### Limitations

#### OPERATION LIMITS

<table>
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<tr>
<th>Structural Weight Limits</th>
<th>A319</th>
<th>A320</th>
<th>A321</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Takeoff</td>
<td>166,400 LBS</td>
<td>169,700 LBS</td>
<td>205,000 LBS</td>
</tr>
<tr>
<td>Maximum Landing</td>
<td>137,800 LBS</td>
<td>142,200 LBS</td>
<td>171,500 LBS</td>
</tr>
</tbody>
</table>

Maximum 90° crosswind component (including gusts) for takeoff and landing: **29 knots**

Maximum 90° crosswind component (including gusts) for CAT II/III approaches: **15 knots**

Limiting tailwind component for takeoff and landing: **10 knots**

Maximum operating altitude: **39,000 feet**

#### SPEED LIMITS

Maximum operating airspeed (VMO): **350 KIAS**

Maximum operating Mach number (Mmo): **0.82M**

Maximum gear extension speed (VLO): **250 KIAS**

Maximum gear retraction speed (VLO): **220 KIAS**

Maximum gear extended speed (VLE): **280 KIAS/0.67M**

<table>
<thead>
<tr>
<th>Maximum Flaps/Slats Extended Speeds (Vfe)</th>
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<tr>
<td>FLAPS</td>
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<tr>
<td>A319/320 Vfe</td>
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<tr>
<td>A321 Vfe</td>
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</tbody>
</table>

Turbulence Penetration Speeds:
- A319/320: 275 KIAS/.76M
- A321: 300 KIAS/.76M

Below 20,000 feet:
- 250 KIAS
- 270 KIAS

#### ICE & RAIN PROTECTION

Engine anti-ice ON when OAT (Ground) / TAT (Flight): **10° C or below**

(except during climb and cruise when the temperature is below -40° C SAT)

Engine anti-ice must be ON prior to and during descent in icing conditions (including temperatures below -40° C SAT)

#### FUEL

<table>
<thead>
<tr>
<th>Usable Fuel Tank Quantity</th>
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<tbody>
<tr>
<td>A319/320 Wing Tanks</td>
</tr>
<tr>
<td>A321 Wing Tanks</td>
</tr>
<tr>
<td>Center Tank</td>
</tr>
<tr>
<td>ACT</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
</tbody>
</table>

Maximum allowable fuel imbalance between left and right wing tanks (outer + inner): **1,000 lbs**

#### HYDRAULICS, BRAKES, & LANDING GEAR

Maximum landing gear extension altitude: **25,000 feet**

#### FLIGHT CONTROLS

Maximum operating altitude with slats, or flaps and slats extended: **20,000 feet**

#### AUTO FLIGHT SYSTEM

Autopilot Engaged – Minimum Height: **100 feet AGL** After Takeoff (if SRS is indicated)

<table>
<thead>
<tr>
<th>Maximum Winds for Automatic Approach, Landing, and Rollout</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headwind</td>
</tr>
<tr>
<td>Tailwind</td>
</tr>
<tr>
<td>Crosswind other than CAT II/III</td>
</tr>
</tbody>
</table>

#### POWERPLANT

Minimum oil quantity for dispatch: **12.5 quarts**
Emergency Equipment

What are the 10 emergency items in the cockpit?

- 1 Medical Kit
- 2 Escape ropes
- 3 fire items: axe, extinguisher, PBE
- 4 Life jackets

GNADIRS Panel

When you turn the mode Selectors to NAV, what are you looking for on the panel?

Ensure that each ADIR has the ability to revert to the batteries by observing the BAT light illuminating for several seconds.

What does the ON BAT light indicate?

It is illuminated amber if one or more IR(s) is supplied by the aircraft battery. Also illuminates briefly during the beginning of a full alignment.

What does a flashing white align light mean?

- IR alignment fault (aircraft moved during alignment)
- No present position entered within 10 minutes of NAV selection
- Difference of 1° Lat/Long between shutdown and entered position

What does a steady white ALIGN light indicate?

The respective IR is in the Align mode.

What does it mean when the IR lights are extinguished?

Alignment has been completed.

How do you fast align an IR?

Turn the IR mode selectors OFF momentarily (not more than 5 seconds) and then back on.

What does steady illumination of the amber IR FAULT light indicate?

A fault affects the respective IR.

What does flashing illumination of the amber IR FAULT light indicate?

Attitude and Heading may be recovered in ATT mode (you have lost the navigation portion).

What does the amber ADR FAULT light indicate?

A fault is detected in the Air Data Reference part.

Does turning the IR to OFF also turn off the ADR?

Yes

Can you turn the ADR OFF and still have the IR?

Yes

What would be missing on the on the Captain’s PFD if IR 1 failed or was turned OFF?

Attitude and navigation information.

What action would recover the attitude and navigation information?

Selecting CAPT 3 on the EIS switching panel ATT/HDG selector.
**What information must be input when the IR is in ATT?**

Input Heading on the IR panel every 10 minutes.

**With the loss of ADR 1, what would be lost on the Captains PFD?**

Airspeed and Altitude information

**What would restore the lost altitude and airspeed information?**

Selecting CAPT 3 on the EIS Switching Panel AIR DATA Selector.

**How do you normally enter Present Position into the IR?**

- Insert the Lat/Long on the MCDU INIT page
- Then press Align IRS

**FLT CTL Panel**

**What does ELAC stand for?**

Elevator Aileron Computer

**How many ELAC’s on the Airbus?** 2

**What are the functions of the ELAC?**

- Normal elevator and stabilizer control
- Normal aileron control
- Normal pitch and roll
- Alternate pitch
- Direct pitch and roll
- Abnormal attitude
- Aileron droop
- Acquisition of autopilot orders

**Under Normal Law, what does ELAC 1 control?**

- Primary - Aileron control (roll)
- Standby - Elevator / Stabilizer control (backs up ELAC 2)
- Provides 5° aileron droop

**Under Normal Law, what does ELAC 2 control?**

- Primary - Elevator / Stabilizer (pitch)
- Standby - Aileron control (backs up ELAC 1)

**What backs up ELAC 2?**

ELAC 1 -> SEC 2 -> SEC 1

**What does SEC stand for?**

Spoiler Elevator Computer

**How many SEC’s are installed?**

3

**What functions are performed by the SEC’s?**

- Normal roll (by controlling the spoilers)
- Speed brakes and ground spoilers (SEC 1 & 3 only)
- Alternate pitch (SEC 1 & 2 only)
- Direct pitch (SEC 1 & 2)
- Direct roll
- Abnormal attitude
Under Normal Law, what do the 3 SEC’s control?

- Primary – Spoiler control (roll)
- Standby – Elevator / Stabilizer control (SEC 1 & 2 back up the ELAC’s)

What is the sole purpose of SEC 3?

Spoiler control

What does FAC mean?

Flight Augmentation Computer

How many FAC’s are installed?

2

What are the functions of the FAC’s?

- Normal roll (turn coordination and yaw damping)
- Rudder trim
- Rudder travel limit
- Alternate yaw

Under Normal Law, what do the FAC’s provide (YAWL)?

- Yaw Control – Damping and turn coordination, rudder limiter, rudder trim)
- Airspeed Protection Computation (Alpha Prot, high / low limits, maneuvering speed, PFD speed scale)
- Windshear protection
- Low Energy Warning Protection (“Speed, speed, speed”)

Is full rudder deflection available during all flight regimes?

No. Rudder deflection is limited as a function of airspeed.

What is the computer and priority for the Ailerons?

ELAC 1 -> ELAC 2

What is the computer and priority for the Elevator and Stabilizer?

ELAC 2 -> ELAC 1 -> SEC 2 -> SEC 1

How are the flight control surfaces controlled and actuated?

All surfaces are controlled electrically and actuated hydraulically.

When is automatic pitch trim available?

In flight under Normal law with bank angle less than 33° with or without autopilot engaged.

If the active elevator actuator fails, what occurs?

Control is transferred the other actuator.

How is roll control normally achieved?

1 aileron and 4 spoilers on each wing.

If both FAC’s fail, is maximum rudder deflection available?

Yes, after slat extension.

Was Bill Gates involved in the Airbus flight computer software development?

Let’s hope not
**EVAC Panel**

*What is checked on the EVAC panel during the Originating check?*

- CAPT & PURS switch in CAPT position
- COMMAND pb is guarded

*How would the flight crew command an evacuation?*

- Press the EVAC COMMAND pb
- Make a PA announcement

**EMER ELEC PWR Panel**

*What buses are powered by the emergency generator?*

- AC ESS and AC ESS SHED
- DC ESS and DC ESS SHED

*What does the RAT & EMER GEN red fault light indicate?*

- Loss of AC GEN BUS 1 & 2,
- Airspeed above 100 knots, and
- Emergency generator not supplying AC power

*What is the function of the RAT & EMER GEN pb?*

- AUTO – RAT will automatically extend if AC BUS 1 & 2 are not powered and airspeed > 100 knots
- MAN - extend the RAT at any time

*How long does it take the RAT to extend and provide power?*

8 seconds (3 seconds for RAT extension, 5 seconds to pressurize the Blue hydraulic system and power the EMER GEN).

