A330-Family Notes

For purposes of the following aircraft in FlightGear:

- A330-200 series ("the omega hanger")[1] [2]

- A330-300 series ("the omega hanger")[1] [2]

- IDG-A33X (IDG)[2]

- And all future iterations of the 3 versions of the A330 above…

FOR FLIGHT SIMULATION PURPOSES ONLY

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[1] Since both aircraft are similar, and to refer to them both, they will be referred to as "TOH"

[2] The acronyms would be utilised to signify instructions that only a specific edition could do, if there are no acronyms, then it can be done by both FlightGear editions of the A330.

PROCEDURES

*All actions in the guide will be based on all the starting positions of the switches in the cockpit, assuming also that the plane's starting state is "Cold and Dark."

**This does not possess procedures for failures.

I.   **PRE-START (BEFORE PROGRAMMING MCDU)**

   A. (IDG) PARK BRK—ON

   B. ELECTRIC POWER

      1. BAT 1 AND 2—ON

      2. EXT A, EXT B—ON

      3. APU MASTER—ON

      4. APU START—ON

      5. (AIR PANEL) APU BLEED—ON

      6. APU GEN—ON

   C. LIGHTS

      1. OVHD INTEG LIGHT—ON (Turn it to the right)

      2. DOME—ON (BRT)

      3. FLOOD LT MAIN PNL—ON (Turn it to the right)

      4. FLOOD LT PED—ON (Turn it to the right)

      5. INTEG LT MAIN PNL & PED—ON (Turn it to the right)

   D. NAVIGATION

      1. BAROMETER—SET

      2. ADIRS IR1 KNOB—NAV MODE

      3. ADIRS IR2 KNOB—NAV MODE

      4. ADIRS IR3 KNOB—NAV MODE

   E. HYDRAULICS

      1. ENG 1 PUMP—ON

      2. ENG 2 PUMP—ON

    F.   AIR CONDITIONING

        1.   PACK 1 & 2-ON

II. MULTI-FUNCTION CONTROL DISPLAY UNIT (MCDU) (WILL BE DISPLAYED IN INSTRUCTIONS)[3]

    A. BRT KNOB–ROTATE TO THE RIGHT

    B. (IDG) Click FMGC

    C. (IDG) Prior to starting, go to the Flight Gear toolbar–>FMGC–>Route Planner and set up the route there.

    D. Under "INIT 1 OF 2", input the following

        1.   "CO RTE" (Code of Company Route, if you know the code and is in the aircraft route database. If none, leave it blank)

        2.   "FROM/TO" (Especially if there is no "CO RTE" input)

        3.   "FLT NBR" (ICAO style)

        4.   "COST INDEX" (OPTIONAL)

        5.   "CRZ FL/TEMP"

        6.   (FOR IDG only) SELECT "ALIGN IRS" (For PFD)

    E. UNDER "INIT 2 OF 2", (click "–>" in keypad from "INIT 1 OF 2") input the following:

        1.   "BLOCKS"

        2.   (TOH)"RTE RSV/%"

        3.   (IDG) Click "ZFW" to add ZFW of aircraft

    F. (TOH) UNDER "F-PLN", input the following (in order)…

        1.   WAYPOINTS OF THE ROUTE

        2.   "SID", "STAR" AND APPROACH for flight-plan

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[3] Refer to this link for further instructions on MCDU initialisation: http://mcdu.equicom.net

3. SPEED/AlTITUDE (you may input the speed value either in Knots, or in Mach, but for altitude, input it in feet) (This has to be the last thing to input as changing any inputs would remove the SPEED/ALTITUDE inputs

    a) CLICK LEFT LSK BESIDE "F-PLN DISCONTINUITY" WHEN DON

G. (TOH) UNDER "PROG" INPUT THE FOLLOWING…

    1. "BRG/DIST"

    2. "ACCUR" setting

H. UNDER "PERF" INPUT THE FOLLOWING IN ORDER

    1. "TAKE OFF" PAGE

        a) "TRANS ALT"

        b) "THR RED/ACC"

        c) "TO SHIFT" (if necessary)

        d) "FLAPS/THS"

        e) "FLEX TO TEMP"

        f) "ENG OUT ACC"

        g) "V1", "VR", "V2"

