OPERATIONS MANUAL
FLT CREW TRAINING

PROJECT OPENSKY
B767

TAXI, TAKEOFF, CLIMB, CRUISE, DESCENT & LANDING

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Disclaimer

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Any exact similarities between this manual and Project Opensky aircraft to actually aircraft, procedures, or airline carriers are strictly coincidental.

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The procedures contained within are this author's interpretation of generic flight operations. These procedures are not always accurate in all situations.

All diagrams have been recreated to mimic actual procedures or scenarios, however, are not taken from actual materials whatsoever.

This manual is not intended for real world flight.

I have modeled this aircraft as accurately as possible to the best of my personal knowledge, experience and available documentation. The only way I could model this aircraft further is if I could arrange dedicated Level D simulator time on this specific model and/or if I could obtain further information. If you can help, I'd be happy to hear from you at:
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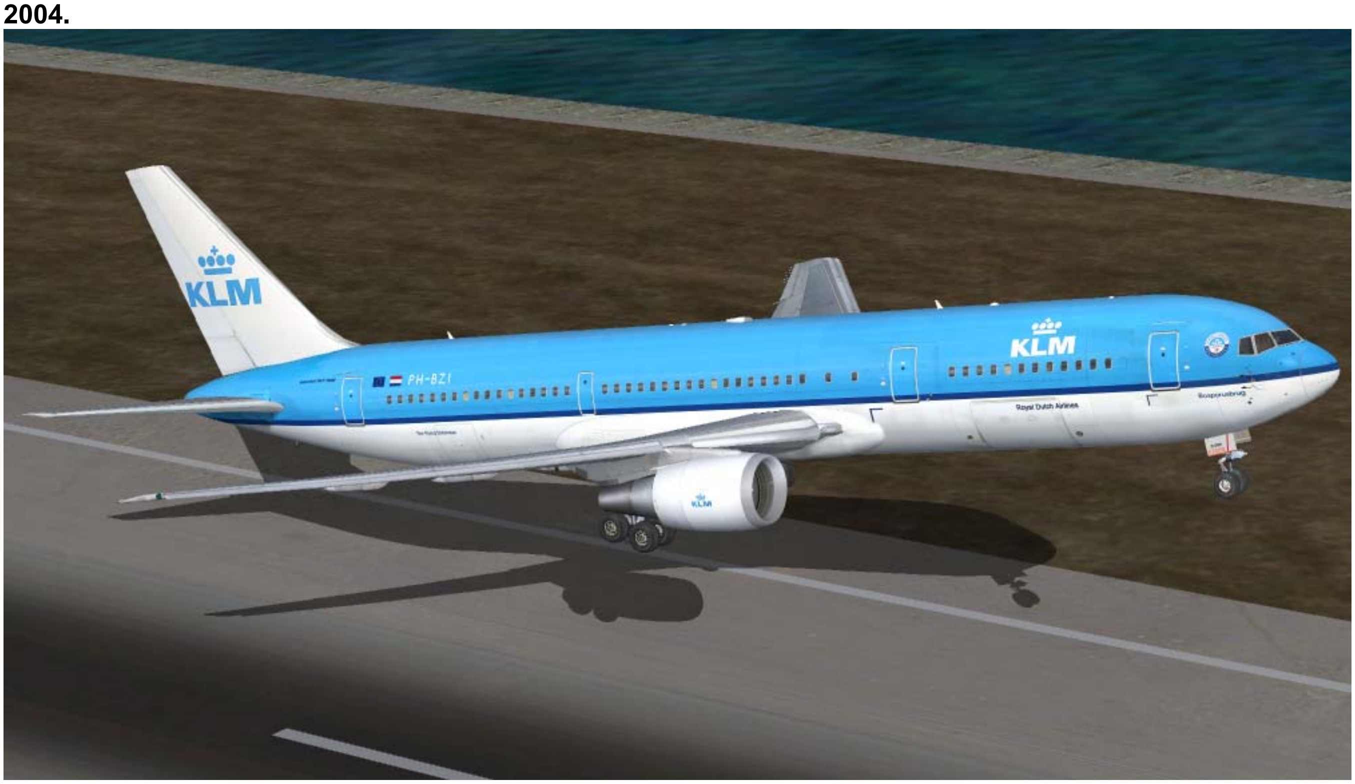
Project Opensky aircraft are intended as a freeware add-on for Microsoft Flight Simulator 2004.



Project Opensky Boeing 767-200, 767-200ER, 767-300, -300ER, 767-400 Series
Version 2004.9.5
Model Designer
Albert Bouwman

Version 2002.5.1, Version 2004.8.0
Model Designers
Mitsushi Yutaka, Hiroshi Igami

Flight Dynamics, Sound, effects Designer
Warren C. Daniel

Technical Resource
Nick Peterson, Simon Ng, Shigeo Kitaguchi, Matt Zagoren

Test Pilots
Project Opensky Members

Flight model based on the most realistic data for the Boeing 767-200, Boeing 767-300, actual experiences on 767 flight decks, 767 commercial D simulators, and several friends who will remain anonymous.

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.

PRINCIPLE DIMENSION AND AREAS

Boeing 767-200/ -200ER – Aircraft Reference Manual

Flight Simulator 2002 Professional Edition

1) Height – 52 ft and 0 in

2) Length -- 159 ft and 2 in

3) Width -- 156 ft and 1 in

4) Engine to Ground Distance:
   Minimum -- 2 ft and 5 in
   Maximum -- 2 ft and 10 in

5) Fuselage to Engine Distance: (fuselage centerline to engine centerline)
   28 ft and 8 in (255 in)

6) Landing Gear:
   Track -- 15 ft 3 in
   Wheelbase -- 64 ft and 7 in

Boeing 767-300/ -300ER – Aircraft Reference Manual
Flight Simulator 2002 Professional Edition

