fuel.
  - Improper aircraft trim.
- 7) **Fuel penalties** are:
  - 2000 FT above optimum – 3 percent increase in fuel usage
  - 4000 FT below optimum – 5 percent increase in fuel usage
  - 8000 FT below optimum –12 percent increase in fuel usage
  - M.01 above M.85 – 3 percent increase in fuel usage
  - Higher climb rates, 3000 fpm over 29,000 – increased fuel usage
- 8) In the case of **engine out cruise**, it may be necessary to descend. NOTE:  
For 747 **three engined** limitations, divert to the nearest available airfield to avoid overstressing engines and unnecessary risk. Use good judgement to select an airfield that can accommodate an aircraft of this size.  
Consideration must also be giving to ground facilities to accommodate number of passengers on board.
- 9) Trim aircraft for proper elevator alignment.
- 10) In case of engine out cruise, trim rudder for directional alignment.
- 11) Deviate from flight plan for weather, turbulence, or traffic as necessary after receiving clearance from ATC.



## Cruising Reference Chart – Part 1

### ALTITUDE CAPABILITY

### BOEING 747 OPERATIONS MANUAL

FLIGHT LEVEL	CRUISE SCHEDULE	TAT FOR ISA C°	OPTIMUM FOR WEIGHT FOR FLIGHT LEVEL 1000 KG	GROSS WEIGHT 1000 KG CRUISE THRUST LIMITS		
				ISA + 10°C AND COLDER	ISA + 15°C	ISA + 20°C
430	LRC	-26	182	216	207	197
	.84	-26	184	220	212	201
	.86	-24	186	212	203	191
	.88	-23	175	189	179	165
410	LRC	-26	200	240	231	219
	.84	-26	206	244	236	224
	.86	-24	207	236	226	213
	.88	-23	194	210	200	186
390	LRC	-26	220	267	257	244
	.84	-26	228	271	263	250
	.86	-24	229	262	252	238
	.88	-23	214	234	223	208
370	LRC	-26	243	297	286	272
	.84	-26	253	301	292	279
	.86	-24	252	292	281	266
	.88	-23	235	261	249	233
350	LRC	-23	267	325	312	297
	.84	-23	279	330	319	304
	.86	-22	279	319	306	290
	.88	-20	258	285	271	253
330	LRC	-19	294	350	334	317
	.84	-19	309	356	342	324
	.86	-17	307	343	327	307
	.88	-16	285	305	288	266
310	LRC	-14	322	372	357	337
	.84	-14	341	372	365	343
	.86	-13	337	368	348	323
	.88	-11	315	326	304	277
290	LRC	-10	353	---	372	355
	.84	-10	370	---	372	360
	.86	-8	369	---	365	337
	.88	-7	348	343	315	284
270	LRC	-5	---	---	---	371
	.84	-5	---	---	---	372
	.86	-4	---	---	---	344
	.88	-2	---	352	319	282
250	LRC	-1	---	---	---	---
	.84	-1	---	---	---	---
	.86	1	---	---	---	347
	.88	2	---	355	316	270

Above: Altitude Capability Chart – Diagram L



Above: Alitalia Boeing 747-200 Descending towards it's destination

### **DESCENT & Landing – Part 1**

- 1) Descent at pre-determined TOD (Top of Decent)
- 2) Descend at 320 KT above 10,000 FT.
- 3) Use speedbrakes or thrust to minimize vertical path error.
- 4) Proper descent planning is necessary to ensure proper speed and altitude at the arrival point. Distance required for descent is 3NM/1000FT. Descent rates are as follows:

Intended Speed	Decent Rate	
	CLEAN	WITH SPEEDBRAKES
.85 MACH/320 KTS	2300 FPM	5500 FPM
250 KTS	1400 FPM	3500 FPM
VREF 30 + 80 KTS	1300 FPM	2400 FPM

Above: Descent Reference Chart – Diagram M

- 5) Plan to descend so that aircraft is at approximately 10,000 FT above ground level, 250 KTS, 30 miles from airport.

## DESCENT & Landing – Part 2

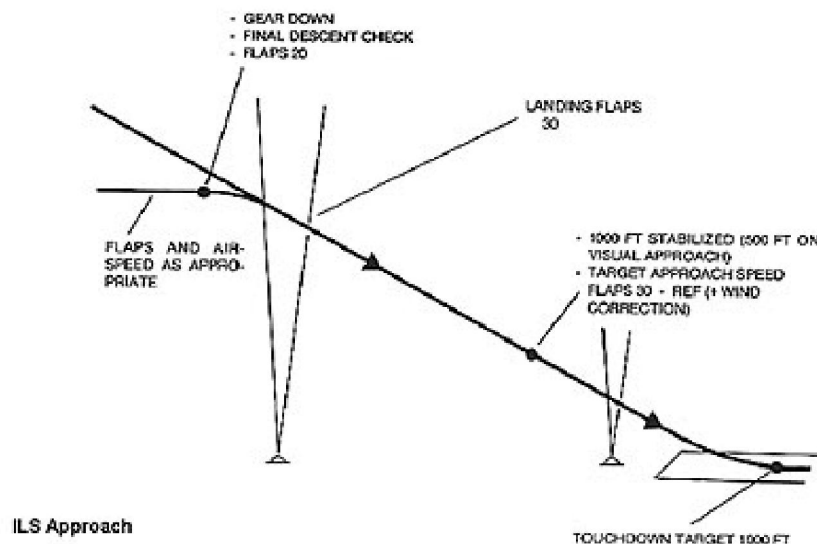
- 6) At average gross weights, it requires 80 seconds and 7 NMs to decelerate from 290 KTS to 250 KTS for level flight without use of the speedbrakes. It requires 120 seconds to slow from 290 KTS to minimum clean airspeed. Using speedbrakes will reduce the times and distances by half.
- 7) Arm speedbrakes and autobraking to position 1 or 2 on initial descent.
- 8) Set airport altimeter below transition level.
- 9) Avoid using the landing gear for drag above 180-200 KTS to avoid damage to doors or passenger discomfort.
- 10) **Recommended approach planning**, ATC and airport rules permitting:
  - 250 KTS below 10,000 FT, 30 miles from airport.
  - 180-230 KTS, 23 miles from airport.
  - 160 KTS, 16 – 17 miles from airport.
  - VREF, 5 – 7 miles from airport.
- 11) **In case of rapid descend due to depressurization**, bring aircraft down to a safe altitude as smoothly as possible. Using the autopilot is recommended. Check for structural damage. Avoid high load maneuvering.
- 12) **Bank Angle Protection (BAP)** is not available on the 747. Over 36 degrees of bank, an audio “bank angle” alarm will sound.
- 13) **Stall recovery** can be accomplished by lowering the aircraft’s nose and increasing power at once to gain airspeed. Beware of terrain. Accelerate to VREF 30 + 80 KTS. Do not retract gear until confirmed stall recovery and positive rate of climb. Keep nose at 5 degrees above the horizon or less.
- 14) If deployed, do not retract slats during the recovery, as it will result in altitude loss.
- 15) In the event of engine out approach, approach at VREF+5 @ flaps 20.
- 16) Under normal conditions land at VREF @ flaps 30. (For V-Speed Table, 747PERFORMANCE.PDF, or calculate on FMC.)