*What does the red FAULT light on the RAT & EMER GEN pb indicate?*

Normal AC is lost and the emergency generator is not supplying power.

*When should the red FAULT light on the RAT & EMER GEN pb be expected?*

During the 8 second RAT deployment and power up.

*What powers the emergency generator?*

Blue hydraulic power from the RAT.

*What is the output of the Emergency Generator?*

5 KVA

*Is there another way to deploy the RAT?*

Yes, from the HYD panel.

*What is different about this deployment?*

Blue HYD pressure only – NO generator.

*Do pilots ever use the EMER GEN TEST pb?*

No – maintenance function only.

*What happens when you push the GEN 1 LINE pb?*

- The GEN 1 Line Contactor opens and the white OFF light illuminates
- AC BUS 1 is powered by GEN 2 through the BUS TIE CONTACTOR
- GEN 1 powers 1 fuel pump in each wing tank
When is this procedure used?
Smoke procedures

What does the SMOKE light in the GEN 1 LINE pb indicate?
Smoke detected in the avionics ventilation ducting.

Will there be any other indications of avionics smoke?
ECAM warning and amber FAULT lights in the EXTRACT and BLOWER pbs on the VENTILATION panel.

**GPWS Panel**

Pressing the SYS pb does what?
Inhibits all EGPWS warnings except TERR system.

What does an amber FAULT light in the SYS pb indicate on the GPWS panel?
Any failure of GPWS mode 1 through 5.

Does this affect the TERRAIN mode?
No

What does LDG FLAP 3 ON light indicate?
Mode 4 “Too Low Flaps” inhibited for a Flap 3 landing.

When would you press the FLAP MODE pb?
To avoid nuisance warnings when landing with flaps less than 3.

What does FLAP MODE OFF light indicate?
Mode 4 “Too Low Flaps” inhibited for a landing with LESS THAN Flap 3.

If the TERR mode failed does it affect the basic GPWS?
No

**RCDR Panel**

When is the RCDR normally on in AUTO?
- On the ground, for 5 minutes after electrical power is supplied to the aircraft
- When at least 1 engine is operating
- Stops 5 minutes after the last engine is shut down

What does the CVR record?
ACP’s and cockpit area microphone.

How do you record the F/A’s PA’s?
ACP 3 PA VOL knob out and in the 3 o’clock position.

How do you erase the RCDR tape?
- RCDR ON
- Aircraft on the ground
- Parking Brake ON
- Press the CVR ERASE pb (2 seconds)
When does the Digital Flight Data Recorder operate?

- On the ground, for 5 minutes after electrical power is supplied to the aircraft
- When at least 1 engine is operating
- Continuously in flight, whether or not the engines are operating
- Stops 5 minutes after the last engine is shut down

**OXYGEN Panel**

**What does the PASSENGER SYS ON light mean?**
The signal to release the oxygen mask doors has been sent.

**Does this mean all the passenger oxygen masks have deployed?**
No, the flight attendants may have to manually deploy some of the masks.

**When do the masks automatically deploy?**
When cabin altitude exceeds 14,000 feet.

**What method is used to supply passenger cabin supplemental oxygen?**
Chemical generators

**How do cabin occupants activate oxygen flow to their masks?**
Pull the mask toward the seat.

**How long does the PAX oxygen last?**
Approximately 13 minutes.

**Where is oxygen stored for the crew?**
In a single high-pressure cylinder.

**Above what altitude will the crew oxygen masks provide 100% oxygen regardless of the position of the N/100% selector?**
35,000 feet

**What happens during the preflight when you push to extinguish the CREW SUPPLY OFF light?**
It opens a valve in the avionics bay to supply low-pressure crew oxygen.

**What would you notice on the DOOR ECAM?**
The OXY would change from amber to green.

**What indication would you have of a crew oxygen cylinder thermal discharge?**
The green disk on the lower left side of the forward fuselage would be missing.

**Will the crew oxygen mask microphone automatically be deactivated when the mask is stowed?**
No, you must press the RESET slide switch.

**CALLS Panel**

**How do you call a mechanic?**
Press and hold the MECH button. It illuminates a blue light on the EXT PWR PANEL and sounds an external horn.
How do you call the forward flight attendant?
- Press the FWD button
- Red light appears on the fwd area Call Panel
- CAPT CALL appears on the FWD F/A indication panel
- A green light illuminates
- A low level chime sounds through the fwd cabin loudspeaker

What happens when you press the EMER pb?
- Pink light flashes at all area Call Panels
- EMERGENCY CALL appears on all attendant indication panels
- High-low chime (repeated 3 times) sounds throughout the cabin loudspeakers

What happens when the F/A’s initiate an emergency call?
- The white EMER ON light and amber CALL lights flash
- The amber ATT lights flash on the ACP’s
- 3 long buzzers sound in the cockpit
- System resets when the attendant hangs up the relevant systems

How do you command an emergency evacuation?
Press the COMMAND EVAC pb and make a PA.

RAIN Panel
What is the maximum windshield wiper operation speed?
230 knots

The RAIN RPLNT pb when pressed does what?
Timer applies a measured quantity of rain repellent to the windshield.

When will the RAIN RPLNT pb not work?
On the ground with the engines stopped.

EXT LTS Panel
If the RWY TURN OFF, LAND, and NOSE switches are all in the ON position, which lights automatically extinguish after takeoff?
The NOSE and RWY TURN OFF lights extinguish when the landing gear is retracted.

What is the correct position for the NAV & LOGO switch?
Position 2

When does the LOGO light illuminate with the switch in 2?
Main landing gear strut compression or slat extension.

Are the 1 and 2 positions connected to a single bulb?
No, they are separate bulbs.

What position should the STROBE switch be in during preflight?
AUTO

When do the strobes flash in AUTO?
When the main landing gear strut is not compressed.
**APU Panel**

What does the APU MASTER SW pb to ON do?

- Electrically powers the APU system (Blue ON light in pb)
- ECB performs a power up test
- APU ECAM page appears (if EXT or ENG GEN AC power is available)
- APU air intake flap opens
- APU fuel isolation valve opens
- APU fuel pump operates (if no tank pumps are on)

What happens when you push the APU START pb?

- Blue ON light illuminates
- When APU air intake flap opens the starter is energized
- Ignition is turned ON 1.5 seconds after starter is energized
- Starter is de-energized and ignition turned OFF at 55% N
- Blue ON light in START pb extinguishes
- Green AVAIL light illuminates 2 seconds after 95% N or above 99.5% N
- APU page disappears from the ECAM 10 seconds later

With the APU running and supplying bleed air, how do you shut it down?

- APU BLEED pb OFF
- APU MASTER SW OFF
- APU will cool down and then shut down

What does the green AVAIL light on the APU START pb indicate?

The APU is available to provide electrical power and/or bleed air.

With the APU green AVAIL light ON and the EXT PWR green AVAIL light on, which system is powering the aircraft?

APU

If the APU is running, is it necessary to manually select APU BLEED OFF prior to APU shutdown?

No. When the APU MASTER SW is selected OFF, the bleed air valve is closed and the APU is allowed to cool prior to shutdown.

During the cool down cycle can you still use the APU?

Yes, press the APU MASTER SW pb.

The APU generator can supply 100% load to what altitude?

25,000 feet

The APU can supply bleed air to what altitude?

20,000 feet

An amber FAULT light in the APU MASTER SW pb indicates?

An APU auto shutdown has occurred.

What does an amber FAULT light in the APU BLEED pb mean?

An APU bleed leak.

Does APU air or electric have priority?

Electric
**SIGNS Panel**

*What signs illuminate when you turn the NO PED (NO SMOKING) switch to ON?*

- NO Personal Electronic Device (PED)
- EXIT signs
- Also sounds a low tone chime

*Do we use the AUTO position?*

No

*How come?*

Because

*When will the EXIT signs automatically illuminate?*

- With the EMER EXIT LT switch in ARM, and ...  
  - Normal AC power is lost
  - DC SHED ESS BUS not powered
  - Cabin altitude is excessive (above 11,300 feet)
  - NO PED (SMOKING) signs illuminated

*What lights illuminate when normal aircraft electrical power fails?*

- Floor proximity emergency escape path marking system
- Overhead emergency lighting

*What lights illuminate when the EMER EXIT LT switch is placed to ON?*

- Overhead emergency lighting
- Floor proximity emergency escape path marking system
- EXIT lights

*What occurs when the EMER EXIT LT switch is placed to OFF?*

- All lights OFF
- Amber EMER EXIT LT OFF light illuminates

**INT LTS Panel**

*What flight deck lighting is available if normal electrical power is lost?*

- Captain's Instrument Panel
- Right Dome Light (provided DOME switch set in DIM or BRT)
- Standby Compass

**ANTI ICE Panel**

*Is the engine anti-ice part of the normal pneumatic system?*

No – it is a separate system independent of the pneumatic ducting.