    2. (TOH) "CLB" (optional)

        a) "ACT MODE" setting

        b) "CLIMB SPEED"

        c) "TRANS CLIMB SPEED"

        d) "CLB MACH"

    3. (TOH) "CRZ" (optional)

        a) "ACT MODE" setting

        b) "CRZ MACH"

    4. (TOH) "DESCENT" (optional)

        a) "ACT MODE" setting

        b) "DES SPD"

        c) "DES MACH"

    5. (TOH) "APPROACH" (optional)

      a) "ACT MODE" setting

      b) "APPROACH SPD"

      c) "FLARE SPD"

6. UNDER RAD (IDG)/RAD NAV (TOH) INPUT THE FOLLOWING...

      a) "ILS/FREQ"

      b) "CRS"

      c) "VOR1/FREQ" (optional)

III. BEFORE START–AFTER MCDU SET UP

A. AUTOPILOT/AUTO-THROTTLE

    1. SPEED–SET TO 240KTS

    2. HDG–PUSH (Set up LNAV)

    3. ALT–SET ACCORDING TO F-PLN

B. AIRCRAFT IS REFUELLED WITH THE AMOUNT OF FUEL PLACED IN THE FMGC

C. ANTI-ICE

    1. PROBE/WINDOW HEAT–ON

    2. WING–ON

D. COMMUNICATION

    1. TRANSPONDER–STBY

      a) SQUAWK CODE–SET

    2. RADIO–ON

IV. BEFORE PUSHBACK

A. GROUND EQUIPMENT

    1. (ELEC PANEL) EXT PWR A & B–OFF

    2. (IDG) YELLOW HYD HAND PUMP–OFF

    3. **REMOVE ALL GROUND EQUIPMENT**

B. LIGHTS

      1.   BEACON–ON

      2.   WING–ON

      3.   NAV & LOGO–ON

  C. PUSHBACK VEHICLE–CONNECTED

  D. PARK BRK–OFF

  E. CONTACT GROUND TO REQUEST FOR PUSHBACK

V.   AFTER PUSHBACK/BEFORE ENG START

  A. PARK BRK–ON

  B. PUSHBACK VEHICLE–DISCONNECTED

  C. LIGHTS

      1.   STROBE LIGHTS–ON

  D. FUEL PUMP

      1.   L1, L2, C1, C2, R1, R2 PUMPS–ON

  E. ENG

      1.   ENG MODE–START

VI. ENG START

  A. ENG 1 IGNITION SWITCH–ON

  B. ONCE ENG 1 N1=30.0, ENG 2 IGNITION SWITCH–ON

  C. ONCE ENG 2 N1=30.0, ENG MODE–NORM

VII. AFTER ENG START/TAXI

  A. POWER

      1.   GEN 1 & 2–ON

      2.   APU BLEED(AIR)–OFF

      3.   APU GEN (ELEC)–OFF

      4.   APU MASTER OFF

  B. AIR

      1.   ENG 1 BLEED–ON

      2.   ENG 2 BLEED–ON

      3.   PACK 1 & 2–ON

   C. ANTI-ICE

      1.   ENG 1–ON

      2.   ENG 2–ON

   D. LIGHTS

      1.   NOSE–TAXI

   E. FLAPS–SET

   F. F-CTL–TESTED

   G. TRIM–SET

   H. TRANSPONDER–ALT RPTG OFF

   I.   CONTACT GROUND FOR TAXI CLEARANCE.

   J. THR-INCREASE TO BEGIN TAXI

VIII. HOLDING SHORT OF RUNWAY (BEFORE TAKEOFF)

   A. PARK BRK–ON

   B. AUTO BRK–MAX

   C. LIGHTS

      1.   RWY TAKEOFF–ON

      2.   LAND–ON

      3.   NOSE–TAKEOFF

      4.   STROBE LIGHTS–ON

   D. FLAPS–CHECKED

   E. TCAS–TA/RA

   F. T.O. CONFIG–NORMAL

   G. CONTACT TOWER FOR TAKEOFF CLEARANCE