1) Height – 52 ft and 0 in

2) Length -- 180 ft and 3 in

3) Width -- 156 ft and 1 in

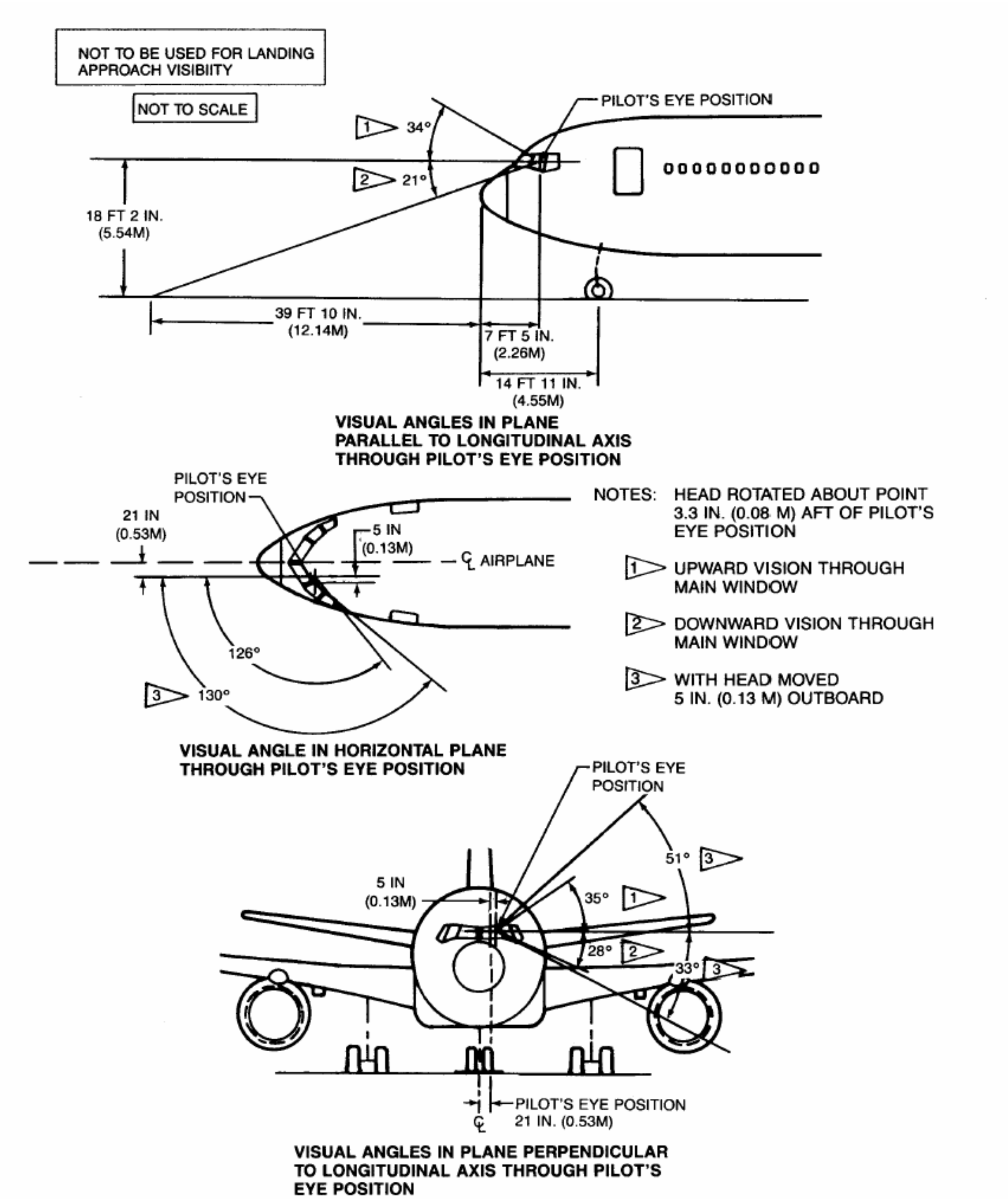
4) Engine to Ground Distance:
Minimum -- 2 ft and 5 in
Maximum -- 2 ft and 10 in

5) Fuselage to Engine Distance: (fuselage centerline to engine centerline)
28 ft and 8 in (255 in)

6) Landing Gear:
Track -- 15 ft 3 in
Wheelbase -- 64 ft and 7 in

BASIC PILOT INFORMATION

Pilot's view reference point is approximately 18.2 feet from the ground, with ground visibility limited to 48.5 feet looking down at an angle of 21 degrees. 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 130 degrees of travel.



TAXI

1) The nose wheel steering and the engine thrust are used to taxi the airplane.

2) Make sure you have the necessary clearance when you go near a parked airplane or other structures.

3) Set takeoff flaps. Opensky recommended setting is Flaps 15.

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.

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 tensional stresses in the landing gear components, and in the tires.

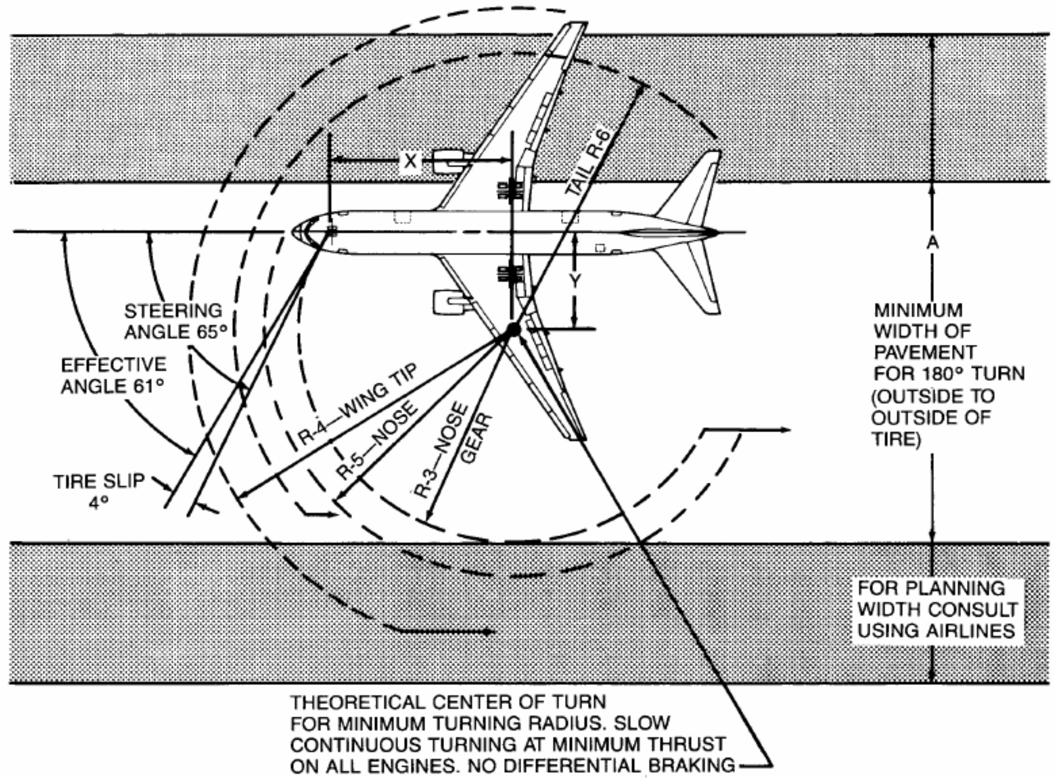
14) Use the Inertial Reference System (IRS) in the ground speed (GS) mode to monitor the taxi speed.

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.

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 129 FT.:



19) Operate the brakes to stop the airplane.

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

TAKEOFF

1) Align aircraft with runway centerline.