## DESCENT & Landing – Part 3

- 17) **ILS Approach** - During initial maneuvering for the approach, extend flaps to 10 and slow to 180-200kts. When the localizer is alive, extend flaps to 20 and maintain 180kts. At one dot below glideslope intercept, extend the landing gear and flaps to 25. Begin slowing to final approach speed. At the final approach fix, extend flaps to 30 and slow to  $V_{ref} + 5$ . Be stabilized by 1000 feet above field level. This means, gear down, flaps 30,  $V_{ref} + 5$  and engines spooled. Plan to cross the runway threshold at  $V_{ref}$ .
- 18) **Visual Approach** - Similar to the ILS approach. The major difference is that aircraft must be stabilized by 500 feet above field level, as opposed to 1000 feet.

747 Normal ILS Approach

MINIMUM MANEUVERING SPEEDS	
SELECTED FLAPS	SPEED
UP	220
5	200
10	180
20	160



ILS Approach

Above: Diagram of Normal 747 ILS Approach – Diagram N





Above: Garuda Indonesia Boeing 747-200 landing

### **DESCENT & Landing – Part 4**

- 19) A stabilized approach at  $V_{ref} + 5$  will result in a pitch attitude of 2-3 degrees nose up. Cross the threshold at  $V_{ref}$ . Begin the landing flare at about 30ft. Only about 1-2 degrees of pitch up is necessary. The tail will strike at approximately 9 degrees. Slowly reduce thrust to nearly idle. Landing with thrust at idle will result in a firm touchdown. Set thrust just above idle. At touchdown, fly the nosewheel on. At touchdown, autospoilers should deploy. Deploy reverse thrust. Normally, autobrakes 1 is sufficient stopping power. 2 is sufficient for short or wet runways. Be out of reverse thrust by 80kts to prevent foreign object damage to the engines.
- 20) For **wind correction**, add  $\frac{1}{2}$  the steady state wind plus the entire gust factor to the  $V_{ref}$ . Do not add more than 20 kts. When landing in a crosswind, do not bank excessively as wingtip or engine pod strike may occur.
- 21) The Commercial Level Simulations 747 is a CATII/III aircraft, meaning the aircraft is capable of landing on autopilot in conditions where visibility is down to 50ft AGL.
- 22) Land the aircraft.
- 23) Disengage (autopilot autothrottle will disengage) reverse thrust at 80 knots.
- 24) Disengage autobraking at 60 knots or as necessary.
- 25) Turn off onto high-speed taxiways at 30 knots or less.

## **DESCENT & Landing – Part 4**



Above: Air Canada Boeing 747-200 slowing down after landing

- 26) Reverse thrust is most effective at higher speeds. Slow to safe taxi speed with braking and exit the runway.
- 27) Decelerate to 8 – 12 knots for 90 degree turns.
- 28) Taxi to gate.

## Landing Reference

### LANDING SPEEDS

GROSS WT 1000 KG	380	370	360	350	340	330	320	310	300	290	280	270	260	250	240	230	220	210	200	190	180	170	160
V <sub>REF</sub>	180	177	174	171	168	165	162	159	157	153	150	146	143	140	137	134	130	127	124	121	118	114	111

ADD WIND FACTOR OF: 1/2 HEADWIND COMPONENT + GUST (MAX: 20 KNOTS)

### NORMAL FLAP EXTENSION SCHEDULE

SELECT FLAP POSITION	1	5	10	20	25	30
AT SPEED KIAS	V <sub>REF</sub> +80	V <sub>REF</sub> +60	V <sub>REF</sub> +40	V <sub>REF</sub> +20	V <sub>REF</sub> +10	V <sub>REF</sub> + 5

K41E-23.10.19 Rev B

Above: Landing Reference Chart – Diagram O

## Panel Description – Main Panel



### Tips

<b>Autothrottle</b>	Use this to manage the throttle thrust to match your indicated airspeed.
<b>Navigation Mode</b>	Select GPS to fly according to the default Flight Simulator flight planner waypoints.



## Panel Description – First Officer Panel



## Panel Description – INS



Please refer to separate manual for INS operation.

INS can be accessed by opening the Radio panel from simicons on the 2D panel and also you will need to open overhead panel.

## Panel Description – F Lite FMC – Part 1






The FMC (Flight Management Computer) that CLS uses in this aircraft utilizes the internal flight planner in MSFS (Microsoft Flight Simulator), therefore there is no lengthy procedure needed to input a flight plan into the FMC. Once you have established a flight plan in the sim it then can be displayed in the FMC and you can follow the route and view data on the waypoints along the way.

There is also a Direct To feature which will allow you to jump over one or more waypoints if desired. There are basically two ways to select the different pages in the FMC, one is by using the softkeys which are left and right of the display screen when the Main Menu is displayed. You can always go to the Main Menu by selecting the "Menu" button on the far right on the second row of buttons under the display screen.