IX. TAKEOFF

   A. STOPWATCH–START

B.   THROTTLE–FLX/MCT OR TOGA

X.   AFTER TAKEOFF (IF ALT<11,000FT)

A.   GEAR–UP

B.   PRIMARY FIGHT DISPLAY

    1.   "LVR CLB"–>THROTTLE TO CLB

C.   AP1–>ON

    1.   V/S–SET($\approx$1800FT/MIN)

D.   A/THR–>ON

E.   FLAPS–>UP (0)

F.   BAROMETER–>STD

G.   LIGHTS

    1.   RWY TAKEOFF–>OFF

    2.   NOSE–>OFF

XI. AFTER TAKEOFF (IF ALT≥11,000FT)

A.   LIGHTS

    1.   LAND–>OFF

B.   AUTO-THROTTLE–CHANGE IAS TO MACH

XII. CRUISE

A.   IF AND ONLY IF: PRIMARY FLIGHT DISPLAY–>"ALT CRZ"

B.   LIGHTS

    1.   SEATBELTS–>OFF

    2.   NO SMOKING–ON

XIII.PREPARATION FOR DESCENT (ALT=CRZ ALT)

A.   WEATHER CONDITIONS FOR DESTINATION–REVIEWED

    1.   APPROACH FREQUENCY ADJUSTMENT (IF RUNWAY CHANGES)–SET

2. APPROACH STAR ADJUSTMENT (IF RUNWAY CHANGES)—SET IN F-PLN

  B. AUTOPILOT

    1. AUTO-THROTTLE—CHANGE MACH TO IAS

    2. ALT—SET TO STAR ALTITUDE

    3. V/S—SET TO BEGIN DESCENT

XIV. DESCENT(IF ALT≥11,000FT)

  A. LIGHTS

    1. SEATBELTS SIGN—ON

    2. NO SMOKING—ON

  B. IF IAS IS INCREASING...

    1. V/S DESCENT RATE—DECREASED; OR

    2. SPOILER/SPEED-BRAKE—>1/2 OR FULL

XV. DESCENT (IF ALT<11,000FT)

  A. BAROMETER—SET TO AIR PRESSURE OF DESTINATION

  B. LIGHT

    1. RWY TAKEOFF—ON

    2. NOSE—T.O.

  C. AUTOPILOT

    1. AUTO-THROTTLE—SET TO ≤240KNOTS

    2. HDG—>PULL—>SET HDG TO BEGIN STAR APPROACH

      a) HDG—>PUSH—>WHEN CHANGING WAYPOINTS

XVI. AT BASE OF RWY APPROACH (NOT INTERCEPTING ILS)

  A. AUTOPILOT

    1. ALT=2000FT-3000FT AGL

    2. SPD= 180 KNOTS

    3. HDG= PUSH

    4.   V/S−0 FT/MIN

  B.   FLAPS−2

  C.   AUTO BRAKE−MED

  D.   SPEED BRAKE/SPOILER−ARM

  E.   LS MODE−ON

XVII. INTERCEPTING RWY APPROACH

  A.   AUTOPILOT

    1.   LOC−ON (WHEN DIAMOND IS IN CENTRE OF LATERAL LS)

    2.   SPD−140 KNOTS

  B.   FLAPS−FULL

  C.   GEARS−DOWN

XVIII. INTERCEPTED RWY APPROACH

  A.   AUTOPILOT

    1.   LOC−ON

    2.   SPD−150 KNOTS

    3.   PRESS APPR−WHEN DIAMOND IS CENTRE OF VERTICAL LS

      a)   IF APPR−PRESS, SPD−PUSH

  B.   ECAM CHECKLIST−COMPLETED (ALL GREEN)

XIX. LANDING

  A.   "RETARD, RETARD, RETARD" OR 50FT AGL−>THROTTLE−>IDLE[4]

  B.   ONCE ALL GEARS ON CONTACT WITH GROUND−>REVERSE THRUST

  C.   BEGIN ROLLOUT

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[4] Disregard clicking A/THR to disengage auto-throttle, just set throttle to idle; A/THR will automatically be overridden by changing throttle.