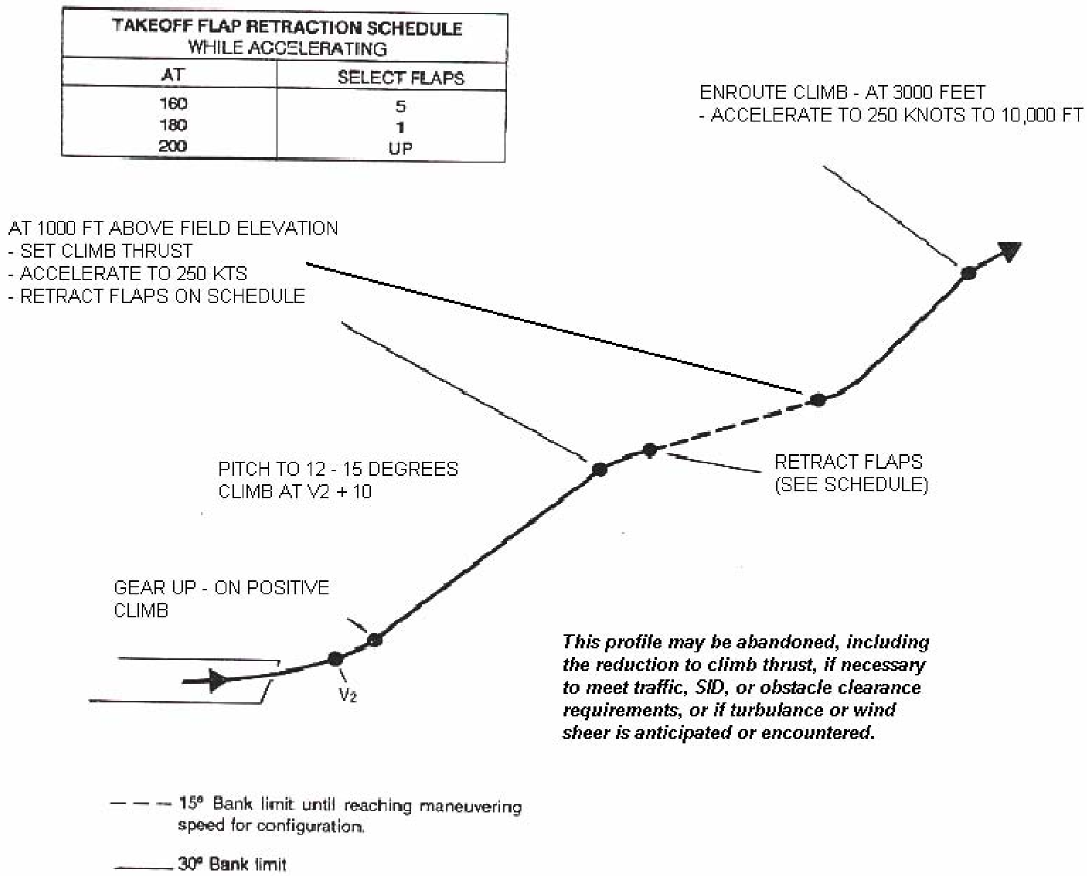
2) Increase power to approximately 55% N1, pause briefly to verify that engines have stabilized.

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 9 degrees rotation. (For V-Speed Table, 767200PERFORMANCE.PDF, 767300PERFORMANCE.PDF.)

6) Hold nose at +12 - 15 degrees after positive rate of climb is confirmed, then raise landing gear after V2 (see below).



NORMAL TAKEOFF
FLAPS 5 OR 15

7) Set initial climbout speed to V2+10 KTS.

8) Maintain +15 degrees climb to 1000 FT, or obstacle clearance, whichever is higher. +10 degrees climb after 1000 FT.

9) At 1000 FT above field elevation, begin slat retraction per retraction table. Maximum slat speed limits are:

Slat Position	Max Speed
1	250
5	230
15	210
20	210
25	180
30	180

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.

CLIMB

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 easy 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 is 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 280 KTS. Above 10,000 FT, climb at 300 KTS or .785 MACH. Climb speed table is as follows:

ALTITUDE	**SPEED**
Sea Level to 10,000 FT	250 KTS
Above 10,000 FT	300 KTS/.785 MACH

7) **Max climb speed** is 300 knots until reaching .785 MACH at initial cruise altitude.

8) **For engine out climb**, speed and performance various 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).

CRUISE

1) **Cruise** at .785 - .80 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.

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 .80 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.80 – 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 767 **ETOPS (Extended Twin-engine Operations)** limitations, divert to the nearest available airfield within **180 minutes** (3 hr) 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.

DESCENT

1) Descent at pre-determined TOD (Top of Decent)

2) Descend at 300 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
.785 MACH/300 KTS	2300 FPM	5500 FPM
250 KTS	1400 FPM	3500 FPM
VREF 30 + 80 KTS	1100 FPM	2400 FPM

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

6) At average gross weights, it requires 60 seconds and 5 NMs to decelerate from 290 KTS to 250 KTS for level flight without use of the speedbrakes. It requires 100 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 2 or 3 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 767. 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.

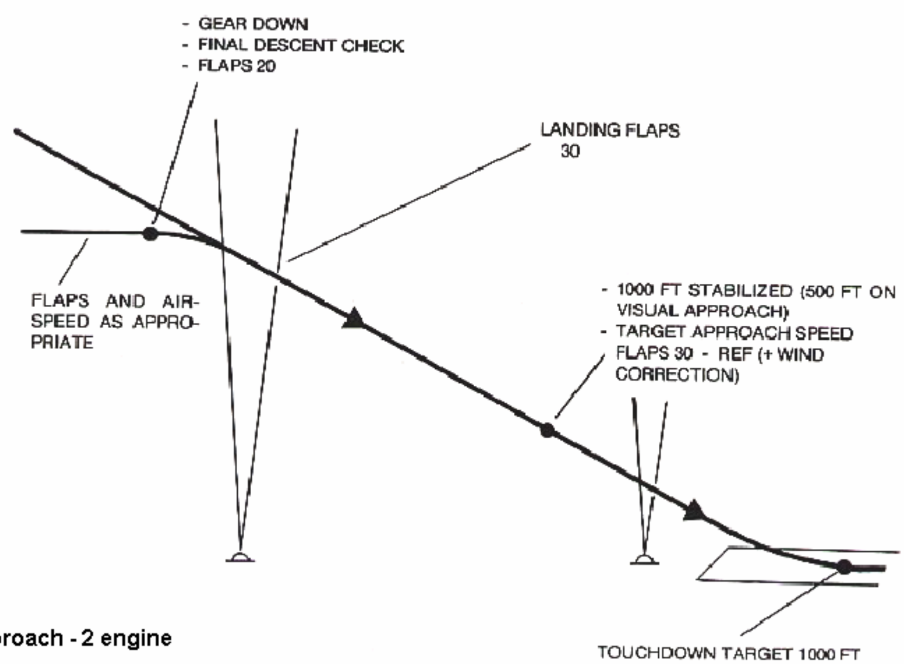
16) Under normal conditions land at VREF @ flaps 30. (For V-Speed Table, 767200PERFORMANCE.PDF, 767300PERFORMANCE.PDF.)

