AIRBUS A319/320/321

Technical Ground School Study Guide

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TGS – PART ONE

Ice & Rain Protection

1. After takeoff, when should WING ANTI-ICE be selected ON, if needed?

Wing anti-ice operation:

- Select WING ANTI ICE ON after thrust reduction altitude
- Normally, WING ANTI ICE should be selected OFF at the FAF
- If in severe icing conditions, WING ANTI ICE may be left ON for landing

Wing anti-ice is not permitted on the ground or in flight when the TAT exceeds 10°C.

2. What happens to engine RPM when either engine anti-ice valve is open?

The N1 limit for that engine is automatically reduced, and if necessary, the idle N1 is automatically increased for both engines in order to provide the required pressure. Additionally, continuous ignition is activated for that engine.

3. When would probe heat automatically come on?

- On the ground, low power is applied to the heaters when at least one engine is operating.
- In flight, the heating system automatically changes to high.
- The probe heaters can be activated manually prior to engine start by placing the PROBE/WINDOW HEAT pb ON.

Note: The TAT probes are not heated on the ground.

4. What would happen if the RAIN RPLNT pushbutton was pushed on the ground with the engines shut down?

The RAIN RPLNT pb is inhibited on the ground with the engines stopped.

5. Is electrical heat applied to the galley/lavatory drain masts anytime there is aircraft electrical power on the aircraft?

The drain masts are heated any time the electrical system is powered.

6. When are the windshields and side windows heated automatically on the ground?

The windshields and side windows are electrically heated for anti-icing and anti-fogging. The system is controlled automatically by the Window Heat Computers which provide regulation, protection, and fault indications. Windshield heat automatically operates at low power on the ground with at least one engine operating. In flight, the windshield heating system changes to normal. The changeover is automatic. Only one heating level exists for the windows. The system can be activated manually prior to engine start by placing the PROBE/WINDOW HEAT pb ON.

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

- Wing: Valves close automatically if electrical power is lost.
- Engine: If AC electrical power is lost, the valve opens automatically.

8. While using engine anti-ice, is it necessary to select the engine mode selector to IGN?

No – Continuous ignition is selected when the valve is opened and the ANTI ICE ENG pb is selected ON.

9. When engine anti-ice is selected ON, what else occurs with regard to the engine?

When an engine anti ice valve is open, the N1 limit for that engine is automatically reduced and, if necessary, the IDLE N1 is automatically increased for both engines in order to provide the required pressure.

10. If performing an APU BLEED ON TAKEOFF, is it permissible to use APU bleed to provide air for wing anti ice?

Limitation: APU air bleed extraction for wing anti-icing is not permitted.

Electrical

1. What is the normal priority for supplying electric power to the aircraft?

- 1. Engine generators
- 2. External power
- 3. APU generator
- 4. Emergency generator (RAT)
- 5. Batteries

2. What does the EXT PWR pb AVAIL light mean?

AVAIL light illuminates green if:
- External power is plugged in, and
- External power parameters are normal.

3. What does the EMER GEN red FAULT light indicate when illuminated?

This light illuminates red if the emergency generator is not supplying power when AC BUS 1 and AC BUS 2 are not powered.

4. If the BAT pushbuttons are in AUTO position overnight without any other power, will the batteries discharge completely?

Automatic battery contactors are open when:
- The aircraft is on the ground.
- The BAT pbs are in AUTO.
- The main power supply (EXT PWR + GEN) is cut off.
- The battery voltage is low.

Battery automatic cut-off logic prevents complete discharge of the battery when the aircraft is on the ground and unpowered.

5. When is the main galley power automatically shed?

The main galley (A319/320), all galleys (A321), and in-seat power supply are shed automatically when:
- In flight: only one generator is operating
- On the ground: only one generator is operating (All galleys are available when the APU GEN or EXT PWR is supplying power)

6. How long must the IDG pushbutton be held to achieve a disconnect?

Press IDG pb until the GEN FAULT light comes on but for not more than 3 seconds to avoid damage to the disengage solenoid.

7. What does the GEN 1 LINE pb light indicate when SMOKE is illuminated?

Illuminates amber, along with a warning on the ECAM, when smoke is detected in the avionics ventilation duct.

8. With loss of AC BUS 1, what would a FAULT light in the AC ESS FEED pb indicate?

The AC ESS BUS is not electrically supplied.

The AC ESS bus is normally powered by AC BUS 1 through the AC essential feed contactor.
The AC ESS FEED pb allows the pilot to transfer the AC ESS bus power source from AC BUS 1 to AC BUS 2.

Note: In case of total loss of main generators, the AC ESS BUS is automatically supplied by the emergency generator or by the static inverter if the emergency generator is not available.

9. Can the batteries be depleted?

Battery automatic cut-off logic prevents complete discharge of the battery when the aircraft is on the ground and un-powered.

10. If automatic cutoff has occurred, how can the crew re-establish battery power?

The flight crew can reset the contactors by switching the BAT pb to OFF then AUTO.

11. If both main AC buses lose electrical power with airspeed above 100 knots, what will happen?

If both AC BUS 1 and 2 are lost and the airspeed is above 100 knots, the RAT automatically deploys and pressurizes the Blue hydraulic system, which drives the hydraulically driven emergency generator. A generator control unit controls generator output, which is considerably lower than that of the main generators.