XX. ROLLOUT/AFTER LANDING

A. LIGHTS

    1. STROBE–OFF

    2. LAND–OFF

    3. WING–OFF

    4. RWY TURN OFF–OFF

    5. NOSE–TAXI

B. SPOILER–DISARM

C. FLAPS–UP

D. THR–INCREASE TO TAXI TO GATE/PARKING

E. AUTO-BRAKE–OFF

F. POWER/APU

    1. APU MASTER ON

    2. APU START ON

    3. APU GEN ON

    4. APU BLEED ON

G. STOPWATCH–STOP

XXI. PARKING & SECURE AIRCRAFT

A. PARK BRK–ON

B. ENG

    1. ENG 1–OFF

    2. ENG 2–OFF

C. GROUND SERVICES

    1. EXT PWR A & B–ON

D. LIGHTS

    1. SEATBELTS–OFF

    2. NO SMOKING–ON

        3.   EMER LT–OFF

        4.   BEACON–OFF

        5.   NAV & LOGO–OFF

        6.   NOSE–OFF

   E.   FUEL PUMP

        1.   L1, L2, C1, C2, R1, R2 PUMPS–OFF

   F.   ADIRS IR1, IR2, IR3–OFF

   G.   APU BLEED–OFF

   H.   APU MASTER–OFF

   I.   APU BAT–OFF

Formulas

Information:

A330-200 fuel burn=5590kg/hr

A330-300 fuel burn=5800kg/hr

FUEL:

Let F_{Burn}=Fuel burn (kg/hrs)

Let T_{Route}=Time of Flight (hrs)

Let T_{RALT}=Time of Route Alternative Flight[5] (hrs)

Let F_{Route}=Fuel for Route (kg)

Let F_{RALT}=Fuel for Route Alternative Flight (kg)

Let F_{Taxi}=Fuel for Taxi (kg)

Let F_{Total}=Total Fuel (kg)

$$F_{Total}=F_{Route}+F_{RALT}+F_{Taxi}+\{0.2 \times (F_{Route}+F_{RALT})\}$$

$$F_{Route}=F_{Burn} \times T_{Route}$$

$$F_{RALT}=F_{Burn} \times T_{RALT}$$

$$F_{Taxi}=200$$

So, to simplify and substitute the formula F_{Total}...

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[5] According to ICAO, if there is no Route Alternative in the Flight Plan, then the $T_{RALT}=2$

$$F_{Total}=(F_{Burn} \times T_{Route})+(F_{Burn} \times T_{RALT})+200+[0.5 \times \{(F_{Burn} \times T_{Route})+(F_{Burn} \times T_{RALT})\}]$$

WARNING:
BE AWARE OF THE UNITS USED TO MEASURE FUEL IN THE SIMULATOR

V1, V$_R$, V2 SPEEDS

Let x=Functions with flaps setting 10° (Flap setting 1 on Airbus)

Let y=Functions with flaps setting 15° (Flap setting 2 on Airbus)

Let $V_1(x)$= V_1 Speed with flap setting 10° (in knots)

Let $V_r(x)$= V_r Speed with flap setting 10° (in knots)

Let $V_2(x)$= V_2 Speed with flap setting 10° (in knots)

Let $V_1(y)$= V_1 Speed with flap setting 15° (in knots)

Let $V_r(y)$= V_r Speed with flap setting 15° (in knots)

Let $V_2(y)$= V_2 Speed with flap setting 15° (in knots)

Let m=mass (in metric tonnes)

$V_1(x) = \{0.3 \times (m-80)\} + 125$

$V_r(x) = \{0.3 \times (m-80)\} + 140$

$V_2(x) = \{0.3 \times (m-80)\} + 150$

$V_1(y) = \{0.3 \times (m-80)\} + 115$

$V_r(y) = \{0.3 \times (m-80)\} + 130$

$V_2(y) = \{0.3 \times (m-80)\} + 140$

COST INDEX

Let C_i=Cost Index

Let C_f=Cost of fuel

Let C_F=Cost of Flight

$C_i = \dfrac{Cf}{CF}$

FLEX TO TEMP

Information required:

- International Standard Atmosphere (ISA)