17) **ILS Approach** - During initial maneuvering for the approach, extend flaps to 5 and slow to 180-200kts. When the localizer is alive, extend flaps to 15 and slow to 170kts. At one dot below glideslope intercept, extend the landing gear and flaps to 20. Begin slowing to final approach speed. At the final approach fix, extend flaps to 30 and slow to Vref + 5. Be stabilized by 1000 feet above field level. This means, gear down, flaps 30, Vref +5 and engines spooled. Plan to cross the runway threshold at Vref.

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.

767 Normal ILS Approach

MINIMUM MANEUVERING SPEEDS	
SELECTED FLAPS	SPEED
UP	220
1	200
5	180
15/20	160



ILS Approach - 2 engine

19) A stabilized approach at Vref +5 will result in a pitch attitude of 2-3 degrees nose up. Cross the threshold at Vref. 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, auto brakes 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 ½ the steady state wind plus all of the gust factor to the Vref. 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 Project Opensky 767 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 auto braking at 60 knots or as necessary.

25) Turn off onto high-speed taxiways at 30 knots or less.

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.

Project Opensky Boeing 767 – Frequently Asked Questions

Q) Why is there a 767 Easy version?

A) In the Commercial Level D simulators, I found that the previous FDE versions for the 767 had the correct performance, however, the feel was not correct. I adjusted the FDEs to reflect the actual aircraft performance *and* feel. This will cause the plane to be extremely difficult to fly for beginners, those who do not have much flight experience, or simply do not care about realism. The N767EZ FDE will allow users to fly as they wish, without realistic performance. Note, however, no support will be giving by Project Opensky on this easy version, as the FDE is merely a converted default Microsoft 777. If you can fly the 777, then you can fly the N767EZ.

You can read more about my experience in the United Airlines Level D simulators here:

http://forum.projectopensky.com/index.php?showtopic=10914

Q) OMG, the FDE is much harder to fly than before. The plane is more difficult to handle. What happened?

A) After spending time in DC-10, 737, 747-400, 757, 767, and 777 Level D simulators, I realized that the performance for the previous generation of FDEs was there, however, I grossly underestimated the actual "feel" of large aircraft. In large commercial airliners the control surfaces are effective, however, the sheer mass and inertia of the plane cause delays in how quickly the aircraft reacts to inputs.

To date, all FDEs I have flown (including my own) have failed to capture this critical element – inertia. This new generation of FDEs is designed to show the average flight simmer exactly how difficult it is to fly a large aircraft, particularly in adverse weather or emergency conditions.

I have flown small aircraft, Level D simulators, and have been designing FDEs for nearly 10 years now. I can confidently say now, THIS is how the real aircraft FEELS and PERFORMS. I feel I have captured about 95% of how the actual aircraft feels in a Commercial Level D simulator and actual flight. The remaining 5% I could not capture are things such as airframe vibration through wing flap (fueled wings which are off-center have quite a lot of inertia of their own) and control surface slip (first the control surfaces "bite" into the air, then they begin to move the aircraft after some point in time– this feeling is difficult to mimic without an actual motion sim, although I have added more "slip).

The control surfaces are heavy, but effective. If you actually take the time and LOOK at a large aircraft, you will notice the control surface, say an aileron, has only a small surface area in relation to the rest of the plane. These surfaces must "push" the aircraft in the desired direction. As in the actual aircraft, you will find yourself often "overcompensating" and correcting when you fly manually until you become used to the feel.

If you find the aircraft a challenge to fly, imagine an engine out emergency, landing in gusty or side wind conditions, or on wet/icy runways. My goal is to show you what an actual commercial pilot experiences.

Q) But the controls are SO heavy. Are you sure this is right?

A) The control surfaces require 45 – 55 lbs of force to move the yoke, control wheel and rudders. This new generation of FDEs places emphasis on both performance AND feel. I am not trying to make a video game – I'm designing flight simulator dynamics.

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

A) 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?

A) 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 2 on initial decent, but don't be afraid to use position 3. On shorter fields and higher gross weights, it may be necessary to use position 4 or max braking.

Q) I just can't get the hang of these new FDEs. I'm new to FS or have no previous experience flying aircraft. What can I do?

A) I suggest you learn how the real aircraft feels so you have a better understanding of the real plane. If that fails, use the 767 Easy Version FDE included in the package. Remember, as N767EZ is basically a default 777, no product support is offered.

Q) I can't climb as high as I thought. What is wrong? Am I too heavy?

A) Most likely. **See page 12 of Matt's 767 performance document included in this package.** We've gone over this 1 million times on the forum: you have a maximum and an optimum altitude based on your weight. Depending on how heavy you are, wind conditions, route restrictions, and ATC, you may not climb as high or as quickly as you might have expected. You don't just crank it up to 43,000 ft, sit back with your arms crossed and expect to pull 6000 fpm all the way there. *Keep in mind at 400,000 lbs max weight, your maximum altitude would be 35,000 ft.* Also remember, your maximum altitude may not be your optimum altitude. Typically, you would select the optimum altitude to save money on fuel economy.

If you insist on climbing up, up, and away however, then I suggest you fly the N767EZ FDE.

Q) Why is it that when I load the aircraft in FS2004, it's usually overweight?

A) Typically, when you load an aircraft into FS2004, it maximizes everything – both fuel and payload. I design the FDEs so that you know the MAXIMUM capacity of the payload or fuel tank on a typically route. It is up to you, the pilot, to REMOVE fuel for higher payload capacity. Conversely, for longer range, you must add fuel and REMOVE payload. I design the FDEs this way to eliminate questions on "what is my maximum or typical allowed capacities". If you don't want to focus on weight management, then use the N767EZ FDE.

Q) I noticed that EPR/EGT shows red with the MSFS default panels / with other panels, EPR/EGT is low, doesn't match, etc. What happened?

A) EGT and EPR are difficult to model in FS2004. Basically, you can define a limit, and a rate of change, but you cannot control the values throughout the entire range of the band. What I have from the 767 manuals is that max EGT = 1130, max EPR = 1.65%. I base FDEs off of the MSFS standard panels, so the values will show correctly most of the time, except for very high altitude cruise.

Q) I'm using a panel other than Ed Cox's 2D 757/767 panel. I am using gauges other than the default FS2004 gauges. I see all sorts of strange things, or features like auto braking or auto spoilers are not working properly. What can I do?

A) Contact the designer of the panel you are using. The Opensky 767 FDE was designed with many features which may not be supported in other panels. Ed's panel works just fine, however, we cannot be responsible for every panel out there.