Once the emergency generator is up to speed it will supply power to the AC ESS BUS and DC ESS BUS (via the ESS TR) in addition to the AC ESS SHED and DC ESS SHED buses. During RAT deployment and emergency generator coupling (approximately 8 seconds), the batteries supply power to these buses.

After landing, the DC BAT bus is automatically connected to the batteries when airspeed drops below 100 knots. When the speed decreases below 50 knots, the AC ESS bus is automatically shed, and power is lost to the CRTs.

12. What will cause the RAT to extend automatically?

See question 11.

13. Where are the circuit breakers located and how is their condition monitored?

Green C/Bs are monitored by the ECAM system. The ECAM displays "C/B TRIPPED ON OVHD PNL (or REAR PNL)" warning when a monitored circuit breaker is tripped for more than 1 minute.

14. If the Galleys shed due to overload, can the crew recover galley power?

No

Fire Protection

1. If the ENG FIRE pushbutton were released out, would that action affect the electrical system?

The ENG FIRE pb:

- Silences the aural fire warning
- Arms the fire extinguisher sqibs
- Closes the LP fuel valve
- Closes the hydraulic fire valve
- Closes the engine bleed valve
- Closes the pack flow control valve
- Disconnects the FADEC power supply
- **Deactivates the IDG**

2. What action arms the engine fire extinguishing squibs?

Releasing the ENG FIRE pushbutton (see question 1).

3. How would the crew know if any component of the fire detection system fails?

The ECAM will issue appropriate messages if any component of the detection system fails.

4. If there is an APU fire in flight will the APU automatically shutdown?

On the ground, detection of an APU fire causes automatic an APU shutdown and extinguisher discharge. In flight, there is no automatic APU shutdown, and the extinguisher must be manually discharged.

5. What is required for a fire warning to be indicated in an engine or APU?

Each engine is equipped with two identical detection loops (A & B) each of which contain three heat sensing elements and a computer (Fire Detection Unit). The sensing elements are located in the pylon nacelle, engine core, and fan section. The FDU issues a fire warning when both loops detect an overheat in a particular area. If one loop fails, the fire warning system remains operational with the other loop. A fire warning is also issued if both loops fail within 5 seconds of each other.

An engine fire is indicated by an aural CRC, the illumination of the ENG FIRE pb, and MASTER WARN lights.

Each engine is equipped with two fire extinguishers which are discharged by pressing the associated AGENT DISCH pb on the respective engine FIRE panel.

6. Can the APU FIRE test be performed with the APU running?

Yes – The automatic shutdown of the APU on the ground will not occur while the flight crew is performing this test.

7. What is required for a fire warning to be indicated in an engine or APU?

See question 5.

8. What external indications may be received in the event of an APU fire while on the ground?

- The red APU FIRE light illuminates and an external warning horn sounds
- The APU fire extinguisher discharges automatically 3 seconds after the appearance of the fire warning.
- The light extinguishes when the fire has been extinguished.

9. How many fire extinguisher bottles are provided for the cargo compartments?

One extinguisher bottle supplies one nozzle in the forward compartment and two nozzles in the aft compartment. The agent is discharged by pressing either the FWD or AFT DISCH pb.

10. If a cargo smoke detector fails, does that render the system inoperative?

Both cargo compartments are equipped with smoke detector loops. The forward compartment contains two smoke detectors in the A319/320 and four smoke detectors in the A321. In the A319/320, the aft compartment contains two loops with two detectors each. In the A321, the aft compartment contains three loops with two smoke detectors in each. A Smoke Detection Control Unit issues a smoke warning when two smoke detectors of one loop detect smoke. If one smoke detector fails, the system remains operational with the other detector.

Cargo smoke is indicated by an aural CRC, the illumination of the MASTER WARN and CARGO SMOKE light on the CARGO SMOKE panel.

If the cargo smoke warning is activated in either compartment, the associated isolation valves close and the extraction fan stops.

11. In case of lavatory smoke, would you get a warning in the cockpit?

Lavatory smoke is indicated by:

- Aural CRC
- Illumination of MASTER WARN light
- Red ECAM SMOKE LAVATORY SMOKE

Aircraft Fuel

1. What is the total fuel capacity of the Airbus A320?

	A319/320	A321
Wing Tanks	27,500 lb	27,500 lb
Center Tank	14,500 lb	14,500 lb
ACT	-	10,500 lb
TOTAL	**42,000 lb**	**52,500 lb**

2. Is refueling possible if the aircraft batteries are the only source of power.

External power, the APU, or battery power can be used for refueling.

3. Can fuel be suction fed to the engines?

If the wing tank pumps fail, suction feeding is possible only from the inner wing cells (A319/320), or the wing tank (A321).

4. If the boost pumps in the left fuel tank were OFF, how would the APU obtain fuel?

An APU fuel pump is in the left fuel manifold to provide fuel to the APU when the tank pumps are off.

5. How can you know the crossfeed valve is fully open?

The X FEED pb OPEN light illuminates green when the valve is fully open.

6. What does a wing tank pump fault light indicate?

Amber light illuminates and ECAM caution appears when the delivery pressure drops.

7. When does the fuel crossfeed valve automatically open?

Never

8. When and how is fuel normally transferred from the outer to inner wing tanks?

The wing tank transfer valves automatically latch open when the wing inner cell fuel quantity drops to 1,650 lbs thus allowing the outer cell fuel to drain into the inner cell. The transfer valves open simultaneously in both wings and remain open until the next refueling operation. During steep descents and acceleration/deceleration, the transfer valves may open prematurely and trigger a LO LVL warning.