*When do you use engine anti-ice?*

- When OAT (Ground) / TAT (Flight) 10° C or below with visible moisture present
- Prior to and during descent in icing conditions (including temperatures below ~40° C SAT)

*What is the exception to the above rule?*

During climb and cruise when the temperature is below ~40° C SAT

*What does a FAULT light in the ENG ANTI ICE pb indicate?*

Switch/anti-ice valve disagreement
With ENG ANTI ICE ON what indications will you see?

- Blue ENG ANTI ICE light ON
- ECAM: ENG ANTI ICE
- ECAM: IGNITION
- N1 limit is reduced (amber tick on N1 indicator)
- N1 idle is increased

What should you do if there is significant engine vibration due to ice?

Increase N1 to 70% for a minimum of 15 seconds prior to selecting a higher thrust.

With engine anti-ice ON, is your descent affected?

Yes, because idle thrust is increased.

Can you use the wing anti-ice on the ground?

No

What happens if you turn the switch on the ground?

The wing anti-icing valves will open for a 30 second test.

What part of the wing is heated?

Outboard 3 slats.

When do the wing anti-ice valves automatically close?

- On landing
- Bleed leak detected
- Loss of electrical power

Can you use the APU bleed for wing anti-ice?

No

What does the amber FAULT light in the WING ANTI ICE pb indicate?

- Position of the anti-icing control valve is not in the required position
- Low pressure is detected

In what position do the Wing and Engine Anti-Ice valves fail if electrical power is lost?

- Wing – valves CLOSE
- Engine – valves OPEN

PROBE/WINDOW HEAT Panel

Which exterior aircraft components utilize electrical heating?

- Cockpit windshields and sliding side windows
- AOA, TAT, pitot probes, and static ports
- Waste water drain masts

On the ground, with the PROBE/WINDOW HEAT pb in AUTO, when are the probe and mast heaters activated?

- LOW with at least one engine running (except the TAT probe)
- HIGH is automatically selected after takeoff

What does the PROBE/WINDOW HEAT pb do?

Manually activates the probe, drain mast, and window heaters.

With the PROBE/WINDOW HEAT pb ON will the heaters automatically switch to AUTO?

No
**CABIN PRESS Panel**

*What does the DITCHING pb do?*

Closes all valves below the water line.

*Which valves will a close signal be sent to (CARPO)?*

- Cargo (aft) isolation valve (if installed)
- Avionics Inlet and Extract valves
- Ram air inlet
- Pack Flow Control valves
- Outflow valve (only if in AUTO mode)

*Will the DITCHING pb always close the outflow valve?*

Not if the outflow valve is under manual control.

*Can the pilot control the outflow valve?*

Yes, select MAN on the MODE SEL and use the MAN V/S CTL switch.

*Approximately what rate of cabin change does 1 click of the MAN V/S CTL switch produce?*

50 FPM

*How many controllers are in the pressurization system?*

2, only one is used at a time and they swap roles after each landing.

*How do you manually switch controllers?*

Switch MODE SEL to MAN for 10 seconds, then back to AUTO

*What does an amber FAULT light in the MODE SEL pb indicate?*

Both automatic pressure controllers are faulty.

*The LDG ELEV selector in the AUTO position does what?*

The pressurization system uses the FMGS data to construct an optimized pressurization schedule.

*Where does the pressurization system obtain the landing elevation from?*

FMGC database

*When out of the AUTO position, what is different?*

The pressurization system uses the manually selected landing elevation.

*What is the maximum cabin rate of descent with the pressurization in AUTO?*

750 FPM

*What protects the airframe from excessive cabin differential pressure?*

2 pressure relief valves.

*How many outflow valve motors are installed?*

3 – one for each automatic controller and one for manual control.

**AIR CONDITION Panel**

*The pneumatic system is monitored and controlled by?*

2 Bleed Monitoring Computers (BMC)
If one BMC fails, can the other take over?

Yes, they are interconnected. If BMC 1 fails:

- APU and ENG 1 leak detection are not monitored
- ECAM APU BLEED LEAK warning is lost

On the ECAM Bleed page, how do you tell if GND HP air supply is connected?

The GND unit bleed pressure and pressure are indicated on the ECAM BLEED PRECOOLER #1

The PACK FLOW selector has LO, NORM, and HI positions (A319/320). What does this allow us to do?

Select pack flow rates representing LO 80%, NORM 100%, and HIGH 120% of NORM according to number of pax and ambient conditions.

What flow rate is automatically selected when APU bleed air is in use or during single pack operation?

- HI (A319/320)
- NORM (A321)

If the engine bleed air in-flight is too low what will occur?

Engine speed is automatically increased to provide adequate bleed air pressure.

What would cause an amber PACK FAULT light to illuminate (PCS)?

- Pack outlet overheat
- Compressor outlet overheat
- Switch position disagreement with pack flow control valve

Note: FAULT light will be illuminated during preflight as no bleed air is supplied.

What does the amber FAULT light in the APU BLEED pb indicate?

Bleed leak (APU bleed valve closes)

What causes the amber FAULT light on the ENG BLEED pb (ASOLO)?

- APU bleed valve open and engine bleed valve not closed
- Engine Start with bleed valve not closed
- Overpressure downstream of the bleed valve
- Leak (low pressure)
- Overheat

What are the two functions of the engine bleed valves?

- Pressure regulation
- Shut off valves

What is the RAM AIR pb used for?

- Smoke removal in cabin
- Ventilation of cabin with a dual pack failure

At what cabin differential pressure does the RAM AIR valve open?

1 PSI \( \Delta P \) or less.

What logic controls the X-Bleed valve when the X-BLEED switch is in AUTO?

- When APU bleed valve is OPEN, the X-Bleed valve is open
- When APU bleed valve is CLOSED, the X-Bleed valve is closed
- X-Bleed also CLOSES for wing, pylon, or APU duct leak (except during engine start)
What causes the Pack Flow Control valve to automatically close?

- Upstream pressure below minimum
- Compressor outlet overheat
- Engine start sequence
- Engine FIRE pb on the related side pressed
- DITCH pb is selected

What does the amber HOT AIR FAULT light indicate?

Duct overheat. The Hot Air and Trim Air valves close automatically.

What is the function of the HOT AIR pb?

Controls the hot air pressure regulating valves which controls the flow of hot air to the trim air valves. This hot air is mixed with the pack-conditioned air for zone temperature control.

How many Zone Controllers are there?

1 (2 channels – Primary/Secondary)

How many Pack Controllers?

2 (2 channels each – Primary/Secondary)

Describe how the air conditioning system controls the temperature in each zone.

- Pack output temperature regulation is determined by the zone requiring the coldest air
- Hot air is added to the individual zones by the trim air valves to maintain the desired zone temperatures

If the Zone Controller Primary channel fails how are the Packs controlled?

- COCKPIT selector controls Pack 1
- Average of FWD CABIN and AFT CABIN selectors controls Pack 2, fixed at 76° F

If both channels in the Zone Controller fail, what occurs?

Pack temperatures will default to 68° F from Pack 1, and 50° F from Pack 2.

If both channels of a pack controller fail, what will occur?

Pack outlet temperature is fixed at 59° F.

If an air cycle machine (ACM) fails, what occurs?

The affected pack will operate as a heat exchanger.

What effect will the engine start sequence have on the pack flow control valves?

The pack flow control valve will close automatically.

What causes the pack flow control valve to close?

- Upstream pressure below minimum
- Compressor outlet overheat
- During engine start
- FIRE pb on that side pressed
- DITCHING pb pressed

After engine start with the APU BLEED pb ON, what source is supplying bleed air to the packs?

APU Bleed

When does the Lav/Galley Extract Fan operate?

Continuously when electrical power is available.
If the Lav/Galley Extract Fan fails, what occurs?  
Cabin temperature defaults to a set value.

ELECTRIC Panel  
When performing the Originating checklist, what is the minimum Battery Voltage?  
25.5 Volts  
What do you do if it is below 25.5V?  
Select BATT pb's to ON with EXT PWR on aircraft.  
How long will it take to charge the batteries?  
20 minutes  
During the Originating Checklist what are we looking for on the ELEC panel BAT check?  
- ECAM ELEC page – select  
- BAT 1 & 2 – OFF then ON  
- Check BATT charge current is < 60 amps and decreasing within 10 seconds  
Will the batteries completely drain if you leave the BAT switches in AUTO after AC power is removed?  
No. Battery cut-off logic prevents complete discharge when the aircraft is on the ground and unpowered.