Q) I noticed you have sound packages now with your planes. Where did these sounds come from?

A) I recorded all of these sounds myself from my travels in my real job. I also gave my DV camera to friends at airports to record the external sounds of the aircraft. These are the sounds from the actual aircraft with very little mixing or editing. I want to rely the true sound and power of these aircraft.

When you are standing directly next to the actual aircraft, the scream and pitch is more like white noise. I have chosen to reflect these sounds in the sound package.

Q) Can I edit these sounds or re-upload with other packages?

A) Unfortunately, no. Please contact me if you wish to use these sounds. Legal implications exist from the air carrier who allowed me to record these sounds.

Q) What is that sound I hear when the engines are shut down?

A) This is the sound of the APU running. This will sound even if you have not engaged an APU switch. Basically, this is modeled into the FDE, and I wanted to model something that has not yet been accurately modeled in sound files before. Although you could run off of the Ground Power Unit (GPU), typically, the APU is used for engine startup. Also, in case of engine out flight or Ram Air Turbine (RAT) deployment, the APU is used in flight for additional power.

Q) What is that whirring sound I hear when I touchdown?

A) This is the sound of the auto spoiler mechanism engaging.

Q) Why don't I hear the flap motors when I engage the flaps?

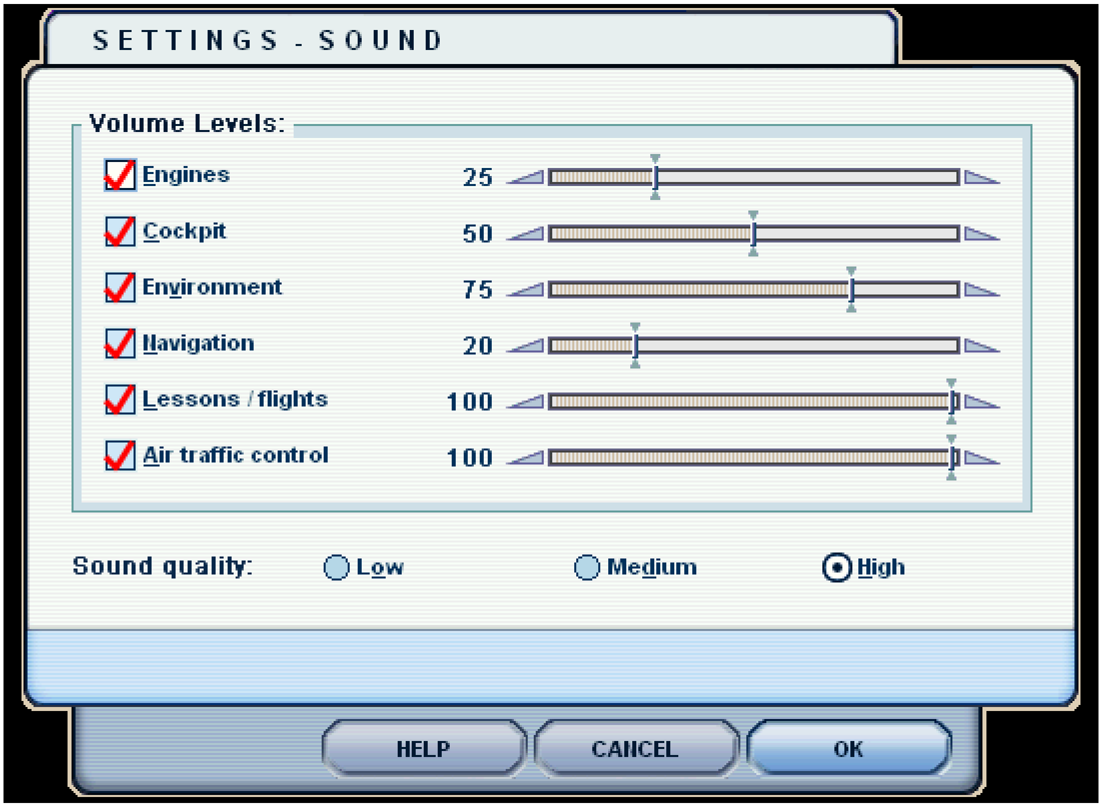
A) Because these sounds were recorded for the flight compartment, hence, you will hear the flap level click into the detent notch.

Q) Why are your sounds different than what I remembered in economy class?

A) All of my sounds are recorded from FORWARD of the engines. The pitch of the engines is much different forward of the engines than aft. Behind the engines, you hear more combustion exhaust than engine whine.

Q) What sound settings do you recommend?

A) Set your sound options to the following:



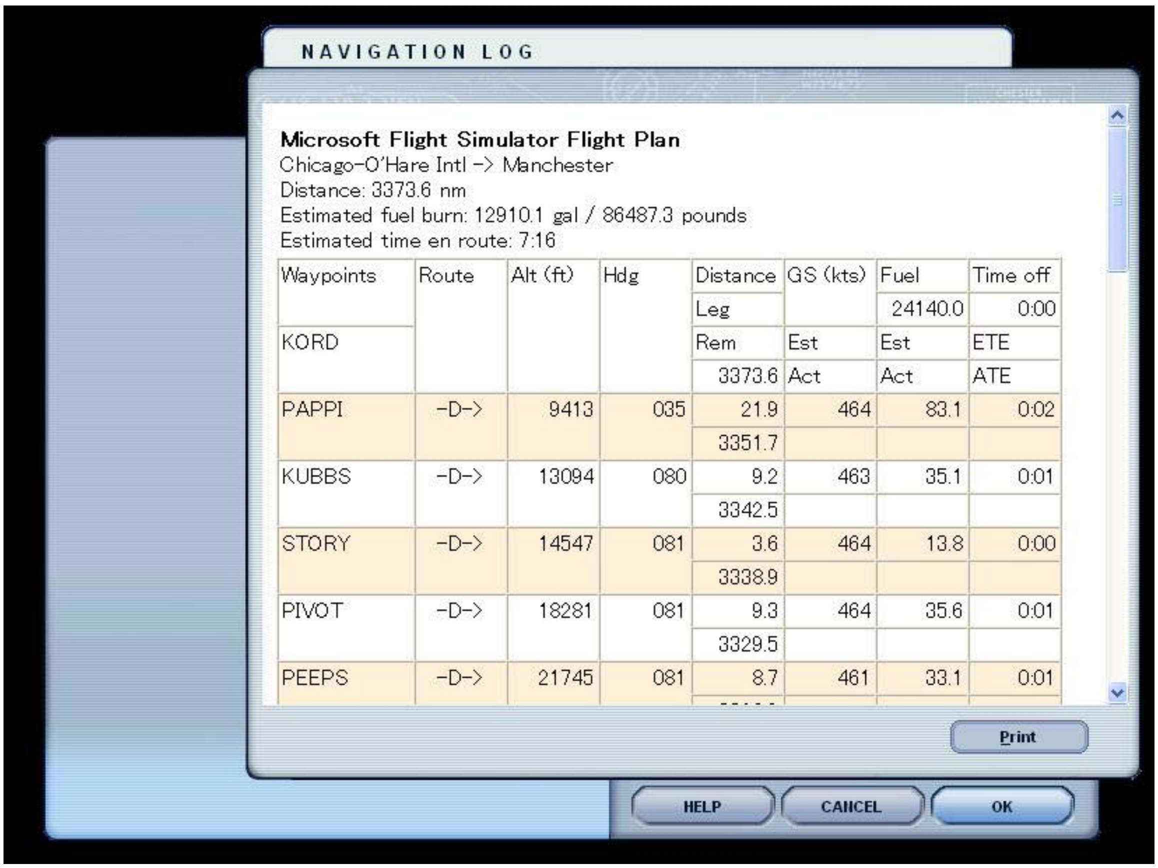
For the most part, you mainly hear the hiss of pressurized air and the sounds of the flight deck. You practically don't hear the engines at all, except on takeoff, climb out, and when the thruster reverses engage. Other than that, the large PWs, RR Trents, or GEs are quiet as a mouse. My sound files are mixed for these settings. Not using these settings will not result in the desired effect.

