

Engine Variant: CFM56-5B4

What you can expect from the flight model:

All the nice features a fully optimized FS2004 flight model has plus:

Accurate fuel consumption during Cruise (Guaranteed +/- 0 to 30 kg/h FF inaccuracy on most circumstances)

Accurate Weight & Balance modeled from the real thing.

Realistically replicates the maximum handling limits of the A320. 15 deg roll/1 sec guaranteed at all speeds, pitch attitudes 2.5g/-1.0g limits.

Accurate drag parameters within the limits of FS.

Accurate pitch attitudes on all phases of flight. Most certainly, accurate pitch on cruise and final approach. +/- 1 degree from the real thing.

Realistic engine spool-up & behavior based on real A320 pilot inputs, engine variant... within the limits of FS.

Dead-accurate N1/N2 indications during ground idle, takeoff, climb, cruise, flight idle, & landing.

Takeoff & landing performance tested.

FS limitations:

FF when on the ground is rather high. So far there's no way to get around this. It's better to get the fuel flow accurate during cruise for now. We sacrificed ground idle FF in order to replicate idle taxi characteristics.

This A320 flight model has been developed and tested for over a year... the parameters based on real performance data and pilot inputs. Below you will see some recommended procedures on how to fly the A320 to replicate the real thing as close as possible within the limits of FS2004. We sure hope you have a nice time flying the Project Airbus A320 v2!

PREFLIGHT

The Project Airbus A320 is configured as follows:

	KGS	TONS	LBS
Zero Fuel Weight:	56730	56.7	125068
MACZFW:	31.80%		

MACTOW and STAB TO for the following figures:

TO FUEL	TOW in tons	MACTOW	STAB TO
4000	60.7	31.8%	-0.8 NOSE DOWN
5500	62.2	30.8%	-0.5 NOSE DOWN
7000	63.7	30.3%	-0.4 NOSE DOWN
8500	65.2	30.2%	-0.3 NOSE DOWN
10000	66.7	30.1%	-0.3 NOSE DOWN
11500	68.2	30.0%	-0.3 NOSE DOWN
13000	69.7	29.5%	-0.2 NOSE DOWN
14500	71.2	28.8%	-0.1 NOSE DOWN
16000	72.7	27.7%	0.3 NOSE UP
17500	74.2	27.3%	0.3 NOSE UP
19000	75.7	26.7%	0.5 NOSE UP

Applicable for both CFM & IAE variants.

Plan your fuel load for the flight. Plan to have a landing weight of around 62T/136,400lbs. (Not higher than 64.5T/141,900lbs) The A320 with CFM56-5B4 power plants consumes around 2,530kg/5,544lbs of fuel per hour.

STARTUP

Startup may vary according to Airline procedures so we'll do what's most common, start engine 1 first then engine 2.

Accomplish before startup checklist before or during pushback prior to engine startup

Move the engine start selector to ignition and move the engine 1 start switch to ON, monitor N2, EGT and FF. Once they are stabilized (Approx. 19.4% N1, 52% N2, FF 400+ kg/h) we can now start engine 2... wait again for the engine to stabilize, now is a good time to arm your spoilers and set your takeoff trim (refer to weight and balance chart). Call for after startup checklist.

TAXI

-NOSE light AS RQRD

Select nose wheel light to TAXI day and night

-PARKING BRK OFF

-ELAPSED TIME AS RQRD

-THRUST LEVERS AS RQRD

Spool the engines up to around 27% N1 to start the taxi. (Never exceed 40% N1) Maintain around 24% N1 till around 10kts then bring the thrust levers back to idle and the aircraft should accelerate slowly to 20kts on a normal takeoff weight. If it reaches 25kts, tap on the brakes till the speed goes down to 15kts then release. Make tight turns below 10kts. Add power during tight turns to compensate for the added drag during a turn.

Accomplish Before Takeoff Checklist during taxi.

TAKE OFF

Be sure to turn strobes and landing lights to ON when you are cleared for takeoff. Spool the engines up to around 50% N1 and wait for both of them to stabilize then advance the thrust levers to the FLEX or TOGA gate. (FLEX approx. 85-88% N1, TOGA approx 95% N1 to max throttle position)

Procedures are as follows:

-ANNOUNCE "TAKE OFF"

-BRAKES RELEASE

Rolling takeoff recommended when possible

-THRUST LEVERS Set 50% N1, when thrust stable set FLX or TOGA

*PF modulates the thrust as necessary when turning on the runway at the beginning of a rolling T.O then set takeoff power.

*To restrict nose up effect at engine take off power setting APPLY half forward stick deflection till 100kts. Release stick progressively.