9. In an A321, which fuel tank is emptied first?

A321: The fuel transfer system controls the flow of fuel from the center tank to the wing tanks, which feed the engines. The tanks empty in the following sequence:

1. ACT transfers fuel into the center tank
2. Center tank transfers fuel into the wing tanks
3. Wing tanks

With the MODE SEL pb in AUTO, the Fuel Level Sensing Control Unit (FLSCU) has automatic control of the transfer valve. When the transfer valve is open, fuel from the wing tank pumps flows through the jet pump and creates suction. This suction moves the fuel from the center tank to the related wing tank. The FLSCU automatically closes the associated center tank transfer valve when the wing tank is full. The transfer valve reopens the center tank transfer valve when the engines have used 550 lbs of wing tank fuel.

With the ACT pb in AUTO, automatic control of the transfer occurs after takeoff at slats retraction. It is initiated if the center tank high level sensor has been dry for 10 minutes and fuel remains in either ACT. Fuel transfer from the ACTs to the center tank is made by pressurizing the ACT, closing the ACT vent valves, and opening the air shut-off and inlet valves. ACT2 transfers first.

With the MODE SEL in MAN, the center tank transfer valves open. Wing tank overflow must be prevented by selecting the CTR TK XFR pbs OFF when the wing tanks are full. They must also be selected OFF when the center tank is empty.

During transfer, if the center tank high level sensor gets wet, transfer from the ACT stops. The transfer valve opens when the center tank high sensor is dry for ten minutes.

A319/320: Normal fuel feed sequencing is automatic. When there is fuel in all tanks, the center tank feeds the engines first (even though the wing tank pumps operate continuously).

With the fuel MODE SEL pb in AUTO, the center tank pumps operated for two minutes after both engines are started to confirm center tank pump operation prior to takeoff. After takeoff, the center tank pumps restart when the slats are retracted and continue to operate for five minutes after the center tank is empty or until the slats are extended.

With the MODE SEL pb in MAN, the center tank pumps operate continuously. The crew must select the CTR TK PUMP pbs OFF when the center tank is empty.

10. Normally, can fuel be transferred between center and wings during flight on the A319/320?

Except during normal fueling operations, fuel cannot be transferred from one tank to another.

Pneumatics, Air Conditioning, & Pressurization

1. What would an amber temperature indication in either the Pack Outlet Temperature or Pack Compressor Outlet Temperature indicate?

The temperature changes from green to amber if the temperature exceeds the advisory threshold.

2. With the LDG ELEV selector at 2, what would be the landing elevation?

2,000 feet

3. What is indicated if the Cabin Vertical Speed is indicated in amber?

The cabin vertical speed is in the advisory range.

4. With the LDG ELEV selector in AUTO, what altitude is used for landing field pressurization reference?

FMGS data is used.

5. The pack flow control valve automatically closes for engine start when the mode selector is moved to IGN/START. When does the valve automatically reopen?

Reopening of the valves is delayed for 30 seconds to avoid a supplementary pack closure during second engine start.

6. The APU BLEED pb FAULT light illuminates amber when?

This amber light illuminates and an ECAM caution appears when the system detects an APU bleed leak.

7. Can external air be used to supplement low APU bleed pressure?

No

8. When operating pressurization in AUTO, if the pilot suspects the selected controller is malfunctioning, how can he swap controllers?

Attempt to select the other system by switching the MODE SEL pb to MAN for at least 10 seconds, then return it to AUTO.

9. If one cabin pressure controller fails, how is pressurization maintained?

In the automatic mode, one cabin pressure controller is active and the other serves as a backup. If the active controller fails, the backup automatically resumes control.

10. Is cargo heat provided to the forward cargo compartment?

No, although a portion of the avionics cooling air is exhausted through the cargo underfloor.

11. When would we use the ON position of the ECON FLOW selector (A321)?

PACK FLOW Selector (A319/320)
- LO: if number of pax is less than 90 or for long haul flights.
- HI: for abnormally hot and humid conditions.
- NORM: for all other operating cases.

ECON FLOW Selector (A321)
- ON: ECON FLOW if number of pax is less than 140.
- OFF: for normal flow

12. Is the LDG ELEV knob used when operating manual pressurization?

I can't find the official answer to this one.

13. What indications on the ventilation panel are given if smoke is detected in the avionics ventilation duct?

FAULT illuminates amber in both BLOWER and EXTRACT pbs.

14. Will the DITCHING push-button always close the outflow valves?

The outflow valve will not close automatically if it is under manual control.

Instruments/Navigation/Communication

1. When would the GPWS FLAP MODE pushbutton be selected?

Flap mode is inhibited to avoid nuisance warning when landing with a reduced flap setting.

2. What can be expected if the CALLS EMER pushbutton is pressed?

- Pink light flashes at all area call panels.
- EMERGENCY CALL appears on all attendant indication panels.
- High-low chime (repeated 3 times) sounds through all loudspeakers.

3. Is the radar display available in all modes of the ND selector on the EFIS Control Panel?

Any ND mode except PLAN.

4. Does the EGPWS use radar signals to "ground map" terrain?

The enhanced function is based on a worldwide terrain database. It provides Terrain Awareness Display (TAD) which predicts terrain conflict and displays the terrain on the ND, and Terrain Clearance Floor which triggers a warning. The TAD function computes a caution and warning envelope ahead of the aircraft and when the boundaries of this envelope conflict with the database terrain information, it generates alerts.