Q) When I taxi, I can't turn. What's wrong?

A) You must slow down to 30 knots for high speed turnoff taxiways, 8 to 12 knots for 90 degree turns, and about 3 - 5 knots for turns over 120 degrees. Basically, the maximum turn angle of the 767 nose gear is 65 degrees. Slip causes you to only achieve between 61 – 64 degrees of effective steering. Attempting to turn at higher speeds will result in tire rollover and push, resulting in the airplane still going straight ahead. See the diagram in the Ops Manual on page 9.

Q) How can I perform trip/flight planning and fuel planning?

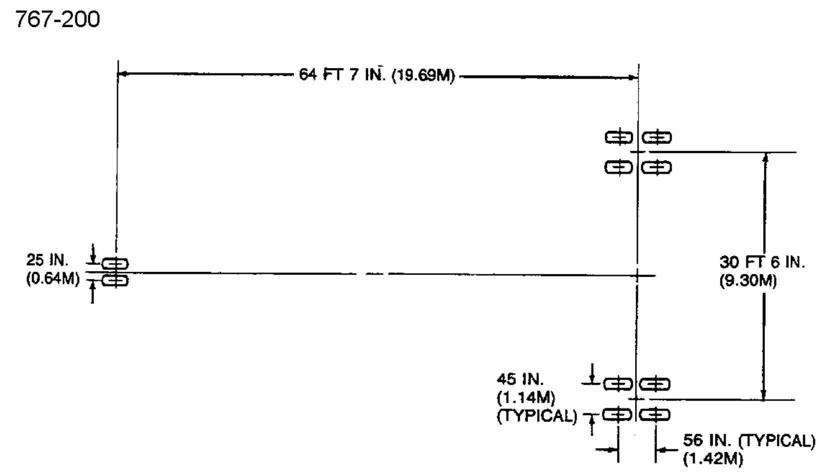
A) Use the default Microsoft flight planner and navigation log. When you plan your trip, then look at the navigation log for the fuel required for your trip. The value listed at the top includes your as trip block fuel. However, it does NOT include your taxi and reserve/deviation fuel quantities. For the 767, add 15,000 lbs of reserve fuel, plus 2000 lbs taxi fuel, for a total of 17,000 extra lbs of fuel. To use the flight planner: 1) Load the aircraft, 2) download real-world weather or set your weather, 3) use the trip planner, then 4) review your navigation log. The 767 FDE is now adjusted for the default Microsoft Fuel Planner, however, you will notice on longer haul flights with real world wind, the Flight Planner does not take into account headwinds/tailwinds.



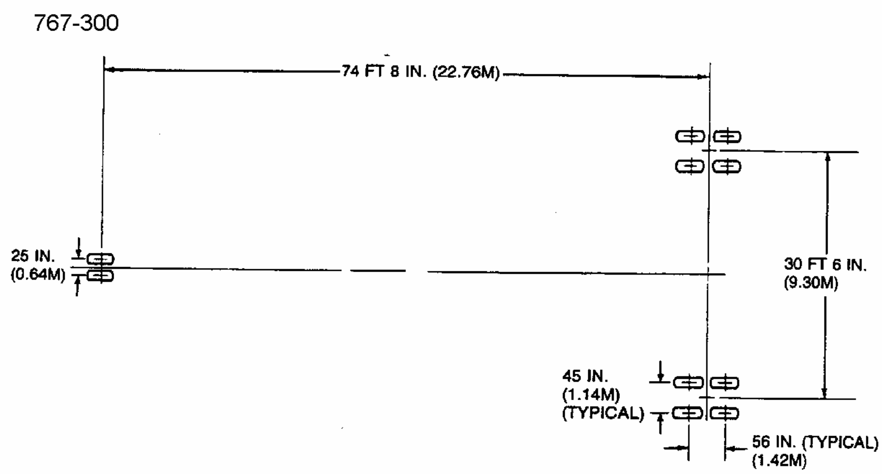
Waypoints	Route	Alt (ft)	Hdg	Distance	GS (kts)	Fuel	Time off
				Leg		24140.0	0:00
KORD				Rem	Est	Est	ETE
				3373.6	Act	Act	ATE
PAPPI	-D->	9413	035	21.9	464	83.1	0:02
				3351.7			
KUBBS	-D->	13094	080	9.2	463	35.1	0:01
				3342.5			
STORY	-D->	14547	081	3.6	464	13.8	0:00
				3338.9			
PIVOT	-D->	18281	081	9.3	464	35.6	0:01
				3329.5			
PEEPS	-D->	21745	081	8.7	461	33.1	0:01

Q) What happened to the default and alternate gear points? You only have the 767 footprint in the FDE now. What is the aircraft footprint?