*CM1 keeps his hand on thrust levers until V1 is reached.

Crosswind takeoffs:

*For crosswind greater than 20kts or tailwind, rolling takeoff is required. Move thrust levers progressively to reach FLX/TOGA gate at 40kts.

-DIRECTIONAL CONTROL USE RUDDER

-CHRONO START

-PFD/ND SCAN

*Check FMA on PFD FLX (or TOGA), SRS, RWY (or blank), FD 1(2)

-TAKE OFF N1 CHECK
(Check take off N1 is set before reaching 80kts. Check EGT)

-PNF ANNOUNCES "POWER SET"

-PFD and ENG indications SCAN
*Scan airspeed, N1, EGT throughout take off

-ANNOUNCE "ONE HUNDRED KNOTS"
(PF crosschecks speed indication on PFD)

-ANNOUNCE "V1"

-ANNOUNCE "ROTATE"

-ROTATION PERFORM
*At VR, rotate the aircraft smoothly using a continuous pitch rate to a pitch attitude of 12.5 degrees. (Try to maintain V2+10 on initial climb out; pitch may go up 15-18deg depending on takeoff thrust)
*After liftoff follow SRS pitch command bar.

-ANNOUNCE "POSITIVE CLIMB"
*Announce positive climb when the vertical speed indication is positive AND the radio altitude has increased.

-ORDER "GEAR UP"

-LANDING GEAR SELECT UP

-EXTERNAL LIGHTS SET
*Set NOSE switch to OFF. Landing and runway turnoff lights may be left ON according to Airline policies. (Usually left around till 10,000ft)

-AP AS REQUIRED
*Above 100ft AP 1 or 2 may be engaged.

-ANNOUNCE FMA

-ANNOUNCE "GEAR UP"

At thrust reduction (Approx. 1500ft) move thrust levers to the CL detent. N1 indications should go down to 84-86% N1. Follow flap retraction schedule as programmed. (Usually 3000ft) Above F speed select FLAPS 1, at S speed select FLAPS 0... continue climb at 250kts till 10,000ft and 300kts above 10,000ft, upon reaching Mach .76-78 switch to Mach mode maintaining Mach .76-78.

Climb rates referenced to N1 values are as follows:

ISA+15

Below 10,000ft: 250kts, 2700-3800fpm @ 84-86% N1

11,000-18,000ft: 300kts, 2,100-2,500fpm @ 87-88.6% N1

18,000-22,000ft: 300kts, 1,800-2,100fpm @ 88.3-89.2% N1

22,000ft-25,000ft: 300kts, 1,400-1700fpm @ 88.5-89.5% N1

25,000ft-29,000ft: 300kts/Mach .76-78, 1,000-1,400fpm @ 88.7-89.8% N1

29,000-31,000ft: Mach .76-78, 900-1,100fpm @ 89.6-89.8% N1

31,000-37,000: Mach .76-78, 400-800fpm @ 89.6-89.9% N1

Maintain .76-78 to desired cruise altitude with N1 @ 89%. (not exceeding 92%) Climb rate should be around 400-1,000fpm

*****SET BARO REF to STD upon passing Transition altitude. (1013 Hp or 29.92 in)**

CRUISE

Normal cruise at FL310 may give you a 2.5 deg pitch up at Mach .76-78. FF may be around 1240-1320 kg/H per engine. The higher you cruise, the less fuel you consume. Plan your cruise altitude depending on your flight.

DESCENT

Descent preparation and approach briefing can take approximately 10 minutes, so they should be initiated approximately at 80NM from Top of Descent.

Normally 290-310kts/Mach.76-78

Descent calculation. ALT (drop all the zeros) x 3= Distance of your Top of Descent towards destination

E.g.

Cruise altitude: 31,000ft

$31 \times 3 = 93$ (93nm TOD)

What some pilots do for a cleaner and more economical descent till landing is to minus 10 from the computed TOD. (e.g. $31 \times 3 = 93 - 10 = 83$ nm TOD)

Descent rates:

E.g.

Speed to be used: 300kts

When starting a descent from 31,000ft. Maintain Mach .78 til reaching 300kts then switch to SPEED mode.

Approx. Descent rates are as follows:

37,000-31,000ft.... Mach .76-78 @ -2,600-3,200fpm

31,000-21,000ft.... 300kts @ -2,400-2,600fpm

21,000-11,000ft.... 300kts @ -2,200-2,500fpm

10,000-4,000ft(till approach phase) 250kts @ 1,300-1,500fpm

Note: One of the most common mistakes of flight simmers is to land AT ABOVE Maximum landing weight. (MLW) Maximum landing weight of the A320 is 64.5T or 142,200lbs. Plan your fuel load for your flight to reach your destination with your weight below MLW. (Recommended fuel for landing, approx. 3-4T)

Set QNH upon passing transition altitude.