To access the FMC panel click the FMC simicons.

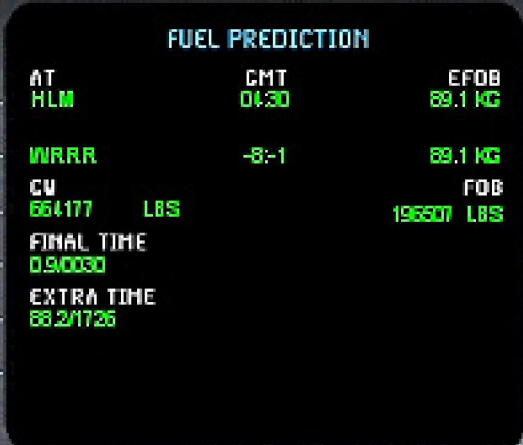
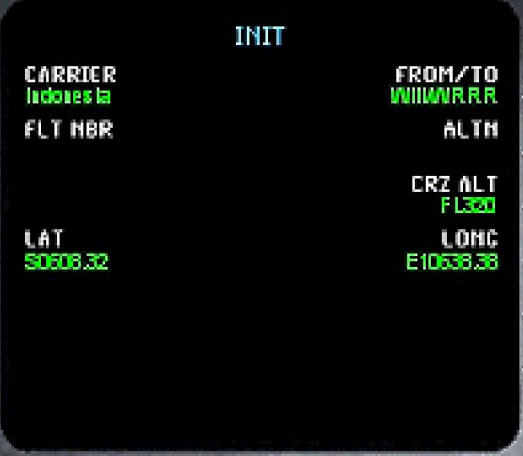



## Panel Description – F Lite FMC – Part 2

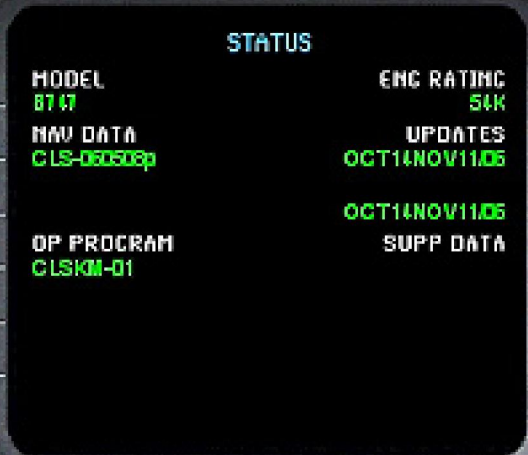
	<p><b><u>Approach</u></b></p> <p>Approach data</p>																					
	<p><b><u>DATA</u></b></p> <p>Displays the Data of the flight</p>																					
 <table><thead><tr><th></th><th>FLIGHT PLAN TIME</th><th>TRK</th></tr></thead><tbody><tr><td>HLM</td><td></td><td></td></tr><tr><td>KASAL</td><td>008 MIN</td><td>104 °</td></tr><tr><td>CA</td><td>005 MIN</td><td>105 °</td></tr><tr><td>PIALA</td><td>004 MIN</td><td>098 °</td></tr><tr><td>ANY</td><td>010 MIN</td><td>098 °</td></tr><tr><td>BA</td><td>008 MIN</td><td>089 °</td></tr></tbody></table>		FLIGHT PLAN TIME	TRK	HLM			KASAL	008 MIN	104 °	CA	005 MIN	105 °	PIALA	004 MIN	098 °	ANY	010 MIN	098 °	BA	008 MIN	089 °	<p><b><u>Flight Plan</u></b></p> <p>The Flight Plan page shows the waypoints of your flight based on default Flight Simulator planning. You will need to use default Flight Simulator Flight planner.</p>
	FLIGHT PLAN TIME	TRK																				
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ANY	010 MIN	098 °																				
BA	008 MIN	089 °																				



## Panel Description – F Lite FMC – Part 2

	<p><b><u>FUEL Prediction</u></b></p> <p>This calculates the fuel used during the flight.</p>
	<p><b><u>INIT</u></b></p> <p><b>Carrier:</b> This can be set by editing atc_airline parameter on the aircraft.cfg</p> <p><b>LAT:</b> The location in which the aircraft is at</p> <p><b>From/To:</b> Your flight to and from in airport ICAO code format.</p> <p><b>CRZ ALT:</b> You can set this from the Flight Simulator default flight planner.</p>
	<p><b><u>Main Menu</u></b></p> <p>Access the FMC function from here. You will see the main menu screen when you first open the FMC panel.</p>

## Panel Description – F Lite FMC – Part 2

 <p><b>RAD NAV</b></p> <table> <tr> <td>COM 1 122.95</td> <td>COM 2 119.90</td> </tr> <tr> <td>COM 1 STBY 118.00</td> <td>COM 2 STBY 121.70</td> </tr> <tr> <td>NAV 1 108.00</td> <td>NAV 2 113.30</td> </tr> <tr> <td>NAV 1 STBY 110.60</td> <td>NAV 2 STBY 109.60</td> </tr> <tr> <td>ADF 200.00</td> <td>XPDR 2210</td> </tr> </table>	COM 1 122.95	COM 2 119.90	COM 1 STBY 118.00	COM 2 STBY 121.70	NAV 1 108.00	NAV 2 113.30	NAV 1 STBY 110.60	NAV 2 STBY 109.60	ADF 200.00	XPDR 2210	<p><b><u>RAD/NAV</u></b></p> <p>Radio Frequencies</p>
COM 1 122.95	COM 2 119.90										
COM 1 STBY 118.00	COM 2 STBY 121.70										
NAV 1 108.00	NAV 2 113.30										
NAV 1 STBY 110.60	NAV 2 STBY 109.60										
ADF 200.00	XPDR 2210										
 <p><b>STATUS</b></p> <table> <tr> <td>MODEL B747</td> <td>ENG RATING 54K</td> </tr> <tr> <td>NAV DATA CLS-060508p</td> <td>UPDATES OCT14NOV1105</td> </tr> <tr> <td></td> <td>OCT14NOV1105</td> </tr> <tr> <td>OP PROGRAM CLSKM-01</td> <td>SUPP DATA</td> </tr> </table>	MODEL B747	ENG RATING 54K	NAV DATA CLS-060508p	UPDATES OCT14NOV1105		OCT14NOV1105	OP PROGRAM CLSKM-01	SUPP DATA	<p><b><u>Status</u></b></p> <p>This screen is static.</p>		
MODEL B747	ENG RATING 54K										
NAV DATA CLS-060508p	UPDATES OCT14NOV1105										
	OCT14NOV1105										
OP PROGRAM CLSKM-01	SUPP DATA										