5. When the TO CONFIG pushbutton is depressed, a take-off power application is simulated. What are some of the systems are being checked by this test?

If the airplane is not properly configured for takeoff, the following warnings and cautions are triggered when the TO CONFIG pb is pressed or when takeoff power is applied:
- SLATS/FLAPS NOT IN T.O. RANGE
- PITCH TRIM NOT IN T.O. RANGE
- SPEED BRAKES NOT RETRACTED
- SIDESTICK FAULT
- HOT BRAKES
- DOORS NOT CLOSED (tested only if engines are operating)

6. What does STS indicate when displayed on the EWD?

The boxed message STS is displayed in white on the lower part of the E/WD, during non-normal operations, to remind the crew that airplane systems are degraded. The STS message flashes after engine shutdown to alert maintenance of any other applicable messages.

7. When the Mode Selectors are positioned to NAV and the IRS not previously aligned what indications should be noted on the GNADIRS panel?

- ON BAT Light … Extinguished
- IR FAULT Lights … Extinguished
- IR ALIGN Lights … Illuminated or flashing
- ADR pb Lights … Extinguished

8. What does the ON BATT light indicate?

Light illuminates amber when one or more IR(s) is supplied only by the aircraft battery. Also illuminates for a few seconds at the beginning of the alignment, but not for a fast realignment.

If, when the aircraft is on the ground, at least one ADIRU is supplied by aircraft batteries:

- An external horn sounds
- The ADIRU and AVNCS light illuminates blue on the EXTERNAL POWER panel.

9. If continuous spurious caution messages are received that are known to be incorrect, is there any way to cancel this caution?

Press the EMER CANC pb on the ECAM control panel.

10. After pressing the EMER CANC pushbutton, how can the system be returned to normal?

Press the RCL pb on the ECAM control panel. This pb is used to call up the warning messages, caution messages, and the status page, that may have been suppressed by the activation of the CLR pb or by flight-phase related inhibition. If the RCL pb is held down for more than 3 seconds, the E/WD shows any caution messages that have been suppressed by the EMER CANC pb.

11. If the upper ECAM screen fails, will the crew still be able to see E/WD data?

E/WD has priority over the SD. If the upper ECAM screen fails (or is selected off), E/WD data is automatically transferred to the lower screen.

12. If all systems were working normally, and a crewmember wanted to remotely tune a VOR through the RMP, would that have any effect on the FMGC NAV functions?

The RMP NAV key engages the radio navigation backup mode. It takes control of the VOR, ILS, (MLS, and ADF not installed) receivers away from the FMGC and gives it to the RMP.

13. If RADIO ALTIMETER #1 fails, would radio altitude information display be lost on any PFD?

RA1 height is normally displayed on the captain's PFD, and RA2 height is normally displayed on the first officer's PFD. If one radio altimeter fails, the remaining radio altimeter is displayed on both PFDs.

14. What does the amber "=" sign mean on the airspeed tape?

This symbol shows the V_{FE} corresponding to the next flap lever position.

15. Which RMP is functional in the emergency electrical configuration?

Only RMP 1 is operational in EMER ELEC CONFIG.

16. Can the EMER CANC pb cancel any aural warning?

Warnings:
- Cancels (stops) an aural warning for as long as the failure condition continues.
- Extinguishes the MASTER WARN lights.
- Does not affect the ECAM message display.

Cautions
- Cancel any present caution (single chime, MASTER CAUT lights, and ECAM message) for the rest of the flight.
- Automatically calls up the STATUS page, which displays "CANCELLED CAUTION" and the title of the failure that is inhibited.

The EMER CANC pb should only be used in flight to suppress spurious MASTER CAUTIONS.

17. If the #1 IR mode selector was selected to OFF, would that effect the #1 ADR?

- OFF: The ADIRU is not energized. ADR and IR data is not available.
- NAV: Normal mode of operation. Supplies full inertial data to aircraft systems.
- ATT: IR mode supplying only attitude and heading information if the system loses the ability to navigate.

18. If the TERR ON ND pushbutton is selected ON, will this inhibit the weather radar display?

When TERR ON ND pb is selected ON, the weather radar image is not displayed although the weather radar is ON.

Powerplant

1. If the #1 ENG MAN START pushbutton is depressed, will the engine begin to motor?

The start valve opens if the ENG MODE selector is set to CRANK or IGN/START and N_2 < 20%.

When the ENG MASTER switch is selected ON, the FADEC controls the start sequence, including both fuel valves, ignition, and closing of the start valve.

2. During a manual start of the #1 engine, does the ENG MAN START pushbutton have to be depressed to close the start valve?

When the ENG MASTER switch is selected ON, the FADEC controls the start sequence, including both fuel valves, ignition, and closing of the start valve.

3. During a manual start, are the automatic start interruption and auto-crank functions available?

The FADEC provides full monitoring during manual start and will provide appropriate ECAM cautions and procedures for the crew to follow in the event of a start fault; however, automatic start interruption (except if on the ground and the start EGT limit is exceeded before reaching 50% N_2) and auto-crank are not available.

4. What is the minimum oil quantity for dispatch?

13 quarts

5. How is autothrust disconnected to avoid thrust surges?

Autothrust instinctive disconnect pb.