How is the BATTERY BUS normally powered?  
DC BUS 1 through a DC tie contactor  
What does the amber FAULT light in the GALLEY pb indicate?  
At least 1 generator load is above 100% rated output.  
How does the GALLEY pb work in AUTO?  
Sheds main galley (A319/320), all galleys (A321), and in-seat power supply if:  
- Only 1 generator (APU or Engine) is available in FLIGHT, or  
- Only 1 ENGINE generator is available on the GROUND  
What is the max continuous load rating of the engine and APU generators?  
90 KVA  
What does a FAULT on the ENG GEN pb indicate?  
- A fault is detected by the GCU, and/or  
- The generator line contactor is open  
When is it normal to see the ENG GEN FAULT light illuminated?  
Prior to engine start  
What does the APU GEN FAULT light indicate?  
The generator line contactor is open.  
When is the APU GEN FAULT light inhibited?  
- APU speed too low  
- Line contactor OPEN after EXT PWR or ENG Generator takes over
What is the function of the BUS TIE in the AUTO position?
Allows the BUS TIE CONTACTORS to open and close automatically to maintain power to both AC BUS 1 & 2:
- Allows a single source to power the entire system
- Allows connection of the APU GEN or EXT PWR to the system
- Inhibits multiple sources connected simultaneously

What does IDG stand for?
Integrated Drive Generator

What is the function of the IDG?
Converts variable engine speed to constant speed for optimum generator operation.

What does an IDG FAULT light indicate?
- Oil pressure low (inhibited when N2 < 14%)
- Oil outlet temperature overheat
- Light is inhibited when IDG is disconnected

What precautions must you take when disconnecting an IDG?
- Do not disconnect when the engine is not operating or windmilling
- Do not hold button longer than 3 seconds
- Only maintenance personnel can reconnect the IDG

What is the function of the AC ESS FEED pb in the normal position?
If AC BUS 1 is lost AC BUS 2 automatically feeds the AC ESS BUS

What does the AC ESS FEED pb white ALT light indicate?
The AC ESS BUS is supplied by AC BUS 2.

What is the purpose of the static inverter?
To provide AC power to the AC ESS bus from the battery when operating in the Emergency Electrical Configuration.

When is the battery check performed?
During the Originating Check of the ELEC panel.

How is the Battery check accomplished?
- Select ECAM ELEC page
- Switch BAT 1 & 2 OFF, then ON
- Check charging current below 60 amps and decreasing within 10 seconds

What does a BAT FAULT light indicate?
Battery charging current is outside limits (BAT contactor opens).

What are the 3 times the batteries are connected to the BATTERY BUS?
- APU start
- Battery charging
- AC BUS 1 & 2 not powered and airspeed below 100 knots

What is the priority sequence for electrical power?
- 1. Engine Generators
- 2. EXT PWR
- 3. APU Generator
- 4. RAT Emergency Generator
- 5. Batteries
With the APU green AVAIL light ON and the EXT PWR blue ON light illuminated, which system is powering the aircraft?

EXT PWR

What is the significance of the green collared circuit breakers on the flight deck?

- Green – Monitored by ECAM system
- Red – Wing tip brake C/B
- Yellow – pulled in compliance with prescribed procedure on battery power only

**FUEL Panel**

What is the normal in-flight fuel management scheme?

Use center tank first, then the wing tanks.

How many fuel pumps are installed (A319/320)?

- 2 in each wing tank
- 2 in center tank
- 1 APU pump to provide fuel to the APU when the tank pumps are off

With full fuel, when do the center tank fuel pumps operate (A319/320)?

- For 2 minutes after BOTH engines are started (if slats are UP will continue to run)
- After slat retraction
- Continue to run for 5 minutes until the center tank is empty or slats are extended

What will cause a FUEL MODE SEL FAULT light?

- Failure of the AUTO mode
- Center tank contains more than 550 lb and either main tank has less than 11,000 lb

What is the approximate fuel capacity of each outer fuel tank (A319/320)?

1,560 lb

When do the main tank outer cells drain into the inner tanks (A319/320)?

When the inner tank quantity reaches 1,650 lb.

If only one inner tank reaches 1,650 lb, what happens to the other transfer valve (A319/320)?

All 4 transfer valves open.

Once opened to transfer fuel, how are the fuel transfer valves closed?

Automatically at the next refueling operation.

How is the IDG cooled?

By fuel from the HP fuel pump drawn in from the fuel manifold and then returned to it’s respective outer tank. When full the outer tank spills over to the inner tank.

If the IDG return fuel fills the wing tanks, what occurs?

The center tank pumps turn off until the wing tank quantity reduces by 1,100 lb.

What does an amber FAULT light in the FUEL PUMP pb indicate?

Low fuel delivery pressure

If the wing tank pumps fail, is suction feeding possible?

Yes – only from the inner wing tank cells.
**Can fuel be transferred from one tank to another?**

Only during ground refueling.

**With full wing fuel what prevents the IDG fuel from overflowing the wings?**

Separate full level switches.

**Why are the outer wing tanks drained last?**

Structural wing bending moment relief.

**When does the APU fuel pump run?**

When the wing or center tank pumps are not on.

**What does the REFUEL message on the ECAM indicate?**

The refueling control panel door is not closed.

**What does an amber boxed ECAM FOB indicate?**

Some fuel is unusable.

## HYDRAULIC Panel

**Can the aircraft be flown with a loss of all hydraulic systems?**

No – you must have at least one (scary, huh?)

**What occurs when you press the RAT MAN ON pb?**

The RAT extends providing pressure to the BLUE hydraulic system.

**Does the PTU transfer hydraulic fluid?**

Nope

**How many hydraulic pumps are in the GREEN system?**

- 1 Engine
- 1 PTU

**How many hydraulic pumps are in the BLUE system?**

- 1 Electric
- 1 RAT

**How many hydraulic pumps are in the YELLOW system?**

- 1 Engine
- 1 Electric
- 1 PTU
- 1 Hand pump

**When does the BLUE ELEC PUMP operate?**

- After the first engine is started
- If the BLUE PUMP OVRD pb on the MAINTENANCE panel has been pressed with no engine running

**What is normal system hydraulic pressure?**

3000 PSI

**Does the RAT automatically deploy with the loss of BLUE pressure?**

No, it must be deployed manually by the RAT MAN ON pb.
If the ACCU PRESS indicator is low, what should you do?

Obtain ground clearance, then turn ON the YELLOW ELEC PUMP to pressurize the accumulator.

When does the PTU operate with pb in AUTO?

- With a difference of 500 PSI between GREEN and YELLOW pressure
- After first engine start until second engine is started

When is the PTU inhibited?

- PTU pb OFF
- First Engine start
- Parking brake is ON and only one ENG MASTER switch is ON
- NWS in towing position and parking brake ON
- Cargo door operation

If the ECAM actions lead you to turn OFF the PTU for a Reservoir Overheat, will the FAULT light go out?

No, not until the overheat subsides.

If the FAULT light in the PTU pb is ON, are there any other indications on the HYD Panel?

Yes – also a FAULT light illuminated in the respective ENG PUMP pb.

Can the YELLOW ELEC PUMP run the PTU?

Yes, which will then pressurize the Green hydraulic system.

Does operating the cargo door run the PTU?

No, it is inhibited.

Name several items that run from only the GREEN system?

- Landing gear
- Nosewheel steering
- Normal Brakes
- Slats and flaps
- #1 Thrust reverser

Name several items that run from only the YELLOW system?

- Alternate Brakes
- Parking Brake
- Cargo doors
- #2 Thrust reverser

What does an amber FAULT light in the PTU pb indicate (OLL)?

- Overtemp in reservoir
- Low air pressure in the reservoir
- Low quantity in the reservoir

What does an amber FAULT light in the ENG PUMP pb indicate (POLL)?

- Pump pressure low
- Overtemp in reservoir
- Low air pressure in the reservoir
- Low quantity in the reservoir

What does a FAULT light in the BLUE or YELLOW ELEC PUMP pb indicate (POLLO)?

- Pump pressure low
- Overtemp in reservoir
- Low air pressure in the reservoir
- Low quantity in the reservoir
- Pump Overheat
**Where are the HYD FIRE SHUTOFF VALVES located?**
Between the reservoirs and the ENG pumps.

**What is the function of the hydraulic priority valves?**
Hydraulic power to the flaps, slats, landing gear, NW steering, and emergency generator is cut off if pressure drops below a predetermined value.

**What is the purpose of the hand pump?**
To provide Yellow hydraulic pressure for cargo door operation.

**FIRE Panel**

**Where are the engine fire loops installed?**
- Pylon nacelle
- Engine core
- Fan section

**What happens if both fire loops fail?**
If the failure of both loops occurs within 5 seconds of each other, a FIRE warning will be issued.