Accomplish Approach Checklist

Approaching 12,000ft reduce VSI to -1000fpm to slow to 250kts when reaching 10,000ft. Don't expect the n1 indications to go down to 25% at flight idle. They won't! Just like the real thing. :)

Descend below 10,000ft at 250kts VSI goes around 1,300-1,500fpm.

If a faster descent rate or deceleration is desired, use speed brakes as necessary. The A320's pretty hard to slow down from 250-200kts at a clean

configuration. Extend FLAPS 1 at Green Dot Speed. You may maintain a speed of around 160-170kts at FLAPS 2. (Be at FLAPS 2 before GS interception)

Landing Gear limitations:

Max gear extension (V_{LO}): **250 KIAS**

Max gear retraction (V_{LO}): **220 KIAS**

Max gear extended (V_{LE}): **280 KIAS / .67M**

Max Flap / Slats (V_{FE}):

Model	Position	1	1+F	2	3	FULL
A319/320	V_{FE}	230 KIAS	215 KIAS	200 KIAS	185 KIAS	177 KIAS

** Approach Phase should be activated approximately 15nm from the destination.*

APPROACH:

The objective is to be stabilized on the final descent path at VAPP, thrust above idle, with landing configuration at 1000ft in instrument conditions or 500ft in visual conditions (or as restricted by Airline policy/regulations)

APPR pushbutton on FCU PRESS

* APPR pb is to be pressed only when ATC clears the aircraft for the approach. This arms LOC and G/S modes.

BOTH AP ENGAGE

*When APPR mode is selected both AP should be engaged.

AT GREEN DOT SPEED:

ORDER..... "FLAPS 1"

FLAPS 1..... SELECT

CONFIRM/ANNOUNCE..... "FLAPS AT 1"

* FLAPS 1 should be selected not later than 3nm prior to Final Approach Fix.

*The aircraft will reach or be established on the glide slope with FLAPS 1 and S speed at or above 2,000ft AGL.

*In the event that aircraft speed is significantly higher than S on the G/S, or the aircraft does not decelerate on the G/S, extend the L/G in order to slow the

aircraft down. Use of speed brakes is not recommended, as it will cause an unwanted increase in VLS.

-FMA CHECK

-LOC CAPTURE MONITOR

-ANNOUNCE "LOC"

-G/S CAPTURE MONITOR

-ANNOUNCE "G/S"

-GO AROUND ALTITUDE SET

*Set on FCU.

AT 2,000ft AGL MINIMUM

-ORDER "FLAPS 2"

-FLAPS 2 SELECT

-CONFIRM/ANNOUNCE "FLAPS AT 2"

*Check deceleration towards F speed

*If the glideslope is intercepted from below 2,000ft AGL, select FLAPS 2 at one dot below the glideslope.

WHEN FLAPS 2

-ORDER "GEAR DOWN"

-L/G DOWN

-CONFIRM/ANNOUNCE "GEAR DOWN"

-GROUND SPOILERS ARM

-AUTO BRK AS RQRD

*When landing on short or contaminated runway or when operating in low visibility conditions, the use of LOW or MED auto brake is recommended. To save brakes it is recommended to use reverse thrust until 70kts *minimum 60kt) and brakes, as necessary, according to the remaining distance.

WHEN L/G DOWN

-ORDER "FLAPS 3"

-FLAPS 3 SELECT

-CONFIRM/ANNOUNCE "FLAPS AT 3"

*Select FLAPS 3 below VFE

-ORDER. "FLAPS FULL"

-FLAPS FULL SELECT

-CONFIRM/ANNOUNCE "FLAPS FULL"

*Check deceleration towards VAPP

-AUTOTHRUST CHECK IN SPEED MODE OR OFF

-EXT LIGHTS SET

Set NOSE switch to TAXI

RWY TURN OFF switch to ON and

LANDING LIGHTS to ON

-LDG MEMO CHECK NORMAL

*Speed Brk..... ARM

Flaps..... CONF 3 or FULL

Signs..... ON

Ldg gr..... DOWN

Accomplish landing checklist.