6. With the ENGINE MODE switch in NORM, will ignition be provided if an engine flameout is detected in flight?

Yes

7. How is the FADEC powered?

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

8. If a thrust lever is set between a detent, what rating limit will the FADEC select?

If the thrust lever is set between two detents, the FADEC selects the rating limit corresponding to the higher limit. This limit is displayed on the upper ECAM.

9. Continuous ignition is provided automatically when:

- ENG ANTI ICE is selected ON
- Engine flameout is detected in flight
- The EIU fails

10. What is an indication that the start sequence is complete?

At ISA sea level (2-4-6-6):

- N1 approximately 19.5%
- EGT approximately 390°C
- N2 approximately 58.5%
- FF approximately 600 lb/hr
- **Gray background on N_2 indication disappears.**

11. Operationally, which engine do we start first? Why?

Engine 1 is started first under the assumption it will be a single engine taxi. This will ensure engine driven Green hydraulic pump pressure will be available for normal brakes and nosewheel steering.

APU

1. What is the maximum operating altitude of the APU?

39,000 feet

2. What are the altitude limits for APU generator and bleed air?

- APU generator – 100% load up to 25,000 feet (Note: APU GEN is available up to 39,000 feet).
- APU Bleed – Maximum altitude for APU bleed operation is 20,000 feet.

3. When an APU auto shut down has occurred, what other indications are received in addition to the ECAM procedure?

APU MASTER SW pb amber FAULT light will illuminate.

4. If external power is powering the aircraft during APU start, when the green AVAIL light illuminates on the APU START pushbutton, what is the source of ships electrical power?

EXT PWR

5. What are some of the causes for an APU automatic shutdown?

• Fire (on ground only)	• Reverse flow
• Air inlet flap not open	• Low oil pressure
• Overspeed	• High oil temperature
• No acceleration	• ECB failure
• Slow start	• Loss off overspeed protection
• EGT overtemperature	• Underspeed
• No flame	• DC power loss

6. If EXTERNAL POWER were powering the aircraft, what indications would be seen during an APU fire test?

- A continuous repetitive chime sounds
- The MASTER WARN lights flash
- APU FIRE warning appears on the ECAM

On the APU FIRE panel:

- The APU FIRE pb illuminates red
- The SQUIB light illuminates white
- The DISCH light illuminates amber

Note: The automatic shutdown of the APU on the ground will not occur during the test.

7. If an APU fire occurs in flight will the APU shut down automatically?

APU will automatically shutdown due to fire on the ground only.

8. Can the APU be shut down from outside the aircraft?

APU SHUT OFF pb on External Power Panel.

TGS – PART TWO

Auto Flight System

1. What is Thrust Lock?

The thrust lock function prevents thrust variations when the autothrust system fails and disengages.

The thrust lock function is activated when the thrust levers are in the CL detent (MCT with one engine out) and:
- The pilot disengages A/THR by pushing the A/THR pushbutton on the FCA, or
- The A/THR disconnects due to a failure.

When thrust lock is active:
- "THR LK" flashes amber on the FMA
- ECAM "ENG THRUST LOCKED" flashes every 5 seconds
- ECAM displays "THR LEVERS … MOVE"
- A single chime sounds and the MASTER CAUTION light flashes every 5 seconds. All warnings cease when the thrust levers are moved out of the detent.

The thrust is locked or frozen at its level prior to disconnection. Moving the thrust levers out of the CL or MCT detent suppresses thrust lock and allows manual control by means of the thrust levers.

2. What is Alpha Floor?

A protection that commands TOGA thrust regardless of the positions of the thrust levers. This protection is available from lift-off to 100' RA on the approach.

ALPHA FLOOR calls up the following indications:
- A FLOOR in green surrounded by a flashing amber box on the FMA and in amber on the E/WD as long as alpha floor conditions are met.
- TOGA LK in green surrounded by a flashing amber box on the FMA when the aircraft leaves the alpha floor conditions. TOGA thrust is frozen and thrust lever movement will have no effect.

Alpha floor is inhibited:
- Under alternate or direct flight control law.
- In case of engine failure with flaps extended.

To cancel ALPHA FLOOR thrust, disconnect the autothrust.

3. Can the autopilot be engaged with both flight directors off?

- If the autopilot is engaged when both flight directors are OFF, the autopilot will engage in either HDG V/S or TRK FPA mode depending on which mode is selected on the FCU.
- If an autopilot is engaged with at least one FD ON, the autopilot will engage in the active FD mode(s).

4. When will the autopilot automatically disengage during a RNAV approach?

When FINAL APP NAV modes are engaged, the AP will disengage at DA – 50' (if entered), or 400' AGL if no DA was entered. The FDs will revert to basic modes (HDG V/S).

5. What is TOGA Lock?

TOGA thrust is frozen and thrust lever movement will have no effect. To cancel TOGA LK, disconnect the autothrust. ALPHA FLOOR protection commands TOGA thrust regardless of the positions of the thrust levers. This protection is available from lift-off to 100 feet RA on approach.

ALPHA FLOOR calls up the following indications:
- "A FLOOR" in green surrounded by a flashing amber box on the FMA and in amber on the E/WD as long as α floor conditions are met.
- "TOGA LK" in green surrounded by a flashing amber box on the FMA when the aircraft leaves the α floor conditions. TOGA thrust is frozen and thrust lever movement will have no effect.