**What does an amber DISCH light mean?**
The fire extinguisher bottle has lost its pressure.

**How many fire extinguishers are provided for each engine?** 2

**List the actions that occur when an ENGINE FIRE pb is pressed.**
- 1 – Silences the aural fire warning
- 2 – Arms the fire extinguisher squibs
- 1 – Closes the hydraulic fire valve
- 2 - Closes the LP fuel and engine fuel return valves
- 1 – Deactivates the engine generator
- 2 - Closes the pack flow control and engine bleed valves

**What occurs when you press the TEST pb on the ENGINE FIRE panel?**
- CRC sounds
- MASTER WARN lights flash (2)
- ENG FIRE pb illuminates red (1)
- SQUIB and DISCH lights illuminate (2)
- ECAM FIRE WARNING (1)
- FIRE light on the ENG panel illuminates (1)

**How many fire extinguishers are provided for the APU?** 1

**List the actions that occur when the APU FIRE pb is pressed.**
- 1 – Silences the aural fire warning
- 1 – Arms the APU fire extinguisher squib
- 2 - Closes the LP fuel valve and shuts OFF the APU fuel pump
- 1 – Deactivates the APU generator
- 2 - Closes the APU bleed and crossfeed valves

**What occurs when you press the APU FIRE TEST pb?**
- CRC sounds
- MASTER WARN lights flash (2)
- APU FIRE pb illuminates red (1)
- SQUIB and DISCH lights illuminate (1)
- ECAM FIRE WARNING (1)
Does the APU fire extinguisher automatically discharge if a fire is detected in ground?
Yes. The APU will automatically shut down and the APU fire extinguisher will discharge.

Does the APU fire extinguisher automatically discharge if a fire is detected in flight?
No

AUDIO MGMT Panel

What is the AUDIO SWITCHING PANEL used for?
Allows for switching to ACP 3 if ACP 1 or 2 fails.

MAINTENANCE Panel

Do the pilots use the Maintenance panel?
No

If a mechanic pressed the APU AUTO EXTING TEST pb what would occur?
The APU will shut down.

CARGO HEAT Panel

What does the CARGO HEAT HOT AIR amber FAULT light indicate?
Duct overheat

What does the CARGO HEAT AFT ISOL VALVE amber FAULT light indicate?
Valve disagreement of inlet or outlet valve

CARGO SMOKE Panel

How many fire extinguishers are provided for the cargo compartments?
1 bottle, which can be discharged to either compartment.

What are the indications when you test the CARGO SMOKE (2,2,2,2,2)?
- 2 amber DISCH lights illuminate
- 2 red SMOKE lights illuminate
- 2 MASTER WARNING lights with CRC
- 2 CARGO SMOKE lines on the ECAM
- Test runs TWICE to check both SDCU channels

What does the red SMOKE light in the FWD or AFT pb indicate?
- Both channels detect smoke, or
- One channel faulty and the other detects smoke

How many smoke detectors are there?
- A319/320 – 2 fwd, 2 aft
- A321 – 4 fwd, 2 aft

With a CARGO SMOKE warning what happens to the Isolation Valve and Extract Fan?
- Isolation Valve closes
- Extract Fan stops

VENTILATION Panel

What is the purpose of the CABIN FANS?
To re-circulate cabin air to the mixing chamber and then back to the cabin.
With **BLOWER** and **EXTRACT** pbs in **AUTO** how does the system operate?

- Ground – system is in OPEN configuration
- Flight – system is in CLOSED configuration
- Intermediate – Closed except Extract Valve is partially open

With **both BLOWER** and **EXTRACT** pbs in **OVRD**, what are the positions of the **INLET** and **EXTRACT** valves?

- INLET valve CLOSED
- EXTRACT valve OPEN

**What fan is OFF in the above situation?**

- BLOWER fan OFF
- EXTRACT fan ON

**Is Air Conditioning ever introduced into the Avionics Compartment?**

Yes – In the SMOKE configuration or Abnormal configuration.

**Is the skin heat exchanger ever bypassed in flight?**

Yes – during SMOKE configuration.

**What does a FAULT light on the **BLOWER** pb indicate?**

- SMOKE Warning is activated
- Computer power supply failure
- Low Blower pressure
- Duct overheat

**What does a FAULT light on the **EXTRACT** pb indicate?**

- SMOKE Warning is activated
- Computer power supply failure
- Low Extract pressure

**With 2 FAULT lights on the **VENTILATION** panel are there any other indications?**

Yes – The SMOKE light in the GEN 1 LINE pb.

**ENG Panel**

**What are the primary differences between a manual and a normal automatic start?**

- The FADEC provides full monitoring during a manual start and will provide appropriate ECAM cautions and procedures to follow in the event of a start fault
- Automatic start interruption and auto-crank are not available

**With the **ENG MODE** selector in IGN/START what occurs when you press the **ENG MAN START** pb?**

- The start valve opens
- Both pack flow control valves close

**Will the start valve then automatically close?**

Yes, at 50% N2.

**When would you use a manual start?**

- After a failed auto start (stall, EGT overlimit, no N1 rotation, hung start)
- A mature engine
- Hot/high conditions
- Low starting air pressure
- Tail wind
GLARESHIELD/FCU

**What does the red AUTO LAND light indicate?**

Below 200 feet RA:
- Excessive deviation (LOC or G/S)
- Loss of both autopilots
- Loss of LOC or G/S signals
- Difference of 15 feet between the RA’s

**What does the red arrow in the SIDE STICK PRIORITY light mean?**

It illuminates in front of the pilot losing authority.

**How would you regain control?**

- The last pilot to press the pb on the sidestick will have authority
- An aural "Priority Left" or "Priority Right" will sound

**What does the flashing green CAPT and F/O SIDESTICK PRIORITY lights indicate?**

Both sidesticks have been moved simultaneously and neither pilot has taken priority.

**What happens when both pilots make an input simultaneously on the sidesticks?**

- The inputs are algebraically summed up to the normal limits
- An aural "Dual Input" will sound
- Green CAPT and F/O lights will illuminate

**What is the function of the LOC pb?**

Arms, engages, or disengages the LOC mode

**When do you press the APPR button?**

When cleared for the approach.

**After pressing the APPR button, what do you check for?**

- ILS – Blue LOC and GS in FMA
- RNAV – APP NAV and FINAL

**What is the function of the Flight Control Unit?**

- Permits short term interface between the pilot and FMGS
- Allows temporary modification of any flight parameter (HDG, SPD, ALT, V/S)
- Used to select operational modes of the autopilots, flight directors, and A/THR system

**What do dashes in the FCU display windows along with the adjacent white dot indicate?**

FMGS Managed Guidance is in use

**How is Selected Guidance engaged?**

Pull the appropriate selector knob.

**How do you confirm all autopilot, FD, and A/THR inputs?**

Confirm all mode inputs by reference to the FMA

**Will the FCU Altitude window ever display dashes?**

No. Pilot selected altitude will always be displayed.
**Primary Flight Display**

**What does each column mean on the PFD?**
A/THR  | VERTICAL  | LATERAL  | APPROACH CAPABILITY, DH/MDA  | AP, FD, A/THR ENGAGEMENT STATUS

**How is the crew made aware of mode changes on the FMA?**
A white box is temporarily displayed around the new indication.

**How are armed modes displayed on the FMA?**
- Blue – armed
- Magenta – armed because of a constraint
- Green - engaged

**When is the sidestick position indication icon (white cross) displayed?**
- Displayed when the first engine is started
- Disappears at liftoff

**What would the large red arrowheads indicate?**
Pitch attitude of +30°

**After you input the destination and ILS information into the MCDU, what do you check for?**
- After the ILS pb is pressed, green light
- ILS frequency and course on PFD
- ILS identifier once identified
- LOC and GS scales displayed on PFD

**What does the MAN PITCH TRIM ONLY in red mean?**
You are in Mechanical Backup.

**What does USE MANUAL PITCH TRIM in amber mean?**
You are in Direct Law

**What are the pitch and roll angle limits indicated by the green = signs?**
- Pitch: +30° up/-15° down
- Roll: +/- 67°

**How can you determine you are in Alternate Law?**
- Amber X’s at the pitch (30° UP/15° DN) and bank (67°) limits
- Only VLS and VSW is displayed on the airspeed scale

**When would the sideslip index change from yellow to blue?**
In case of an engine failure during takeoff/go-around, it is now a blue beta target.

**What does the yellow speed trend line on the airspeed display indicate?**
The speed the aircraft will reach in 10 seconds if acceleration/deceleration remains constant.

**What is the difference between the magenta and blue target airspeeds?**
- Magenta – Managed speed computed by the FMGC
- Blue – Selected speed on the FCU

**What is V_{LS} and how is it displayed?**
- Represents lowest selectable speed providing an appropriate margin to the stall speed
- Defined by the top of the amber strip along the airspeed scale
- In approach mode is equivalent to V_{ReF}
What speed does VMAX represent and how is it displayed?

- It is the lowest of $V_{NO}/M_{NO}$, $V_{LE}$, or $V_{FE}$
- Defined by the bottom of a red and black strip along the speed scale

What is Green Dot speed?