### Panel Description – F Lite FMC – Part 3

	<p><b><u>Take Off</u></b></p> <p>Displays the information for Takeoff</p>
---	---

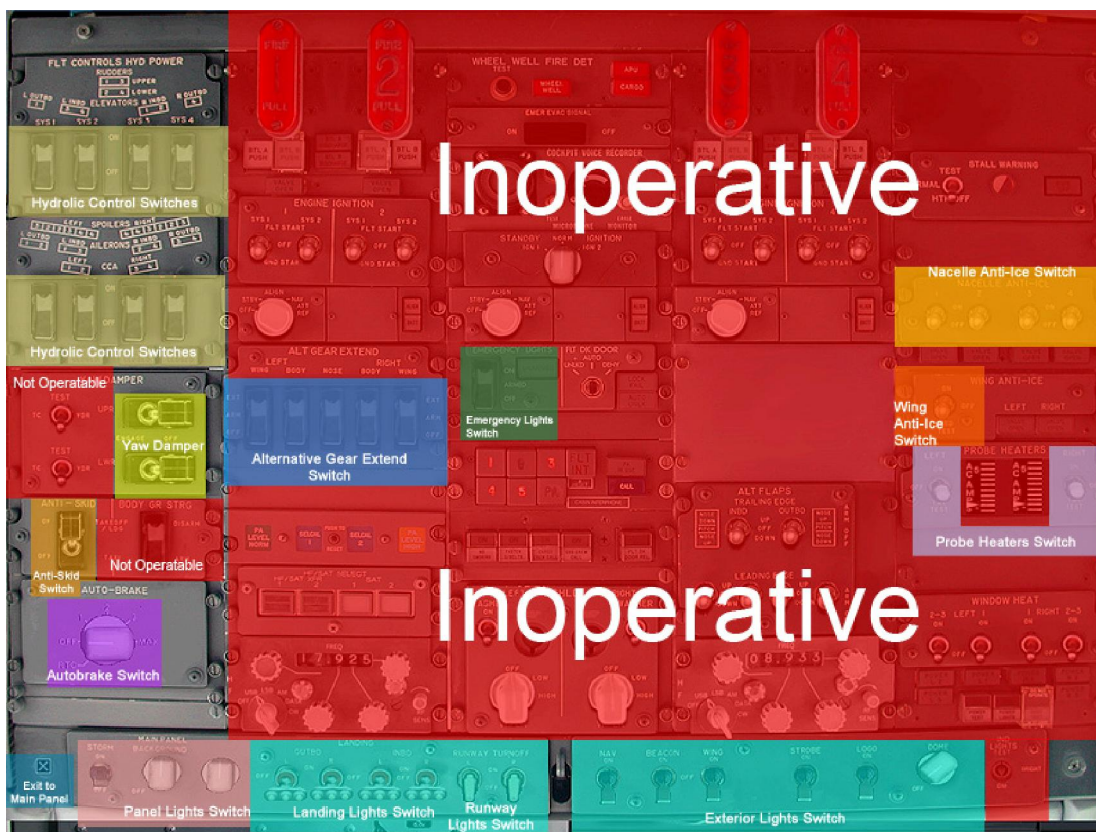
### Notice

This documentation does not provide tutorial for using the F-Lite FMC. Please download our DC10 manual which provides the tutorial for the F-Lite FMC. Our DC10 and Boeing 747 F-Lite FMC is the same.

Follow the link below to download the DC10 manual:

<http://www.commerciallevel.com/misc/DC10/manual.zip>

## Panel Description – Overhead Panel



### Tips

<b>Autobrake</b>	For takeoff, set autobrake to RTO (Rejected Takeoff)
<b>Anti-ice</b>	Ensure that you switch it on for flying in a cold weather