Note: ALPHA FLOOR is inhibited:
- Under alternate or direct flight control law.
- In case of engine failure with flaps extended

6. How is TOGA LK canceled?

TOGA thrust is frozen and thrust lever movement will have no effect. To cancel TOGA LK, disconnect the autothrust.

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Note: ALPHA FLOOR is inhibited:

- Under alternate or direct flight control law.
- In case of engine failure with flaps extended

7. What mode reversion occurs with the loss of the NAV mode when CLB or DES is engaged?

- If CLB engaged, OP CLB engages.
- If DES engaged, V/S engages.

8. If GPS function is lost, is navigation accuracy immediately downgraded?

When GPS function is lost, the message GPS PRIMARY LOST is displayed on the ND and MCDU scratchpad. During an approach a triple click sound is triggered. In this case, navigation accuracy is not downgraded immediately, but only when EPE exceeds RNP.

9. How do I confirm that I have actually ARMED the approach for the flight director or autopilot to capture?

- FMA column 2 (second line): G/S (blue)
- FMA column 3 (second line): LOC (blue)

10. What would cause a red AUTOLAND light to illuminate below 200'?

The following situations, when occurring below 200' RA with the aircraft in LAND mode, trigger the flashing AUTOLAND red warning, and a triple-click warning:

- Both APs OFF below 200' RA
- Excessive deviation in LOC (1/4 dot above 15' RA) or GLIDE (1 dot above 100' RA). In addition, LOC and GLIDE scales flash on the PFD.
- Loss of LOC signal (above 15' RA) or loss of GLIDE signal (above 100'). In addition, FD bars flash on the PFD. The LAND mode remains engaged.
- The difference between both radio altimeter indications is greater than 15'.

Go-Around is mandatory during a CAT II/III approach if AUTO LAND caution light illuminates during the approach.

11. When can the second autopilot be engaged?

Only one autopilot can be engaged in flight except when the ILS approach (APPR) is armed or engaged. The second autopilot will remain engaged until the completion of the Go-Around phase. AP1 is active and AP2 is standby.

12. How is activation of Autothrust confirmed?

- FMA column 5 (third line): A/THR (white – Active)
- FMA column 5 (third line): A/THR (blue - Armed)

13. Will the G/S mode engage without the LOC mode engaged?

No

14. What is indicated when the FMA displays SRS?

Takeoff or Go-around mode is engaged.

Flight Controls

1. How many ELAC computers do we have, and what are their functions?

Two Elevator Aileron computers for normal elevator, stabilizer, and aileron control.

The elevators and stabilizer are normally controlled by ELAC 2. If ELAC 2 or its associated systems fail, ELAC 1 takes over. If both ELACs fail, pitch control is transferred to SEC 1 or 2.

The ailerons are normally controlled by ELAC 1. If ELAC 1 or its associated systems fail, ELAC 2 takes over. If both ELACs fail, aileron droop is deactivated and roll control is provided by the spoilers only.

2. What would the FAULT light in the ELAC 1 pushbutton indicate?

- When a failure is detected, or
- During ELAC power-up test (eight seconds)

3. How many SEC computers are there and what are their functions?

There are 3 SEC computers. The following functions are performed
- Normal roll (by controlling the spoilers)
- Speed brakes and ground spoilers
- Alternate pitch (SEC 1 & 2 only)
- Direct pitch (SEC 1 & 2 only)
- Direct roll
- Abnormal attitude

4. What control surfaces do the FACs control?

The rudder

5. What is the result if both sidesticks are moved at the same time and neither takes priority during flight with the autopilot OFF?

Both green CAPT and F/O SIDE STICK PRIORITY lights flash and a "DUAL INPUT" audio voice message is given every 5 seconds as long as both pilots operate their sidesticks simultaneously.

6. Can the rudders be moved with both FACs inoperative?

Yes – if both FACs fail, maximum rudder deflection can be obtained when the slats are extended.

The FACs perform the following functions:
- Normal roll (coordinating turns and damping dutch roll)
- Rudder trim
- Rudder travel limit
- Alternate yaw

7. Does the SIDE STICK PRIORITY red arrow light illuminate in front of the pilot losing or gaining priority?

- A red light illuminates in front of the pilot whose sidestick is deactivated.
- A green light illuminates in front of the pilot who has taken control, if the other sidestick is not in the neutral position (indicates a potential and unwanted control demand).

Sidestick priority logic:
- When only one pilot operates the sidestick, it sends control signals to the computers
- When the other pilot operates his sidestick in the same or opposite direction, the system adds the signals of both pilots algebraically. The total is limited to the signal that would result from the maximum deflection of a single sidestick.
- Both green CAPT and F/O SIDE STICK PRIORITY lights flash and a "DUAL INPUT" audio voice message is given every 5 seconds as long as both pilots operate their sidesticks simultaneously.
- A pilot can deactivate the other sidestick and take full control by keeping his priority takeover pb depressed.

- To latch the priority condition, press the takeover pb for more than 40 seconds. This allows the pilot to release his takeover pb without losing priority. However, a pilot can at any time reactivate a deactivated sidestick by momentarily pressing the takeover pb on either sidestick.
- If both pilots press their takeover pbs, the pilot that presses last gets priority.
- ***In a priority situation:***
    - A red light illuminates in front of the pilot whose sidestick is deactivated.
    - A green light illuminates in front of the pilot who has taken control, if the other sidestick is not in the neutral position (indicates a potential and unwanted control demand).
    - A "PRIORITY LEFT" or "PRIORITY RIGHT" audio message is given each time priority is taken.