- Engine out operating speed in clean configuration
- Appears when the aircraft is in the clean configuration
- Corresponds to the best lift-to-drag ratio

What is Ground Speed Mini?

- Based on a calculated groundspeed at the runway
- Protects against actual groundspeed dropping below this calculated groundspeed

What does it mean when you see the magenta target airspeed triangle above VAPP on approach?

Ground Speed Mini has increased speed due to a higher headwind component at your present location than what was calculated at the runway.

Is this protection available in Selected speed?

No – Managed speed only

What would be indicated if the altitude window changed from yellow to amber?

The aircraft has deviated from the FCU selected altitude or flight level.

When is altitude alerting automatically inhibited in flight?

- When flaps are extended with the landing gear down
- On approach after glide slope capture

What does it mean when the altitude digits change from green to amber?

The aircraft has descended below the MDA/DH entered into the FMGC.

When is Radio Height displayed on the PFD?

Below 2,500 feet

Information from ILS receiver 1 is displayed where?

- Captain’s PFD
- F/O’s ND

What would a flashing amber ILS indicate on the bottom of the PFD?

Flashes amber when APPR mode is armed and the ILS display is not selected.

NAVIGATION DISPLAY

What displays or modes are available on the ND?

- Rose ILS
- Rose VOR
- Rose NAV
- ARC
- PLAN

What colors are used to represent the various displayed flight plans?

- Active – continuous green line
- Secondary – continuous white line
- Temporary – dashed yellow line
- Alternate – dashed blue line
- Missed approach – continuous blue line
Top of Descent and Continue Descent arrows are displayed in blue or white. What is the difference?

- Top of Descent – Always white (never armed)
- Continue Descent – Blue indicates armed, white indicates NOT armed

What color does each altitude constraint circle represent?

- White – constraint is not taken into account
- Magenta – constraint is predicted to be satisfied
- Amber – constraint is predicted to be missed

If mode range data fails what should you expect to see on the ND?
ROSE NAV and 80 nm range.

Where is VOR data displayed?
Both ND’s and the DDRMI

ENGINE/WARNING DISPLAY

What are the 3 levels of ECAM Malfunction Notifications?

- WARNINGS – Associated with the red MASTER WARN light, CRC, and require immediate action
- CAUTIONS – Associated with the amber MASTER CAUT light, single chime, and require crew awareness
- ALERTS – Associated with amber E/WD message, no aural signal, and requires crew monitoring

If simultaneous failures occur, how will they be presented to the crew?
A level 3 Warning has priority over a level 2 Caution which has priority over a level 1 Alert.

What types of failures are presented to the crew?

- Independent – Failure affecting an isolated system/item without degrading other systems/items
- Primary – Failure of a system/item that affects the use of other systems/items
- Secondary – Loss of a system/item resulting from a primary failure

Which part of the E/WD would the crew find indication of Primary failures?
On the lower left portion of the screen.

What indication does the E/WD provide for secondary failures?
Secondary failures are displayed on the lower right portion of the E/WD and are preceded by an *.

What does the appearance of a green arrow indicate at the bottom of the E/WD screen indicate?
Information has overflowed off the screen and the pilot must scroll down using the CLR pb on the ECAM panel.

What does the display of T.O. INHIBIT or LDG INHIBIT indicate?
Most warnings and cautions are inhibited to avoid unnecessary distractions during critical phases of flight.

What types of warnings are NOT inhibited during takeoff?

- ENGINE FIRE
- APU FIRE
- ENG FAIL (ENG SHUT DOWN)
- ENG OIL LO PR
- L+R EVEV FAULT
- A/P OFF
- CONFIG
- FWC 1+2 FAULT
What are the Takeoff Configuration Warnings/Cautions?

- SLATS/FLAPS NOT IN T.O. RANGE
- PITCH TRIM NOT IN T.O. RANGE
- SPEED BRAKES NOT RETRACTED
- SIDESTICK FAULT
- HOT BRAKES
- DOOR NOT CLOSED
- PARK BRAKE ON
- FLEX TEMP NOT SET (unless thrust levers in TOGA detent)

When does the Takeoff Memo appear?

- 2 minutes after the 2nd engine is started or when the T.O. CONFIG TEST pb is pressed with one engine
- Memo is removed when takeoff power is applied

When does the Landing Memo appear?

- Below 2,000’ RA with gear down or 800’ RA with gear up.
- Below 2,000 feet RA regardless of gear position (aircraft with new FWC)
- Memo disappears after touchdown (80 knots)

SYSTEM DISPLAY

In general, when are the system pages automatically displayed on the SD?

- Relative to the current phase of flight, or
- When a system malfunction is detected

When is a STATUS page displayed?

- After a failure is displayed on the SD and all failure items have been cleared
- Display will reappear when the slats are extended

What does the boxed STS indicate when displayed on the SD?

- The STATUS page holds messages other than CANCELLED CAUTIONS
- Flashes after engine shutdown to alert maintenance of any other applicable messages

FORWARD INSTRUMENT PANEL

What is the function of the 2 Landing Gear Control and Interface Units (LGCIU)?

- Provide sequencing, operation, monitoring, and indications for the landing gear
- Provide aircraft “In Flight” or “On the Ground” signals to other aircraft systems

What hydraulic system powers the landing gear and doors.

Green

After Emergency Landing Gear Gravity Extension, what other system is affected?

Nose wheel steering will be inoperative

Is normal hydraulic power available to the gear after Emergency Landing Gear Gravity Extension?

No

When does the red arrow in the LND panel illuminate?

Below 750 feet RA, when the aircraft is in the landing configuration and the landing gear is not locked down.

What happens if your airspeed is 280 knots and you place the Landing Gear lever to DOWN?

Nothing. A safety valve shuts off hydraulic power to the landing gear system when airspeed is above 260 knots.
**What do the red UNLK lights indicate?**
The landing gear is not locked in the selected position.

**What controls the LDG GEAR lights?**
LGCIU 1

**If LGCIU 1 fails will the lights still work?**
Yes, as long as it is still powered.

**What controls and manages all braking functions?**
The Brake and Steering Control Unit (BSCU)

**What happens when you switch the A/SKID & N/W STRG to OFF?**
- Lose Nosewheel steering
- Braking is powered by the Yellow system
- Anti-skid is deactivated

**Which hydraulic systems provide pressure to the brakes?**
- Normal brakes – Green
- Alternate brakes – Yellow backed up by a hydraulic accumulator

**When do the Autobrakes activate on landing if armed?**
When the ground spoilers deploy.

**What is the difference between LOW and MED AUTO BRK?**
- LOW – progressive pressure applied to brakes 4 seconds after ground spoilers deploy to decelerate at 5.6 FPS
- MED - progressive pressure applied to brakes 2 seconds after ground spoilers deploy to decelerate at 9.8 FPS

**What does the AUTO BRK green DECEL light indicate?**
Actual rate of deceleration is within 80% of the selected rate.

**What is the Takeoff setting for Auto Brakes?**
MAX

**What will cause the MAX AUTO BRK to activate on a RTO?**
- Airspeed above 72 knots, and
- Thrust Levers at IDLE, and
- Ground spoiler extension

**If you lose Green hydraulic pressure will you have Auto Brakes?**
No, not with the Alternate Brake system

**Is Anti-skid available with Alternate Brakes?**
Yes, if certain conditions are met

**With spoilers not armed will the spoilers deploy for an RTO?**
Yes – when at least one engine is in reverse.

**How many brake applications are available with accumulator pressure?**
Approximately 7 full applications
What is the maximum brake temperature for takeoff?

300° C

When should the brake fans be selected to ON?

ON when brake temperature exceeds 300° C and OFF when the temperature decreases to 250° C.

What does the BRAKES & ACCU PRESS triple indicator indicate?

- Yellow hydraulic pressure delivered to the left and right brakes
- Yellow system brake accumulator pressure

How do you perform the brake check during initial taxi?

Press the brake pedals to ensure the aircraft slows, and check the brake pressure on the triple indicator is zero, indicating the Green hydraulic system has taken over.

**EIS SWITCHING PANEL**

What computers feed data to the six display units?

3 Display Management Computers (DMC)

What does each of the DMC’s normally supply?

- DMC 1 – Captain PFD, ND, upper ECAM DU
- DMC 2 – F/O PFD, ND, lower ECAM DU
- DMC 3 – Backup

How can you tell if a DMC has failed?

A diagonal line will be displayed in the respective EFIS/ECAM display unit.

What happens when the upper ECAM display fails?

The E/WD automatically replaces the SD on the lower ECAM display.

If both the E/WD and SD display units fail, how can you display E/WD information?

Select the ECAM/ND switch to CAPT or F/O to transfer the SD to either ND.

**ECAM SWITCHING PANEL**

If the UPPER DISPLAY knob was switched to OFF what would occur?

The E/WD display would automatically transfer to the lower display.

With the E/WD displayed on the lower screen, how else can you view SD information?