## Panel Description – Radio Panel



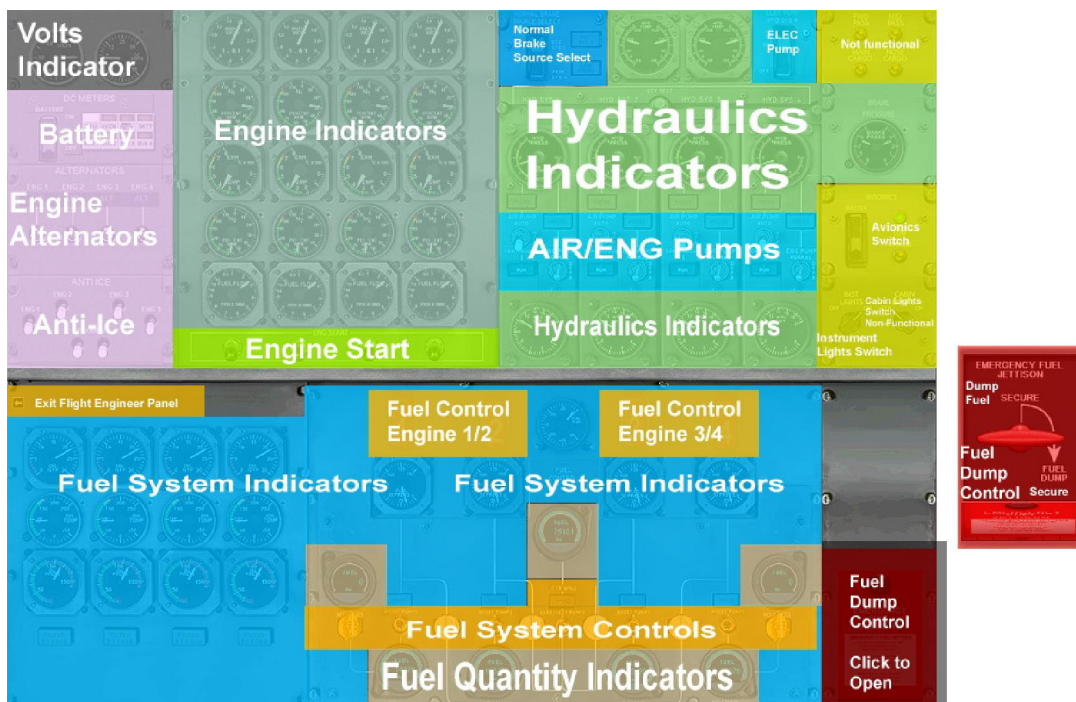
### Tips

#### COM1/NAV1 COM2/NAV2

On some addon scenery, this can be used to activate certain features such as docking, ground equipments and etc. Please refer to your addon scenery manual to determine whether by adjusting the COM/NAV can activate certain scenery feature.



## Panel Description – Flight Engineer Panel



### Tips

<b>Fuel Dump</b>	Use the Fuel Dump Control feature in an event you have to make emergency landing, you will need to dump fuel in order to safely land your plane on the ground.
------------------	--

## Panel Description – Throttle Panel – Part 1



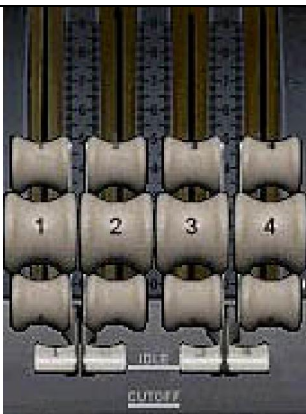
Above: The Throttle Panel Overview

### Engine Control


	<p><b><u>Engine Start Switches</u></b></p> <p><i>Tips: start from No 2 Engines, followed by 3 and 4 then finally a 1 Engine.</i></p>
---	--

## Panel Description – Throttle Panel – Part 2

### Engine Power Control





	<p><b><u>Engine Thrust Control</u></b></p> <p>Control the engine thrust power from here</p>
---	---

### Aircraft Control

	<p><b><u>Takeoff / Go Around</u></b></p> <p>Activate this for Takeoff / Go Around</p> <p><i>Tips: Takeoff: Flap 10/20 Landing: Flap 20/25/30</i></p>
--	--

## Panel Description – Throttle Panel – Part 3

### Aircraft Control - Continue

	<p><b><u>Flap Lever</u></b></p> <p>Press <b>F5</b> to retract fully          Press <b>F6</b> to retract accordingly          Press <b>F7</b> to expand accordingly          Press <b>F8</b> to expand fully</p> <p><i>Tips: Takeoff: Flap 10/20          Landing: Flap 20/25/30</i></p>
	<p><b><u>Speedbrake</u></b></p> <p>Press <b>/</b> to activate/deactivate spoiler on the wings  <i>Tips: You can slow the aircraft down for landing using speedbrake.</i></p> <p><b>Speedbrake Arm</b></p> <p>Press to activate/deactivate speedbrake arming</p>
	<p><b><u>Stab/Trim</u></b></p> <p>You can control the aircraft's stab and trim.</p> <p><i>Tips: Use proper trim setting for takeoff</i></p>
	<p><b><u>Parking Brake</u></b></p> <p>Activate/Deactivate Parking Brake  <i>Tips: Activate Parking Brake all the time when parking at the gate/ramp</i></p>

## Panel Description – Simicons – Part 1

### Simicons – From Left to Right



Above: The Simicons on the Captain Side

ATC	Click to open ATC Dialogue
Kneeboard	Click to open Kneeboard
World Map	Click to open World Map
GPS	Click to open GPS
Overhead	Click to open Overhead Panel
Radio	Click to open Radio Panel
Throttle	Click to open Throttle Panel
Flight Engineer	Click to open Flight Engineer Panel
VC Switch	Click to enable or disable VC – Disable VC and you will get wingview
Doors and Feature Switch	Click to open Doors and Feature switch
FMC	Click to open the FMC panel
F/O Panel Switch	Click to switch to First Officer Panel