8. When does an amber SPD BRK memo appear?

The memo flashes amber if the speedbrakes are extended when the thrust is above idle.

9. Explain, in general terms, High Speed protection.

High speed protection prevents exceeding VMO or MMO by introducing a pitch up load factor demand. The pilot cannot override the pitch up command.

10. When does full ground spoiler extension occur?

Full ground spoiler extension automatically at touchdown of both main gear or in the case of a rejected takeoff (speed above 72 knots) when:
- Both thrust levers are at idle (if the ground spoilers are ARMED), or
- Reverse thrust is selected on at least one engine with the other thrust lever at idle (if the ground spoilers are not ARMED)

11. What is indicated by the low energy warning (SPEED, SPEED, SPEED)?

When change in flight path alone is insufficient to regain a positive flight path (thrust must be increased). Available in CONF 2,3, or FULL, between 100' and 2,000' RA when TOGA not selected.

12. If the flight controls degrade to alternate law, what will happen when the landing gear is extended (if no autopilots are engaged?)

Direct law automatically becomes active. If an autopilot is engaged, the airplane will remain in alternate law until the autopilot is disconnected.

13. Can the pilot make a flight control input that will over-stress the airplane in direct law?

Yes – there are no protections provided in direct law.

14. What are the maximum FLAPS/SLATS extended speeds V_{FE} for the A319/320/321?

Maximum Flaps/Slats Extended Speeds (V_{FE})					
FLAPS	1	1+F	2	3	4
A319/320 V_{FE}	230 KIAS	215 KIAS	200 KIAS	185 KIAS	177 KIAS
A321 V_{FE}	235 KIAS	225 KIAS	215 KIAS	195 KIAS	190 KIAS

15. What happens to extended speed brakes when FLAPS FULL is selected on the A320?

If an inhibiting condition occurs, the speedbrakes retract automatically.
Speedbrake extension is inhibited if:
- SEC 1 and 3 have failed
- An elevator (L or R) has failed (only spoilers 3 and 4 are inhibited)
- Angle of attack protection is active
- **Flaps are in configuration FULL (A319/320) or**
- **Flaps are in configuration 3 or FULL (A321)**
- Thrust levers are above MCT position, or
- Alpha floor is active

Hydraulics

1. Name some of the major users of the GREEN system.

- Landing gear
- Nosewheel steering
- Normal brakes
- Reverser 1
- Various actuators on flaps, slats, rudder, elevator, stabilizer, ailerons, and spoilers.

2. The yellow system has an engine driven pump, what other means do we have to pressurize the yellow system?

- Yellow electric pump
- Power Transfer Unit
- Hand pump for cargo doors

3. How many pumps does the yellow hydraulic system have excluding the PTU?

- ENG 2 Pump
- Yellow electric pump
- Hand pump for cargo doors

4. What is the purpose of the hand pump?

The hand pump is provided for operation of the cargo doors when electrical power is not available.

5. When is the PTU tested?

The PTU is inhibited during the first engine start and automatically tested during the second engine start.

6. Name the three independent hydraulic systems.

- Green
- Yellow
- Blue

7. How are the three hydraulic systems powered?

SOURCE	**GREEN**	**BLUE**	**YELLOW**
Engine Pump	1. Engine 1 pump		1. Engine 2 pump
PTU	2. PTU		2. PTU
Electric Pump		1. Blue Electric pump	3. Yellow Electric pump
RAT		2. Ram Air Turbine (RAT)	
Hand Pump			4. Hand pump for cargo door operation

8. Is it possible to pressurize the green hydraulic system on the ground via the PTU?

Yes

9. With the airplane on the ground and the blue electric pump switch in AUTO, the blue pump will be energized when?

- Ground – pump operates when either engine is running and AC power is available.
- Flight – pump operates continuously unless the BLUE ELEC PUMP pb is OFF.

10. If the YELLOW ELEC PUMP pushbutton is OFF, when will it come on automatically?

When the lever of the cargo door manual selector valve is moved to OPEN or CLOSE.

11. What occurs to the yellow hydraulic system functions when a cargo door is being opened or closed?

The other Yellow system functions are inhibited (except alternate braking and engine 2 reverser).

12. When does the RAT extend automatically?

If both AC bus 1 and 2 are lost and the airspeed is above 100 kts, the RAT automatically deploys and pressurizes the Blue hydraulic system, which drives the hydraulically driven emergency generator. Pressing the EMER ELEC PWR MAN ON pb has the same effect.

13. What is the difference in operation of the two RAT extension methods?

- Manual: The RAT MAN ON pb is used to deploy the RAT manually. Activating this pb will only pressurize the blue system, but will not activate the emergency generator.
- Automatic: If both AC bus 1 and 2 are lost and the airspeed is above 100 knots, the RAT automatically deploys and pressurizes the Blue hydraulic system, which drives the hydraulically driven emergency generator. Pressing the EMER ELEC PWR MAN ON pb has the same effect.

14. What system pressure is indicated on the Triple Pressure Indicator?

- ACCU PRESS – pressure in the yellow brake accumulators.
- BRAKES – yellow pressure delivered to the left and right brakes, as measured upstream of the servo valves.