Press and hold the appropriate system button on the ECAM CONTROL panel you wish to view.

How long will this information be available?

30 seconds

What does the ALL pb do?

- Displays ALL the system pages successively in 1-second intervals when held down
- Release the pb to maintain display of the selected page

What does pressing the RCL pb?

- Allows you to recall any warning or caution messages that the activation of the CLR pb or flight phase inhibition may have suppressed
- If held longer than 3 seconds, the E/WD will show any caution messages suppressed by the EMER CANC pb
If you press the STS pb and the system has no STATUS messages what will be displayed?

"NORMAL" for 5 seconds

If power fails to the ECAM CONTROL panel which buttons are still functional?

- EMER CANC
- ALL
- CLR
- STS
- RCL

What does the EMER CANC do?

- Cancels the current Level 1 or 2 warning for the remainder of the flight
- Cancels the current Level 3 warning for that occurrence

What do you look for on the FHED check?

- Fuel – fuel quantity, configuration, and balance
- Hyd – hydraulic quantity
- Eng – oil quantity above 12.5 quarts
- Door – doors closed, slides armed, crew oxygen pressure

What occurs during the Before Takeoff Checklist when the T.O. CONFIG pb is pressed?

- The system simulates the application of T.O. power and checks certain systems for proper configuration
- A warning is displayed if and system is not configured properly
- “TO CONFIG NORMAL” is displayed in the TO MEMO section if the configuration is correct

TRIMMABLE HORIZONTAL STABILIZER

How is the THS normally operated in flight?

The flight control computers control trim functions automatically

If NO hydraulic power is available can the THS be positioned?

No. The THS requires hydraulic power from the Green or Yellow systems.

If a complete flight control computer failure occurs can the THS be positioned?

Yes, mechanical trimming is possible by manually positioning the Pitch Trim Wheel.

Can you move the PITCH trim wheel if all systems are working normally?

Manual inputs have priority over computer inputs. The autopilot will disconnect.

What happens to the THS after landing?

The trim automatically resets to zero.

ENGINES / THRUST LEVERS

What controls the engines in all operating regimes?

FADEC’s (Full Authority Digital Engine Controls)

What functions does the FADEC control?

- Fuel metering
- Engine limits based on thrust lever angle
- Start sequencing
- Provides engine indications and thrust limit displays on the E/WD
**What redundancy does the FADEC have?**

Dual channel redundancy – one channel is active while the other is standby.

**What is the power source for the FADEC?**

- The system has its own alternator making it independent of the aircraft electrical system when N2 is above a set value
- If this alternator fails the FADEC automatically switches to aircraft electrical power

**When will the FADEC abort a start?**

- Hot start
- Stalled start
- No ignition

**If the FADEC detects a fault during automatic start, is any crew intervention required?**

No. The FADEC will discontinue the start, clear the engine, and attempt a restart (if warranted) automatically.

**When does the FADEC command a higher engine idle speed?**

- Bleed demands
- Approach Configuration
- High engine or IDG temperatures

**How many igniters fire during a Normal automatic ground start sequence?**

- One igniter with the other serving as a backup
- The FADEC automatically alternates the igniters (A and B) at each start

**How many igniters fire on Manual or In-flight starts?**

Both A and B

**When does continuous ignition automatically operate?**

- Engine Anti-ice ON
- Engine flameout detection
- Failure of the EIU

**What are the 5 detent positions of the thrust levers?**

- TOGA
- FLX MCT
- CL
- IDLE
- MAX REV

**On the ground, how do you arm the A/THR?**

- By setting the thrust levers in the TOGA or FLEX gate (with a FLEX temperature inserted in the MCDU)
- At least one FD bust be ON for A/THR to arm during takeoff

**What is the active range of the A/THR?**

- Just above IDLE to the CL detent (2 engines)
- Just above IDLE to the MCT detent (1 engine)

**What is the normal operational position of the thrust levers when A/THR is active?**

The CL detent

**What determines the maximum thrust the A/THR system will be able to command?**

The position detent of the thrust lever
What are 3 ways to disconnect the A/THR?

- A/THR pb
- Instinctive Disconnect buttons
- Thrust Levers to IDLE

What is the preferred method of disconnecting A/THR?

Set the thrust levers to match the TLA to the existing N1 and disconnect using the instinctive disconnect pb.

How do you disconnect the A/THR for the remainder of the flight?

Press and hold the Instinctive Disconnect button for 15 seconds.

Will you be able to restore A/THR?

No

What else will you lose?

Alpha Floor Protection

What happens to thrust and what annunciates on the FMA when you reach Alpha Floor?

- Thrust – TOGA
- FMA – A.FLOOR

What occurs during Alpha Floor protection after speed increases above $V_{LS}$?

FMA changes to TOGA LK

How do you then regain normal A/THR?

- Move Thrust Levers to the TOGA detent
- Press the Instinctive Disconnect button
- Return Thrust Levers to CL detent
- Push the A/THR pb to engage A/THR

When is Alpha Floor Protection active?

From lift-off through 100 feet RA on approach

When would Thrust Lock occur?

- Thrust levers in CL detent and A/THR pb on the FCU is pushed, or
- A/THR disconnects due to a failure

Explain the Normal start sequence.

- ENG MODE to IGN/START
- ENG MASTER to ON
- Observe Start Valve Open and gray N2 background
- At 16% N2 Ignition (A or B) on
- At 22% N2 HP fuel
- At 50% N2 starter cutout
- Approximately 58% gray N2 background disappears
- Idle at 60%

Explain the Manual start sequence

- ENG MODE to IGN/START
- ENG MAN START pb ON
- At maximum N2 motoring speed (min 20%), ENG MASTER ON
- Observe AB Ignition, fuel flow increase, EGT and N1 increase in 15 seconds
- At 50% observe N1 starter cutout and Ignition off
- ENG MAN START pb – OFF
What controls the engine LP fuel valves?

- Engine MASTER switch
- ENGINE FIRE pb

What does a fault light on the ENG panel indicate?

- Auto Start Abort
- Switch disagreement between HP valve and it’s commanded position

What is the rated thrust of each engine?

- A319 – 23,500 lb
- A320 – 27,000 lb
- A321 – 32,000 lb

**TRANSPONDER**

How many transponders are installed?

2

Does illumination of the ATC FAIL light indicate loss of all transponder capability?

No – only the selected transponder has failed

**FLAPS/SLATS**

With only Green hydraulic system pressure available, will both the flaps and slats operate?

Yes, at ½ speed

What system prevents Flap or Slat asymmetry?

Wing Tip Brakes (WTB)

What causes the WTB’s to activate (ROAM)?

- Runaway
- Overspeed (flaps)
- Asymmetry
- Movement (un-commanded)

If the WTB activates due to a flap asymmetry can the slats still operate?

Yes, only flap operation is inhibited

How may Slat/Flap Control Computers (SFCC) are installed?

2

What would occur if one SFCC failed?

The slats and flaps would continue to operate, but at half speed.

What flap/slat configurations correspond to position 1 on the FLAPS lever and how do they differ?

- CONF 1+F is used for takeoff and provides both slats (position 1) + flaps
- CONF 1 is used in-flight and is slats only

When will the Automatic Retraction System (ARS) operate?

During acceleration in CONF 1+F the FLAPS (not slats) will automatically retract to 0 at 210 knots.

What is Alpha Lock?

This function inhibits retracting flaps/slats from 1 to 0 at a high angle of attack or low airspeed.
When the FLAP legend appears in cyan on the upper ECAM display what is indicated?

Flaps/slats in transit

What happens to the ailerons when the flaps are extended?

The ailerons droop 5°

**SPEED BRAKE/SPOILERS**

Is there any landing configuration when speed brake extension is inhibited?

- A319/320 – Flaps FULL
- A321 – Flaps 3 and FULL

When do the Ground Spoilers automatically extend?

- Partial – When reverse thrust is selected on at least one engine with the other at idle and one main landing gear strut is compressed
- Full – At touchdown of both main gear, or in case of RTO with airspeed above 72 knots, when BOTH thrust levers at IDLE (if ground spoilers armed) or when reverse thrust is selected on at least one engine with the other thrust lever at IDLE (if the ground spoilers are not armed)

At touchdown with reverse selected and only one landing is compressed, will the ground spoilers extend?

Partially – Full extension is limited until both main gear are compressed.

When will the ground spoilers automatically retract?

- Thrust levers at idle and speed brake lever is down
- When at least one thrust lever is advanced above IDLE

When is speedbrake extension inhibited?

- SEC 1 and 3 have failed
- L or R elevator has failed
- AOA protection is active
- Flaps in configuration FULL (A319/320)
- Flaps in configuration 3 or FULL (A321)
- Thrust levers above the MCT position
- Alpha Floor is active

In flight, what happens if a spoiler fault is detected or electrical power is lost?

The spoiler automatically retracts.