Virtual Cockpit View

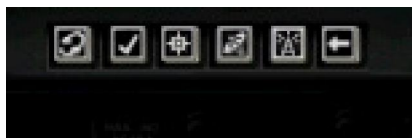


Wingview



## Panel Description – Simicons – Part 2

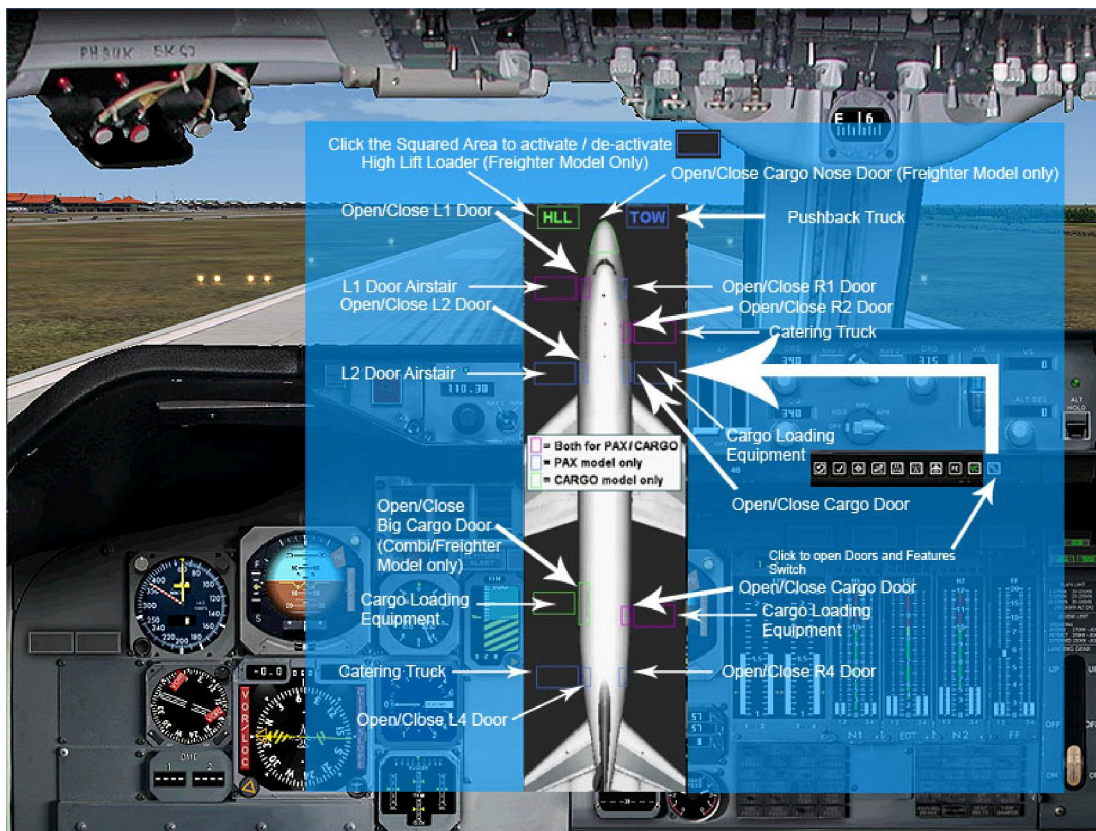
### Simicons – From Left to Right



Above: The Simicons on the F/O Side

ATC	Click to open ATC Dialogue
Kneeboard	Click to open Kneeboard
World Map	Click to open World Map
GPS	Click to open GPS
Radio	Click to open Radio Panel
Captain Panel Switch	Click to switch to Captain Panel

## Panel Description – Doors and Features Switch – Part 1

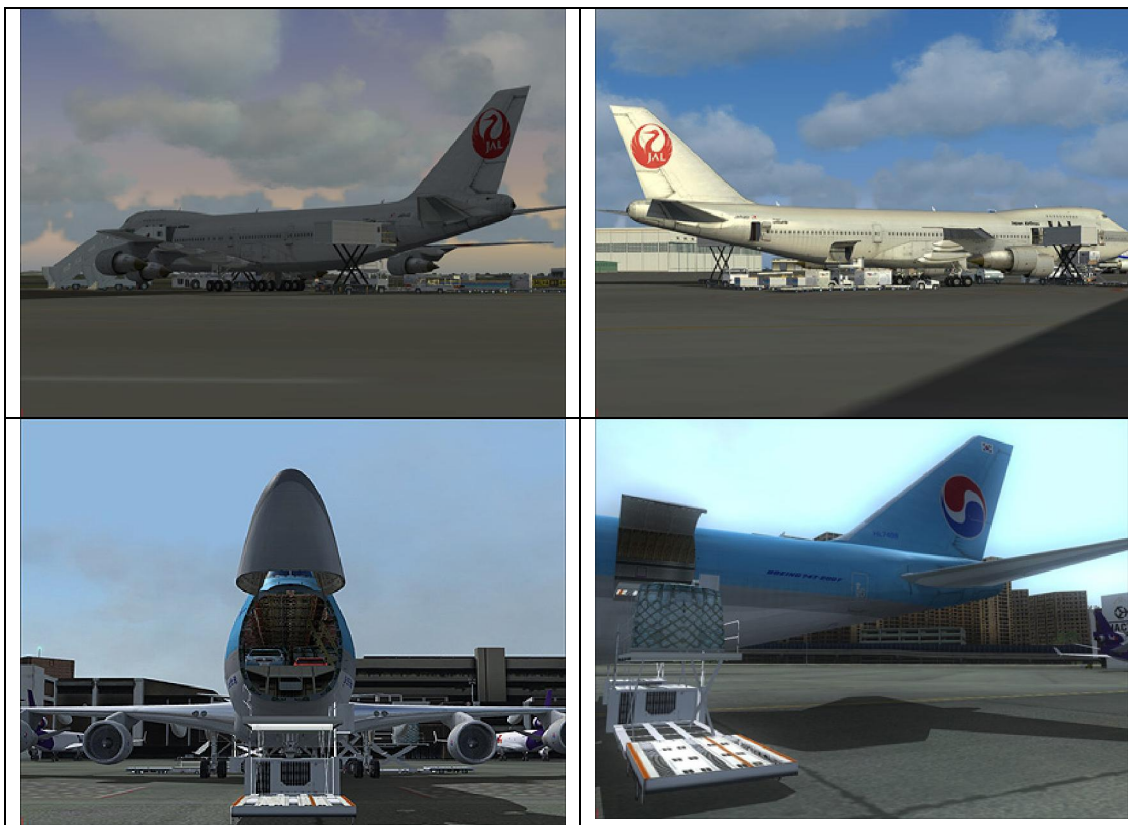


We made it easy for you to access certain functions of the exterior model. Simply open the Doors and Features panel from the simicons on your CLS 747 2D panel. Please ensure you have the right model to operate certain features. It is clearly indicated on the Doors and Features panel.

### Please Note

If you have Aerosoft's Airport Enhancement Service it is not necessary for you to enable certain features from Doors and Features panel. For example tow truck, Air stairs, Cargo Loading equipment and etc.

## Panel Description – Doors and Features Switch – Part 2



### **The Doors and Feature panels in action!**

You'll be amazed at how simple it is to use the Doors and Features panel.