ALTITUDE (Feet)	TEMP. (°C)	PRESSURE			PRESSURE RATIO $\delta = P/Po$	DENSITY $\sigma = \rho/\rho o$	Speed of sound (kt)	ALTITUDE (meters)
		hPa	PSI	In.Hg				
40 000	- 56.5	188	2.72	5.54	0.1851	0.2462	573	12 192
39 000	- 56.5	197	2.58	5.81	0.1942	0.2583	573	11 887
38 000	- 56.5	206	2.99	6.10	0.2038	0.2710	573	11 582
37 000	- 56.5	217	3.14	6.40	0.2138	0.2844	573	11 278
36 000	- 56.3	227	3.30	6.71	0.2243	0.2981	573	10 973
35 000	- 54.3	238	3.46	7.04	0.2353	0.3099	576	10 668
34 000	- 52.4	250	3.63	7.38	0.2467	0.3220	579	10 363
33 000	- 50.4	262	3.80	7.74	0.2586	0.3345	581	10 058
32 000	- 48.4	274	3.98	8.11	0.2709	0.3473	584	9 754
31 000	- 46.4	287	4.17	8.49	0.2837	0.3605	586	9 449
30 000	- 44.4	301	4.36	8.89	0.2970	0.3741	589	9 144
29 000	- 42.5	315	4.57	9.30	0.3107	0.3881	591	8 839
28 000	- 40.5	329	4.78	9.73	0.3250	0.4025	594	8 534
27 000	- 38.5	344	4.99	10.17	0.3398	0.4173	597	8 230
26 000	- 36.5	360	5.22	10.63	0.3552	0.4325	599	7 925
25 000	- 34.5	376	5.45	11.10	0.3711	0.4481	602	7 620
24 000	- 32.5	393	5.70	11.60	0.3876	0.4642	604	7 315
23 000	- 30.6	410	5.95	12.11	0.4046	0.4806	607	7 010
22 000	- 28.6	428	6.21	12.64	0.4223	0.4976	609	6 706
21 000	- 26.6	446	6.47	13.18	0.4406	0.5150	611	6 401
20 000	- 24.6	466	6.75	13.75	0.4595	0.5328	614	6 096
19 000	- 22.6	485	7.04	14.34	0.4791	0.5511	616	5 791
18 000	- 20.7	506	7.34	14.94	0.4994	0.5699	619	5 406
17 000	- 18.7	527	7.65	15.57	0.5203	0.5892	621	5 182
16 000	- 16.7	549	7.97	16.22	0.5420	0.6090	624	4 877
15 000	- 14.7	572	8.29	16.89	0.5643	0.6292	626	4 572
14 000	- 12.7	595	8.63	17.58	0.5875	0.6500	628	4 267
13 000	- 10.8	619	8.99	18.29	0.6113	0.6713	631	3 962
12 000	- 8.8	644	9.35	19.03	0.6360	0.6932	633	3 658
11 000	- 6.8	670	9.72	19.79	0.6614	0.7156	636	3 353
10 000	- 4.8	697	10.10	20.58	0.6877	0.7385	638	3 048
9 000	- 2.8	724	10.51	21.39	0.7148	0.7620	640	2 743
8 000	- 0.8	753	10.92	22.22	0.7428	0.7860	643	2 438
7 000	+ 1.1	782	11.34	23.09	0.7716	0.8106	645	2 134
6 000	+ 3.1	812	11.78	23.98	0.8014	0.8359	647	1 829
5 000	+ 5.1	843	12.23	24.90	0.8320	0.8617	650	1 524
4 000	+ 7.1	875	12.69	25.84	0.8637	0.8881	652	1 219
3 000	+ 9.1	908	13.17	26.82	0.8962	0.9151	654	914
2 000	+ 11.0	942	13.67	27.82	0.9298	0.9428	656	610
1 000	+ 13.0	977	14.17	28.86	0.9644	0.9711	659	305
0	+ 15.0	1013	14.70	29.92	1.0000	1.0000	661	0
- 1 000	+ 17.0	1050	15.23	31.02	1.0366	1.0295	664	- 305

- METAR of origin airport

- Origin airport elevation

Let ISA=15°C

Let e=Elevation of Origin Airport (in feet)

Let F=no. of 1000ft MSL[6] (rounded up)

Let OAT=Outside Air Temperature (in °Celsius)

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[6] Example: *F*, if *e*=1400ft MSL, is 2.

FLEX TO TEMP=$(ISA - ((e \div 1000) \times (1.98 \times (-n)) + OAT$

THE RESULTING VALUE SHOULD BE ROUNDED DOWN TO THE NEAREST INTEGER

FLEX TO TEMP=$(ISA - ((e \div 1000) \times (1.98 \times (-n)) + OAT$