Maintain VAPP speed on landing configuration. (Approx. 136-138kts Flaps FULL)

You should be able to maintain a VAPP speed of 136-138kts at a 2.5-3 degree pitch up at 55-61% N1, normal landing weight. (Around 62-63T GW)

Landing with CONFIG 3 (FLAPS 3) will give you a higher VAPP speed... this should also give you a pitch attitude of around 4.5 degrees pitch up. (VAPP speed at CONF 3 approx 140-142kts) *Use CONFIG 3 for strong winds and during engine outs.*

At DH (or MDA/MDH)

-MONITOR or ANNOUNCE "MINIMUM"

-ANNOUNCE. "LANDING" or "GO AROUND"

*Don't "duck under" the G/S. Maintain a stabilized flight path down to flare.

LANDING

-At 30 ft approx.

-FLARE PERFORM

-THRUST levers IDLE

Commence a gentle progressive flare and allow the aircraft to touch down without a prolonged float.

Note: The Airbus manuals do not tell you to retard the throttles at the “RETARD” call. Retarding the thrust levers will depend on personal preference. (Usually around 20-30ft in the A320) When retarding, you don't need to “slam” the throttles to the idle detent. Retard the thrust levers to the idle detent smoothly.

Tip: For flare, smoothly bring the nose up to around 5-6 degrees at 30ft... start retarding the thrust levers at around 15-25ft. (Hold the pitch attitude) This should give you a smooth touchdown. <G>

Crosswind Landings

Either the “forward slip” or the “decrab” technique may be used or a combination of them both. The preferred technique is to use rudder to align the aircraft with the runway heading during the flare whilst using lateral control to maintain the aircraft on the runway centerline. Remember that the side sidestick commands roll rate during the flare.

For crosswind landing routine use of into wind aileron is not recommended. In strong wind conditions, small amounts of lateral control may be used to maintain wing level but care should be taken to avoid using excessive amount which may prevent both main gears being properly compressed and inhibit ground spoiler deployment.

Ground Clearance

-Avoid flaring high

Tailstrike occurs:

L/G Compressed

0 bank 11.7° pitch

8.6 bank 13.6° pitch

12 bank 13.1° pitch

16 bank 2.9° pitch

L/G extended

0 bank 13.7°

6.3 bank 16°

14.8 bank 14.5°

20 bank 0°

Derotation

Derotation should be commenced as soon as the main wheels have touched. In flare law, the aircraft will tend to nose down naturally as the aft stick applied for flare is relaxed towards neutral. A comfortable nose wheel touchdown will be achieved if the stick is maintained just aft of neutral during derotation. If brakes are applied with the nose high the pilot must be prepared to use up to full back stick to restrain the nose down pitching moment.

-REV PULL

*Pull to reverse idle at main landing gear contact (not before).

*When REV green indicated on ECAM select MAX REV.

*The nose wheel should be touchdown without undue delay if MED is selected.

*There is no limitation on commencing braking before nose wheel is down if required for performance reasons, but when comfort is the priority it should be delayed until the nose wheel has touched down.

*Incase of engine failure, the use of the remaining reverser is recommended.

-GROUND SPOILERS CHECK

Check ground spoilers deployed after touch down on ECAM WHEEL page.

-DIRECTIONAL CONTROL USE

*Use rudder pedals for directional control

-BRAKES AS RQRD

Monitor auto brake if on. If required use pedal braking.

At 70kt (IAS)

-REVERSE levers IDLE

It is recommended to select idle reverse thrust at 70kts.

Use of high levels of reverse thrust at low airspeed should be avoided since the distortion at the airflow caused by gases re-entering the compressor can cause engine stalls, which may result in excessive EGT.

-REVERSE levers STOW

Before 20kts

-AUTO BRK DISENGAGE

*****GO AROUND*****

Apply the three following actions simultaneously:

-THRUST LEVERS TOGA

-ANNOUNCE “GO AROUND-FLAPS...”

-ROTATION PERFORM

-FLAPS RETRACT ONE STEP

-ANNOUNCE “POSITIVE CLIMB”

-LDG GEAR UP

-CONFIRM/ANNOUNCE “GEAR UP-FLAPS”

Follow thrust reduction and flap acceleration as scheduled. Check remaining fuel.

AFTER LANDING

-LAND LIGHTS OFF

-GROUND SPOILERS DISARM

-FLAPS RETRACT

Select FLAP lever position to 0

-ENG START selector NORM

Accomplish After Landing Checklist

PARKING

-PARKING BRK ON

-ENGINE MASTER sw 1 and 2 OFF

Check engine parameters decrease

-EXT LT AS RQRD

Switch off the BEACON sw once both the engines have obviously spooled down.

-ELAPSED TIME STOP

FUEL PUMPS OFF

Accomplish Parking Checklist

Manual written by Peter Binamira & Gianmarco Biettol