## Boeing 747 – Checklist – Part 1

<u><b>PUSHBACK (IF THE PLANE IS PARKED AT THE GATE)</b></u>		
[ ]	Pushback	<b>REQUEST</b> (PRESS <b>SHIFT+P</b> , THEN 1 FOR TAIL-LEFT OR 2 FOR TAIL-RIGHT, THEN PRESS <b>SHIFT+P</b> TO STOP)
<u><b>BEFORE START</b></u>		
[ ]	Parking Brake	<b>SET</b> (PRESS <b>CTRL+PERIOD</b> KEY)
<u><b>ENGINE START</b></u>		
[ ]	Press <b>CTRL+E</b> to initiate engine autostart sequence	
AFTER Start		
[ ]	De-ice	AS REQUIRED
[ ]	Flight Controls	CHECK
[ ]	Autopilot	SET AND OFF
[ ]	Instruments	CHECKED
[ ]	Autobrake	RTO (Rejected Take Off)
[ ]	Avionics Switch	ON
[ ]	Avionics	SET
[ ]	Trim	SET
[ ]	Beacon Light Switch	ON
<u><b>BEFORE TAKEOFF</b></u>		
[ ]	Flaps	SET FOR TAKEOFF (Press <b>F7</b> as necessary)
[ ]	Flight Director	ON
[ ]	Autothrottle	ARM (IF USING TO/GA MODE FOR TAKEOFF)

## Boeing 747 – Checklist – Part 2

<b><u>TAKEOFF</u></b>		
<b>[ ]</b>	Brakes	<b>RELEASE</b>  (PRESS <b>PERIOD</b> KEY)
<b>[ ]</b>	Strobe Lights	<b>ON</b>
<b>[ ]</b>	Transponder	<b>ALT</b>
<b>[ ]</b>	Thrust Levers	<b>ADVANCE TO 1.05 EPR</b> (PRESS <b>F2</b> OR <b>F3</b> AS NECESSARY)
<b>[ ]</b>	Thrust Levers	<b>ADVANCE SMOOTHLY TO 100% N1</b> (PRESS <b>F2</b> OR <b>F3</b> AS NECESSARY)
<b>-- OR --</b>		
<b>[ ]</b>	TO/GA Mode	ENGAGE (PRESS <b>CTRL + SHIFT + R</b> )
<b>[ ]</b>	Thrust	VERIFY CORRECT FOR TAKEOFF
<b>[ ]</b>	Airspeed 80 KIAS	CALLOUT "80 KNOTS"
<b>[ ]</b>	Airspeed V1	CALLOUT "V1"
<b>[ ]</b>	Airspeed VR	CALLOUT "ROTATE"
<b>-- Rotate to Approx. 10 Degrees Pitch Up</b>		
<b>[ ]</b>	Airspeed V2	CALLOUT "V2"
<b>[ ]</b>	Landing Gear	UP (WHEN POSITIVE CLIMB ESTABLISHED – PRESS " <b>G</b> ")
<b>[ ]</b>	Autopilot Heading Select Switch	ON IF DESIRED
<b>[ ]</b>	Airspeed	MAINTAIN V2+15 KIAS
<b>[ ]</b>	Autopilot	ENGAGE
<b>[ ]</b>	Flaps	START RETRACT ON SCHEDULE AT 1,000 AGL (PRESS <b>F6</b> AS NECESSARY)



### Boeing 747 – Checklist – Part 3

<u>CLIMB</u>		
[ ]	Autothrottle	OFF
[ ]	Landing Lights	OFF ABOVE 10,000' MSL
[ ]	Altimeter	SET TO 29.92 CROSSING 18,000' MSL
<u>CRUISE</u>		
[ ]	Thrust Levers	AS DESIRED (PRESS <b>F2</b> OR <b>F3</b> AS NECESSARY)
[ ]	Trim	AS NECESSARY (PRESS <b>NUM PAD 6</b> OR <b>NUM PAD 7</b> AS NECESSARY)
<u>DESCENT</u>		
[ ]	Airspeeds (VREF, VAPP)	COMPUTED AND SET
[ ]	Autobrake	AS DESIRED
[ ]	De-Ice	AS REQUIRED
[ ]	Autopilot	AS DESIRED
[ ]	Thrust Levers	AS DESIRED (Press <b>F2</b> or <b>F3</b> as necessary)
[ ]	Altimeter	SET TO LOCAL SETTING CROSSING 18,000' MSL
[ ]	Avionics	SET
[ ]	Airspeed	<250 KIAS BELOW 10,000' MSL
[ ]	Approach Procedure	REVIEW

## Boeing 747 – Checklist – Part 4

<u>APPROACH</u>		
[ ]	Airspeed	AS DESIRED
[ ]	Thrust Levers	AS DESIRED (PRESS <b>F2</b> OR <b>F3</b> AS NECESSARY)
[ ]	Flaps	AS DESIRED (PRESS <b>F7</b> AS NECESSARY)
[ ]	Speedbrake	ARMED (PRESS <b>SHIFT +/</b> (FORWARD SLASH KEY)
[ ]	Autopilot	AS DESIRED
[ ]	Autothrottle	ARM (IF USING TO/GA MODE FOR GO-AROUND)
<u>LANDING ROLL</u>		
[ ]	Thrust Levers	CLOSED (PRESS <b>F2</b> OR <b>F3</b> AS NECESSARY)
[ ]	Autothrottle	CHECK OFF
[ ]	Speedbrake Lever	CHECK FULL UP (PRESS <b>SHIFT +/</b> (FORWARD SLASH KEY AS NECESSARY)
[ ]	Thrust Levers	REVERSE (PRESS <b>F2</b> UNTIL REVERSE)
[ ]	Thrust Levers	IDLE AT 60 KIAS (PRESS <b>F3</b> UNTIL IDLE)
[ ]	Autobrake	OFF
[ ]	Brake	AS NECESSARY (PRESS <b>PERIOD</b> KEY)
[ ]	Autopilot	CHECK DISENGAGED

### Boeing 747 – Checklist – Part 5

<u>TAXI-IN</u>		
[ ]	Speedbrake Lever	DOWN (PRESS <b>SHIFT +/</b> (FORWARD SLASH KEY)
[ ]	Lights	AS DESIRED
[ ]	Flap Lever	UP (PRESS <b>F6</b> UNTIL UP)
[ ]	Transponder	STBY
<u>PARKING</u>		
[ ]	Parking Brake	SET (PRESS <b>CTRL +</b> <b>PERIOD</b> KEY)
[ ]	Fuel Control Switches	CUTOFF (PRESS <b>CTRL</b> <b>+ SHIFT + F1</b> )
[ ]	De-ice	OFF
[ ]	Lights	AS REQUIRED
[ ]	Flight Director	OFF

## Boeing 747 – Reference – Part 1

Total Flight Simulator Max Gross Weight with full fuel	<b>700,000 lbs</b>
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**NOTE:** To adjust fuel load, on the **Aircraft** menu, click **Fuel and Load**.