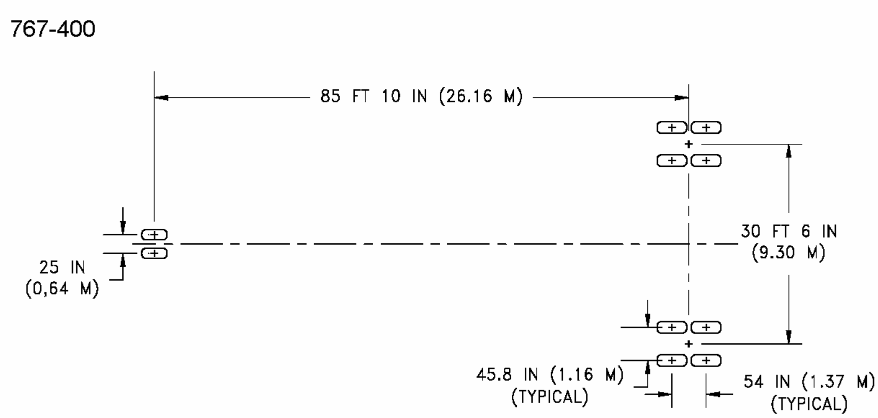
A) The aircraft footprint is the actual location of the aircraft tires on the ground. I now only use aircraft footprints in the FDEs. Basically, I have modeled the true aircraft gear into the FDE, including gear tilt. What this means is that you now have all 10 wheels and tires on the 767: nose gear (2 wheels), left main gear (4) and right main gear (4). All MSFS default aircraft and other FDEs merely offer 3 simple gear points: nose (1), left main (1) and right main (1). By using the actual aircraft footprint from the Boeing specs, this offers redundancy and more realistic feeling. This prevents landing gear "breaking" due to un-flatten scenery or "holes" in runway/taxiways. The actual aircraft footprint for the 767 series is as follows:



767-200
64 FT 7 IN. (19.69M)
25 IN.
(0.64M)
30 FT 6 IN.
(9.30M)
45 IN.
(1.14M)
(TYPICAL)
56 IN. (TYPICAL)
(1.42M)



767-300
74 FT 8 IN. (22.76M)
25 IN.
(0.64M)
30 FT 6 IN.
(9.30M)
45 IN.
(1.14M)
(TYPICAL)
56 IN. (TYPICAL)
(1.42M)



767-400
85 FT 10 IN (26.16 M)
30 FT 6 IN
(9.30 M)
25 IN
(0,64 M)
45.8 IN (1.16 M)
(TYPICAL)
54 IN (1.37 M)
(TYPICAL)

Q) When I rotate the 767 on the takeoff transition, how do I know when the gear has lifted off the ground? How do I avoid tail strike?

A) As you rotate listen for/watch the auto braking knob. The knob will "Click" and turn to the OFF position, indicating the main gear are off the ground and the gear have tilted into place. Then watch the vertical speed indicator. When you see a positive rate of climb (400 fpm or higher), then raise the landing gear to the UP position. You will see the landing gear transition. When they are stored and the transition lights go out, then move the gear lever to "OFF" to disengage the hydraulics.

Remember, although your nose gear is off the ground, the mains far behind you are still rolling. As the wings "bite in", they will generate lift and raise the entire plane off the ground:

http://www.airliners.net/open.file/714413/L/
http://www.airliners.net/open.file/713489/L/
http://www.airliners.net/open.file/713227/L/

Q) For the different 767 variants, are all the engines mounted in the same place?

A) No, the 767 GE engines are mounted 6 inches further forward than the Rolls Royce or Pratt and Whitney engines. Small details like this are modeled into both the visual and FDE models. Other small details included in the FDE, not noticeable by the average simmer but equally important, are that the tire sizes are different for nose gear vs. main gear, the fan sizes/diameters and number of engine stages are different for the various 767 engine types, and different performance based on variant.

Q) The thrust reversers are very ineffective. I can't stop? Is this right?

A) The thrust reversers are very ineffective. 80% of the stopping power actually comes from the wheel brakes.

Q) Will the 767-300 have the same range as the 767-300ER?

A) No, at maximum payload, the 767-300R/ER's range is some 3000 nms less than a standard 767-300ER due to the lack of center fuel tanks. Also, keep in mind that at many airports such as Japan domestic airports, there are ramp weight restrictions, thus the necessity to keep the weight down – another reason why some carriers have the -300 option. The lower weight and lesser fuel capacity shorten the range of the 767-300.

Q) So what are these scenarios? Why did you create scenarios?

A) These scenarios are designed to show the flight simulator community how a 767 truly feels in flight, and what levels of difficulty commercial pilots face.

I honestly feel that many sim pilots rely on pretty panels with FMCs and PFDs, however, do know truly know how to fly, nor understand the actual feel of a large aircraft. Many of us merely fly dumbly from place to place. An FMC can only give you the data you put into it, but it cannot teach you how to fly.

These scenarios are intended to test your basic flight skills and knowledge of emergency procedures. In these, you must rely on your piloting skills, not merely the autopilot or FMC. Any one part of each scenario is easy to overcome by itself, but it's the combination of factors which makes the scenarios difficult.

Good luck! *Many thanks to Jan Pospisil for the help on the ABL code!!!*

Scenario 1) 767-300ER Landing in Adverse Weather Conditions:

You are in command of a 767-300ER from Shanghai to Pusan's Kimhae International Airport. You heading northbound, and are cleared for a 7 NM reversal and landing at Kimhae's Rwy 18R-frequency-108.50 @ 001 degrees, VOR-113.80. Gross wt: 252,000 lbs. FOB: 12,000 lbs. PAX-13 first, 28 business, 124 economy. VREF-127 knots. Airport Conditions: Wind 210 at 9 knots, Visibility 2.5 miles, Light rain, Clouds scattered 500, Broken 1000, Overcast 2500, light to moderate turbulence

Scenario 2) 767-300ER Departure - Fun in the snow:

You are in command of a 767-300ER from Zurich to Dallas-Ft. Worth. You have a full flight today and are fully fueled, keeping her on today's snowy runway with a stiff side wind will be a challenge. Gross weight-396,400 lbs. v1/vR/v2-155/159/164 @ flaps 15. Zurich Rwy14 - 108.30@137 degrees. Zurich VOR-114.85.

Scenario 3) 767-300ER Approach - The Windy City:

Approach into Chicago's O'Hare International Airport. Storms approaching from the west. Conditions at airport-winds 15 knots, gusting 24 knots. Janesville arrival, final approach.

Q) Why does the nose gear hang open when the landing gear is deployed? Is there any way to close it?

A) If you look closely, the nose gear door is actually open on the 767. This is controlled by the visual model animation, not the FDE. But the open gear door is accurate.

Q) What is the proper trim for takeoff?

A) It depends on your weight and station loading according to the MAC% of the plane for your flight. However, in general, it should be about neutral trim at 7 degrees, to nose up of 7.5 degrees. In flight, it may be necessary to adjust your trim up or down depending on your conditions. Note, if you takeoff and the plane either noses up too early, or is hard to lift the nose with excessive nose down attitudes, you are mis-trimmed and would need to adjust your trim settings.

Q) What are some 757/767 differences you modeled into the flight dynamics?

A) You can view these and many other differences at www.767.org.uk/www.757.org.uk:

- The 767 is more sensitive to roll than the 757. The 757 has a heavier feel/more resistance in the controls.
- Pitch is lighter and more stable on the 767 than on the 757.
- The 767 has a larger wingspan, hence more caution must be used when taxiing.
- The 767 nose gear is closer to the flight compartment, so when turning, it is important not to place the nose gear over the taxiway edge.
- The main gears are further back on the 767 than the 757, hence the pilot must turn later and is not able to cut corners as much as the 757.
- More yaw and roll will occur with the 767 on engine out failure.
- More "pull" is required on the 767 on the landing flare, beware of pitch attitudes.