**RADAR**

What capabilities does the RADAR system have?

- Weather avoidance
- Turbulence detection
- Terrain mapping
- Predictive windshear detection

What would prevent the weather display on the ND?

- Mode selector in PLAN
- TERR selected ON

When is WX/TURB mode available?

At ranges of 40 nm or less

Does predictive windshear detection work when the RADAR system is switched OFF?

Yes, if the Windshear switch is in AUTO
What is the scanned area of the predictive windshear detection feature?

Up to 5 nm ahead of the aircraft when the aircraft is below 1,500 feet AGL.

When are predictive windshear alerts inhibited?

- When on the ground above 100 knots until reaching 50 feet AGL
- When landing below 50 feet AGL

How many RADAR systems are installed?

2

RADIO MGMT Panel

How are the communications radios controlled?

From any one of the 3 RMP’s

Which RMP is powered in the Emergency Electrical Configuration?

RMP 1

Which communication radios are powered in the Emergency Electrical Configuration?

VHF COM 1, HF 1

What would cause the SEL indicator to illuminate on both RMP’s?

When a communication radio normally associated with one RMP is tuned by another RMP.

If the NAV key is selected on either RMP, can the FMGC still auto tune nav aids?

- No - RMP now controls the VOR/ILS receivers
- NAV key on RMP 3 has no effect
- Normal radio communication is still available

AUDIO CONTROL Panel

With the INT/RAD switch on the ACP in the INT position and the side stick transmit switch keyed, what will you transmit on?

The radio selected by its transmission key on the ACP.

What methods would the crew utilize to make a PA announcement?

- Pressing the PA switch on the ACP and using the boom, hand, or mask microphone, or
- The flight deck handset dedicated to the PA system only

What does the illumination of the CALL light on the VHF or HF transmission keys indicate?

The SELCAL system detects a call.

Will the loudspeaker control knob control the loudness of the aural alert and voice messages?

No

MCDU/FLIGHT MANAGEMENT GUIDANCE SYSTEM

What are the main components of the FMGS?

- 2 FMGC’s
- 2 MCDU’s
- 1 FCU
- 2 FAC’s
**What are the functions of the Flight Management Guidance Computers?**

- Flight Guidance
- Flight Management

**What are the 3 modes of FMGC operation?**

- Independent
- Single
- Dual

**What are the 2 modes of flight guidance?**

- Managed Guidance
- Selected Guidance

**What is the Managed mode of flight guidance used for?**

Long-term lateral, vertical, and speed profiles as determined by the FMGS.

**What is the Selected mode of flight guidance used for?**

Temporary lateral, vertical, and speed commands as selected with the FCU.

**Does Selected or Managed Guidance have priority?**

Selected Guidance

**What type of database is periodically updated in the FMGS?**

Navigation database

**Can the crew modify data in the navigation database?**

The crew has limited ability to create pilot stored navigational data.

**How do you determine the validity of the navigation database?**

On the Aircraft Status page.

**What input does each FMGC use for position determination?**

A hybrid IRS/GPS position.

**What is the normal operational mode of the FMGS?**

Dual mode, with one FMGS as master and the other FMGS as slave

**How does autopilot selection influence master FMGS logic?**

- If one autopilot is engaged, the respective FMGS is master
- If both autopilots are engaged, FMGS 1 will be the master

**If an amber OFF SIDE FM CONTROL message is displayed on the ND what action should the crew take?**

An FMGS has failed and both ND’s must be set to the same mode and range.

**Can both autopilots be engaged during any phase of flight?**

No, only during an ILS approach.

**What is the difference between the large and small fonts utilized in the MCDU?**

- Large – Pilot entries and modifiable data
- Small – Default/computed non-modifiable data
When would a Takeoff Shift be entered on the PERF TO page?

When take off begins at a runway intersection.

If the FLEX TEMP is not entered on the TAKEOFF page of the MCDU, and the thrust levers are positioned in the FLEX detent, what will occur?

- A warning will be generated
- Continue to move the thrust levers to the TOGA detent and execute a max thrust takeoff

Where do you enter the Zero Fuel Weight?

INIT B page

What do amber box prompts on the MCDU indicate?

An entry is mandatory.

What occurs when managed NAV mode is engaged and the aircraft flies into a flight plan discontinuity?

NAV mode will be lost and the HDG/TRK mode engages.

PARKING BRAKE

What effect does setting the Parking Brake have on other braking modes?

All other braking modes and anti-skid are deactivated.

When brake accumulator pressure is low, how is it re-charged?

With the Yellow system electric pump.

By what means is the parking brake activated when you turn ON the Parking Brake switch?

Electrically

Is it required to depress the brake pedals while setting the Parking Brake?

No

How do you verify the Parking Brake is set?

- ECAM PARKING BRK memo
- Triple indicator brake pressure

If during an engine start with the parking brake ON, the aircraft starts to move due to a parking brake failure, what must you quickly do?

Release the PARKING BRAKE handle to restore Normal braking with the pedals.

What is the thrust limitation with the PARKING BRAKE ON?

Do not exceed 75% N1.

AFT PEDESTAL MISC

When hand flying the aircraft can we trim the rudder?

Yes, by using the RUDDER TRIM rotary switch

What happens if you turn the Rudder Trim with the autopilot engaged?

Nothing

What is the RUD TRIM button used for?

To reset the rudder trim to 0°
Does the rudder RESET button work with the autopilot engaged?
No

Is there any feedback in the rudder pedals from the yaw damping or turn coordination functions?
No

What 3 things occur when you turn the Manual Gear Extension Handle?
- Removes Green hydraulic pressure
- Opens gear doors
- Unlocks the uplocks

How many cranks does it take to lower the gear manually?
1 crank (but 3 clock-wise turns :-(

NOSE WHEEL STEERING

What hydraulic system supplies nose wheel steering?
Green

The steering hand wheels can steer the nose wheel up to how much in each direction?
+/- 75°

When using the rudder pedals for steering, when does the steering angle begin to reduce?
Starts reduction at 40 knots and progressively reduces to zero degrees at 130 knots.

What does the rudder PEDAL DISC button on the steering hand wheel do?
Pressing the button removes control of nose wheel steering from the rudder pedals until released.

What would occur if the A/SKID & N/W STRG switch were selected to OFF?
- Nose wheel steering is lost
- Anti-skid is deactivated
- Yellow hydraulic system would supply the brakes

FLIGHT CONTROL LAWS

What protections do you have in Normal Law?
- High Speed
- High Angle of Attack (AOA alpha protection)
- Load Factor Limitation (+2.5 / -1.0)
- Pitch Attitude (30° UP/15° DN)
- Bank Angle (67°)

How does the High Speed Protection operate?
If Vmo/MMO plus a predetermined factor is exceeded, the system induces a pitch-up input to limit aircraft speed.

Can the pilot override this pitch-up?
No

What is Alpha Max?
The maximum angle of attack allowed in Normal Law, indicated by the top of the red strip on the airspeed scale.

How does High Angle of Attack Protection operate?
When the angle of attack exceeds α prot, pitch trim ceases and angle of attack is now proportional to sidestick deflection, not to exceed α max even with full aft sidestick deflection.
What protections do you have in Alternate Law?

- Load Factor
- High speed stability
- Low speed stability

Can you override the high or low stabilities in Alternate Law?

Yes

What protections do you have in Direct Law?

None

If you are in Pitch Alternate Law, what law would Roll be?

Direct Law

When the landing gear is extended, what happens to Pitch Alternate Law?

Degrades to Pitch Direct Law

When is there a direct relationship between sidestick and flight control surface deflection?

- When in Direct Law
- When below 100 feet

How would you get into Abnormal Law?

By exceeding approximately double the Normal Law limits.

Can you stall the aircraft in Normal Law?

Not in Normal Law, but the aircraft can be stalled in all other laws.

What is the purpose of Abnormal Alternate Law?

Allows the aircraft to be recovered from an unusual attitude.

After recovery from an unusual attitude, what law will you be in?

Abnormal

Will Abnormal Law revert to Direct Law on landing gear extension?

No

What PFD indications indicate Normal Law?

- Green = for pitch, bank, and overspeed limits
- Amber/black (alpha prot) airspeed tape

What is indicated if the PFD pitch and bank limits are amber X’s?

You are not in Normal Law

What would cause you to revert to another law?

Multiple failures of redundant systems.

What law are you in when you perform the flight control check on the ground?

Normal Law, Ground Mode

Can the aircraft be flown with a loss of all flight control computers?

Yes, with Mechanical Backup
How is the airplane controlled in Mechanical Backup?

- Pitch – Trim wheel (horizontal stabilizer)
- Yaw – Rudder pedals (rudder)
- Speed – Thrust levers

MISC

BONUS RESEARCH QUESTION: What is the design weight limit on the cockpit sliding foldout tray?

Updated 5/26/02

Please send corrections/comments/additions to: Bob Sanford, busdriver@hky.com