15. What is the normal source of hydraulic power for the landing gear?

Green system

Landing Gear

1. What is the maximum landing gear extension speed V_{LO}?

250 KIAS

2. What is the maximum landing gear extension altitude?

25,000 feet

3. What does the red UNLK light in the LDG GEAR indication panel mean?

- Illuminates red if the gear is not locked in the selected position.
- Illuminates green if the gear is locked down.

4. Will the lights on the LDG GEAR panel illuminate if the LGCIU #1 is not supplied with electricity?

No

5. Is nose wheel steering available after manual gear extension?

No

6. When using the rudder pedals for nose wheel steering, the steering angle starts to reduce at 40 knots and progressively reduces to zero degrees at 130 knots?

When using the hand wheels, nose wheel steering angle is reduced above 20 knots ground speed. As speed increases, the angle decreases progressively to 0º at 70 knots.

7. To emergency extend the gear the crew has to turn the hand crank 3 turns clockwise. What does this action accomplish?

When the Emergency Gear Extension crank handle is operated:
- The cutoff valve shuts off hydraulic pressure to the landing gear system,
- Opens the gear doors, and
- Unlocks the gear, which extends by gravity.

8. After emergency gear extension do the gear doors remain open?

The gear doors remain open and the nosewheel steering is deactivated.

9. What does the RED ARROW on the landing gear selector lever indicate?

Illuminates if the landing gear is not locked down when the aircraft is in the landing configuration, and a red warning appears on the ECAM.

10. What sequences, operates, and monitors landing gear operation?

Two Landing Gear Control And Interface Units (LGCIU) provide sequencing, operation, monitoring, and indications for the landing gear and cargo doors. Landing gear proximity sensors provide signals to the LGCIUs for processing and monitoring landing gear position, shock absorber status (air/ground mode), and gear doors position. One LGCIU controls one complete cycle of the gear and then automatically switches to the other unit. If one unit fails, the other takes over. In case of a proximity sensor failure, the affected LGCIU will provide signals regarding gear and shock absorber position to the other LGCIU which in turn, automatically assumes control of the landing gear operation. The cargo doors also have proximity switches that provide position information to the LGCIUs.

11. At what speed will the safety valve cut off hydraulic pressure to the landing gear?

260 KIAS

12. Is there any visual means to check landing gear position?

No

13. How is the landing gear held in place when retracted?

Mechanical uplocks hold the gear in the wheel wells.

14. When the towing control lever is in the tow position, a green NW STRG DISC message is displayed on ECAM. What happens to the message after the first engine is started?

The NW STRG DISC message changes to amber.

15. At what speed is the nose wheel steering angle reduced when using the steering hand wheels?

When using the hand wheels, nose wheel steering angle is reduced above 20 knots ground speed. As speed increases, the angle decreases progressively to 0º at 70 knots.

Brakes

1. Where does the crew look to confirm that the parking brake is ON?

The ECAM memo page displays "PARK BRK"

2. What is the purpose of the brake check accomplished immediately after the aircraft starts moving?

- To check brake efficiency,
- That green pressure has taken over, and
- Yellow pressure is at zero on the brake pressure triple indicator.

3. After touchdown, with the autobrakes selected, what control surface must move before autobraking will begin?

Automatic braking is activated when the ground spoilers extend.
Note: During a rejected takeoff below 72 knots, the autobrakes will not activate since the ground spoilers do not extend below that speed.

4. Does the alternate brake system have the same capabilities as normal brakes?

Braking capability is the same as normal brakes, except autobraking is not available.

5. The green DECEL light on the autobrake pushbutton illuminates when the actual airplane deceleration corresponds to what percent of the selected rate?

80%

6. What groundspeed is the antiskid system automatically deactivated?

20 knots

7. When is brake pressure applied to the brakes during landing using the LO setting? MED?

- LO: 4 seconds after ground spoiler deployment.
- MED: 2 seconds after ground spoiler deployment.

8. When using the alternate brake system on accumulator pressure only, how many brake applications can the pilot expect?

At least seven full brake applications.

9. Is the anti-skid system operational with yellow alternate brakes?

Antiskid is normally available using the yellow alternate brakes. During alternate braking, the antiskid system becomes inoperative:

- With electrical power failure,
- With BSCU failure,
- If the A/SKID & N/W STRG switch is selected OFF, or
- If the brakes are supplied by the yellow accumulator only.

10. What controls all normal braking functions?

The Brake and Steering Control Unit (BSCU) controls all normal braking functions (anti-skid, autobrakes, and brake temperature indications).

11. Alternate brakes automatically take over in event of loss of green hydraulic pressure. Are there any differences between normal and alternate brakes?

Braking capability is the same as normal brakes, except autobraking is not available.

12. At the gate you notice brake temperatures above 300°C, you then select BRAKE FANS ON, when should the pilots turn the BRAKE FANS OFF?

Select brake cooling fans OFF when brake temperature decreases to approximately 250°C.

13. When will the Autobrakes activate? What speed must be met or exceeded during rejected takeoff to activate?

Automatic braking is activated when the ground spoilers extend. During a rejected takeoff below 72 knots, the autobrakes will not activate since the ground spoilers do not extend below that speed.

14. On slippery runways, antiskid operation may prevent reaching the predetermined deceleration, and the DECEL light will not illuminate. Is the autobrake still operative?

Yes

15. What happens to the other brake modes when parking brakes are applied (A319/320)?

All other braking modes and anti-skid are deactivated (A319/320 only).