V <sub>MO</sub> - Maximum Operating Speed	<b>350 KIAS</b>
M <sub>MO</sub> - Maximum Operating Speed Mach	<b>.94 Mach</b>
Turbulent Air Penetration Speed	<b>280 KIAS/.73 Mach</b>
V <sub>LO</sub> - Maximum Gear Operating Speed	<b>270 KIAS/.82 Mach</b>
V <sub>LE</sub> - Maximum Landing Gear Extension Speed	<b>270 KIAS/.82 Mach</b>

### Maximum Flap Placard Speeds

Flaps degrees	KIAS
1	<b>280</b>
5	<b>260</b>
10	<b>240</b>
20	<b>230</b>
25	<b>205</b>
30	<b>180</b>

**V<sub>1</sub> - Takeoff Decision Speed** dry runway  
Standard temperature, sea level pressure altitude

700,000 lbs (flaps 10)	<b>153 KIAS</b>
700,000 lbs (flaps 20)	<b>148 KIAS</b>

**Standard temperature, 5,000' pressure altitude**

700,000 lbs (flaps 10)	<b>155 KIAS</b>
700,000 lbs (flaps 20)	<b>149 KIAS</b>



## Boeing 747 – Reference – Part 2

**V<sub>R</sub> - Rotation Speed** dry runway  
**Standard temperature, sea level pressure altitude**

700,000 lbs (flaps 10)	<b>162 KIAS</b>
700,000 lbs (flaps 20)	<b>156 KIAS</b>

**Standard temperature, 5,000' pressure altitude**

700,000 lbs (flaps 10)	<b>164 KIAS</b>
700,000 lbs (flaps 20)	<b>157 KIAS</b>

**V<sub>2</sub> - Minimum Climb Speed** dry runway  
**Standard temperature, sea level pressure altitude**

700,000 lbs (flaps 10)	<b>168 KIAS</b>
700,000 lbs (flaps 20)	<b>161 KIAS</b>

**Standard temperature, 5,000' pressure altitude**

700,000 lbs (flaps 10)	<b>168 KIAS</b>
700,000 lbs (flaps 20)	<b>161 KIAS</b>

### **Boeing 747 – Reference – Part 3**

**V<sub>REF</sub> - Landing Approach Speed gear down**

575,000 lbs (flaps 30)	<b>144 KIAS</b>
525,000 lbs (flaps 30)	<b>136 KIAS</b>
475,000 lbs (flaps 30)	<b>128 KIAS</b>
422,000 lbs (flaps 30)	<b>122 KIAS</b>

## Commercial Level Simulations

### Boeing 747 – Frequently Asked Questions – Part 1

#### **Q) What sound settings do you recommend?**

Set your sound options for the engines to 1/8<sup>th</sup> maximum value. Decrease Navigation also to 1/8<sup>th</sup> bar. As for the other sounds, increase them all to 8/8<sup>th</sup> bar. In the 747, you are a long way away from the engines and the landing gear. You're separated from the cabin by the flight deck door, and the cabin is expansive.

For the most part, you mainly hear the hiss of pressurized air and the sounds of the flight deck. You practically don't hear the engines at all, except on takeoff, climbout, and when the thruster reverses engage. Other than that, the large PWs, RRs, or GEs are quiet as a mouse.

#### **Q) What are the cruising speeds for the 747s?**

747 Classics – M.84. 747-400s – M.85.

#### **Q) It's hard to keep her on the runway with a stiff crosswind. What do I do?**

Typically, you will want to crab into the wind as you approach the airport. On reaching the threshold, you want to aim at the side of the runway into the wind. As you touchdown, use the rudder to yaw the aircraft straight. You will feel the tires scrubbing across the pavement as the wind and your momentum pushes you across the runway with the direction of the wind.

#### **Q) It's hard to stop. Reverse thrust is very un-effective. How do I stop more effectively?**

The majority of stopping power when landing is from the brakes. The thrust reversers do almost nothing to stop the airplane. Set your auto brakes to position 3 on initial decent, but don't be afraid to use position 4. On shorter fields and higher gross weights, it may be necessary to use position 5 or max braking.

## **Commercial Level Simulations**

### **Boeing 747 – Frequently Asked Questions – Part 2**

**Q) How many liveries are available for CLS Boeing 747-200 and -300?**

Our painters have painted 60 liveries for the -200 and 5 liveries for the -300. Both Cargo and Pax airliner. All are Major Airlines.

**Q) I notice there is bugs/problems on CLS 747-200/-300, what can I do? Will you fix?**

Please assist us in reporting bugs/problems you encounter with our product. You may do so by visiting our support forum and post under Boeing 747-200/-300 product support. Please give as many details (description, screenshots) of the bugs/problems you encounter. We will do what we can to fix the problem.

**Q) Are you planning to develop the analogue panel and VC?**

Not at this stage.

For more FAQ please visit this link:

<http://www.commerciallevel.com/forum/index.php?showtopic=7050>



## **Commercial Level Simulations**

### **Support FAQ**

**Q) I want to install the product on my second PC; can I do this with my license key?**

No, you will need to purchase another copy of the product. One license key is valid with one computer only.

**Q) I want to merge CLS 747-200/300 with the other product such as panel merge, can I do this?**

Yes you can, but we will not provide support or instructions to do so. All faults that you have encountered after you merge our product with the other are your responsibilities. Please do not attempt to merge our product with the other product unless you know what to do.

**Q) I bought this product from JustFlight, how do I get support?**

You will need to contact JustFlight for support.

**Q) When will the JustFlight version will be released?**

Go to [www.justflight.com](http://www.justflight.com) to find out



From all of us at Commercial Level Simulations, we would like to thank you for purchasing our product!

Commercial Level Simulations Website:

<http://www.commerciallevel.com>

Commercial Level Simulations Support Forum:

<http://www.commerciallevel.com/forum>

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