Q) What are good sources of online information on the 767?

A) I cannot stress these links enough for 767 fans:

Boeing Website - 767 Family - Filled with official Information
http://www.boeing.com/commercial/767family/technical.html

The Boeing 767 Reference Website - Filled with procedures and information
http://www.767.org.uk/
http://www.757.org.uk/
(sister site)

Smart Cockpit Website - Filled with procedures and information
http://www.smartcockpit.com/b767.html

Boeing 767 Census - Commercial Jet Aircraft Census by Bill Harms
http://bird5.bird.ch/bharms/boeing/b767_t_0.htm

Frequently Asked Questions – Asking real pilots – Answers straight from the pros.

Q) Please explain a takeoff. Typically, what do you guys do at v1/vR/v2, and how do you avoid tail strike. Example, do you rotate smoothly to about 8 degrees, then hold it there until you confirm a positive rate of climb? If you guys have longer fields, do you take off shallow past v2, then climb out at about 12 - 15 degrees deck angle?

A) Well, V1 is decision speed - stop or continue.

vR is the speed that you begin to rotate the aircraft. Also, it is the speed that the aircraft can climb with 1 engine.

v2 is the speed that the aircraft begins to fly (takeoff speed).

At vR the pilot applies back pressure at the rate of about 3 degrees per second. At that rate, the aircraft lifts off before the tail can impact the tail skid.

(Warren note here – You will need to calculate your takeoff N1 speed or max EPR for takeoff, then hold that. That way you will not accelerate wildly past v2 still on the ground. You WILL lift off at v2, you just have to spool the engines properly then pull her back and hold it there. See the 767-200/-300 performance documentation.)

Q) So, the 767-300ER will impact the tail skid at 8 – 9 degrees rotation, correct?

A) Yes, 767-300ER will tail strike at 8 - 9 degrees rotation.

Q) I've seen various numbers from Boeing. Typically, for most carriers, over 10,000 ft, do you guys what are you climbout/decent speeds?

These climb and devent numbers are computed by the flight management computer and is based on weight of the aircraft. Nominal speeds are 250 knots to 10,000 ft, approx 300 during climb until capturing climb Mach approx .78 or .80 then climbing at .78 or .80 Mach until cruise altitude. Decent is approx the same, just backwards.

Q) So in real life, how does a 767 handle?

A) Pitch is effective but heavy--like a truck, don't need to over control but you need to give positive pressure. Turning, the outboard ailerons lock fully out at about 270 kts with both ailerons functioning, roll rate is very brisk-very light on the control, i.e. better than the 777 with the outboards locked out. The roll rate is much slower, very stiff and much more solid with outboard ailerons locked out.

Q) What determines your decision for a high-seed decent? For instance, ATC cleared you behind your decent profile, etc?

A) First, an emergency, that's for worse case scenario. Second, when directed by ATC.

Q) How are the speed brakes?

A) Speed brakes are so-so, not super effective but not ineffective. The 767 is somewhat tough to slow up in flight because it has so much mass. Proper decent planning is essential. You don't want to get caught behind your decent profile, or in a late decent.

Q) How is landing a 767?

A) Landing attitude is relatively flat, only about 1-3 degrees above horizon on the approach. The 767 on landing wants to pitch up after the mains touch. Auto-spoiler when set deploys on touchdown - all spoilers deploy on landing. There is no delay. The 767 will pitch upwards on landing, tends to want to pitch nose up. It is very easy to strike the tail. You have to push forward on the yoke at touchdown.

Q) How are the brakes on a 767?

A) Brakes on 767-300s are carbon fiber. Very smooth and very effective. Older –200 brakes are steel. Takes more effort.

Q) Please explain the anti-skid button on the overhead panel.

Anti skid has nothing to do with over rotation. The anti-skid system is installed in order to keep from locking the brakes during handing or high speed aborted takeoffs. If the wheels lock up due to applying heavy brake pressure, the tires will burst and go flat. This will cause directional control problems while attempting to stop.

Q) Is 767 evacuation is the same at 777. In what I got in 777 training, if ther rear doors are inaccessable, once you stop on the ground, you'd open the side window and toss out the rope.

A) Yes, EVAC on 767 is the same. Rope is above each pilot in overhead compartment.

Q) Let's be honest, this thing is certified up to 41,000 – 43,000 ft, but can it really make it?

A) Climb rates are dependant on aircraft loading. Above 10,000 ft, you can go 2000 fpm, but then dropping to 1500 fpm higher up. When up at FL390 to FL410 it really dogs out. It is certified up to FL430. You can always make FL410 unless it is very hot out and you are very heavy.

Q) For the 767-200s, what happens if you loose an engine on takeoff?

A) Well, no one wants that. Many pilots worry about loosing an engine, especially in mountainous areas like Zurich. You must drop the nose the gain airspeed, rudder it out, but watch for terrain. The 767-200s are really underpowered.

Q) Do you cut the throttles completely when landing?

A) Typically, we keep the throttles going all the way down to touchdown. The 767 can land heavy, so you don't want to crunch it in.

Q) We've seen 767s with national flags sticking out of the windows. How does that work?

A) Yes, we can display a flag, but only on the ground. We merely crank back the side windows and stick the flags out of the side when carrying VIPs or troops.

Q) Per your checklists, I noticed packs are not on all the time, correct?

A) Correct, but they are when we're in the air.

Q) Could you explain the bleed air?

A) Bleed air operates the hydraulics. The pneumatic tunnels show when the bleed air is running off the APU or engines.

A LITTLE BIT ABOUT THE AUTHOR

My name is Warren and I travel around 100,000 miles a year. Most of my travels in recent years have been on the 767 and 777, which are now my favorite aircraft. I believe in the most realism possible. A lot of credit goes to Nick Peterson, Simon Ng, Kitaguchi-san and several other friends who helped along the way. Also, lots of credit goes to Matt Zagoren for taking the trouble to compile his 767 documentation and allowing us to reference it. Also, thanks to Jan Pospisil for helping with the ABL programming language.

I am not an airline captain, but love flight. Formally, I used to fly a Cessna 172 and a PA-28 Turbo Arrow, and a twin-engine Piper Cherokee. My goal is to give the flight simulator community the closest possible experience to flying a real 767.

My hobbies are flight, automobile track racing, and screenwriting.

I cannot promise I'll answer every single question, but someone at the forum will try to get an answer for you. Please send general comments to the forum at: www.projectopensky.com.

Remember that Project Opensky creates these aircraft for free, because we enjoy it. Do not bog us down with ignorant or unnecessary comments or criticism. If you feel you can do better, by all means, please do so, so that we may all benefit from everyone's hard work.

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