AIRBUS A319/320/321

Technical Ground School Study Guide

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Chapter 11: HYDRAULICS

1. Which hydraulic systems have engine driven pumps?

- Eng 1 – Green
- Eng 2 - Yellow

2. When will the YELLOW ELEC pump operate automatically?

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

3. When will the RAT deploy 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.

4. What is the purpose of the priority valve in the Blue Hydraulic System?

The priority valve cuts off hydraulic power from the heavy load using units.

5. 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.

6. 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.

7. 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

8. 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).

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

Yes

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

Green system

11. Can the RAT be deployed manually?

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.

12. What is the purpose of the engine fire shutoff valves?

To isolate the hydraulic pump from its respective reservoir.

13. If an electric hydraulic pump overheats, can it be reset when cooled down?

Yes

Chapter 11: LANDING GEAR

1. What is the maximum gear extension speed (VLO)?

250 KIAS

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

No

3. Is nose wheel steering available after emergency gear extension?

No

4. 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.

5. Is it possible to extend the gear at any speed (high speed, for example)?

A safety valve shuts off hydraulic power to the gear when indicated airspeed is above 260 knots. The valve opens again when the airspeed decreases below 260 knots, provided the gear lever is placed down.

6. 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.

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

260 KIAS

8. What is the maximum gear retraction speed VLO?

220 KIAS

9. What is the maximum gear extended speed V_{LE}?

280 KIAS/0.67M

10. What is the maximum gear extension altitude?

25,000 feet

11. When using the rudder pedals for nose wheel steering during takeoff, the steering angle starts to reduce at what speed and progressively reduces to zero degrees at __130__ knots?

12. 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 message changes to amber.

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

No

14. What does illumination of the red arrow near the 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.

Chapter 11: BRAKES

1. 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.

2. 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.

3. 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.

4. What happens to the other brake modes when parking brakes are applied?

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

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

The BRAKES pressure gauges on the triple indicator.

6. What is the maximum allowable brake temperature for takeoff?

300° C

7. How many brake systems are on the aircraft?

- Normal (Green)
- Alternate (Yellow)
- Parking Brake (Yellow system or accumulator)

8. When will the Autobrakes activate?

Automatic braking is activated when the ground spoilers extend.

9. What speed must be met or exceeded during rejected takeoff for Autobrakes to activate?

72 knots

10. What do the indicators on the AUTO BRK pushbuttons mean?

- Blue ON light illuminates to indicate positive arming.
- Green DECEL light illuminates when the actual deceleration is 80% of the selected rate.
- Off: The indicated brake mode is not active.

11. What groundspeed is the antiskid system automatically deactivated?

20 knots

12. On the WHEEL page, if AUTO BRK is displayed in green, what is indicated?

Autobrake system is armed.

13. Which hydraulic system does the parking brake use?

Yellow hydraulic system or accumulators supply brake pressure.

14. 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).

Chapter 12: FLIGHT CONTROLS

1. 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.

2. 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)

3. 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.

4. What happens to extended speed brakes when FLAPS FULL is selected?

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

5. In general, how do you recognize that you are in Mechanical Law and how does it affect you?

A red "MAN PITCH TRIM ONLY" warning appears on the PFD. Pitch control is achieved through the horizontal stabilizer by using the manual trim wheel. Lateral control is accomplished through the rudder pedals.

6. When does partial ground spoiler extension occur?

Partial ground spoiler extension occurs when:

- Reverse thrust is selected on at least one engine with the other at or near idle, and
- One main landing gear strut is compressed.

7. Can the rudder be manually trimmed with the autopilot engaged?

The rudder trim rotary switch has no effect when the autopilot is engaged.

8. Four Wingtip Brakes are activated in case of asymmetry, over speed, symmetrical runway, or uncommanded movement. If the WTB's lock the flap or slat surfaces and prevent further movement, can the remaining surfaces be extended?

- If the flap WTBs are on, the pilot can still operate the slats;
- If the slat WTBs are on, he can still operate the flaps.

9. 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

10. Explain, in general terms, High Angle of Attack protection.

When the angle of attack exceeds alpha prot, elevator control switches to alpha protection mode in which angle of attack is proportional to sidestick deflection. However, alpha max will not be exceeded even if the pilot applies full aft deflection.

11. Is automatic pitch trim available in alternate law?

12. How can the aircraft be controlled in mechanical backup?

Pitch control is achieved through the horizontal stabilizer by using the manual trim wheel. Lateral control is accomplished using the rudder pedals. Both controls require hydraulic power.

13. After touchdown, what will the stabilizer trim do?

Stabilizer trim is automatically reset to zero as the pitch attitude becomes less than 2.5°.

Chapter 14: AUTOFLIGHT

1. 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.

2. 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.

3. 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

4. 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.

5. When is the windshear detection function available?

The Airbus **Reactive Windshear** Detection function is available during takeoff from liftoff to 1,300 feet AGL, and on approach from 1.300 feet AGL to 50 feet AGL, when aircraft configuration is 1 or greater.
When a FAC detects windshear conditions, it triggers a warning:
- "WINDSHEAR" in red on both PFD's (for at least 15 seconds)
- An aural warning, "WINDSHEAR, WINDSHEAR, WINDSHEAR"

The **Predictive Windshear** system operates when the aircraft is below 1,500' AGL. It scans the airspace within 5 nm forward of the aircraft for windshears. When a windshear is detected, a warning, caution, or advisory message appears on the PFD and (depending on the range selected on the ND) an icon appears on the ND. Predictive windshear warning and caution are associated with an aural warning. During takeoff, both warnings and cautions are available within 3 nm. Alerts are inhibited above 100 knots and up to 50'. During landing, alerts are inhibited below 50'.

When the WINDSHEAR switch is in AUTO, the Predictive Windshear function is activated. Windshear areas are detected by the antenna scanning below 2,300' RA, even if the transceiver selector is set to OFF, and displayed on the ND if below 1,500'.

Predictive windshear aural alerts have priority over TCAS, EGPWS, and other FWC aural warnings. They are inhibited by windshear detection by FAC (Reactive) and stall warning aural messages.

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

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

7. How is the Go-Around mode engaged?

When at least one thrust lever is placed in the TOGA detent, the slats/flaps lever is at least in position 1, and :
- the aircraft is airborne or
- the aircraft has been on the ground for less than 30 seconds.

8. 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.

9. How is A/THR activation confirmed?

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

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

No

11. What is indicated when the FMA displays SRS?

Takeoff or go around mode is engaged.

12. What does Column 1 of the FMA display?

Autothrust operation.

13. 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).

14. Define SRS.

Speed Reference System is a vertical mode which controls pitch to maintain a speed defined by SRS guidance (provided V_2 is inserted in the MCDU PERF TO page, the slats are extended, and the aircraft is on the ground). It engages automatically when the thrust levers are set to TOGA or MCT/FLX detent. It disengages manually when another vertical mode is engaged, or automatically when the aircraft reaches acceleration altitude or an FCU selected altitude.

The pitch guidance maintains airspeed at V_2 + 10 knots. If an engine failure is detected, pitch guidance maintains the greater of V_2 or current speed. Additionally, the mode protects against high pitch attitude and provides a minimum climb rate. Go-around mode combines the SRS vertical mode and the GA TRK lateral mode.

15. An amber THR LK flashes on the FMA. What does this indicate?

Thrust Lock function is active - See question 2.

Chapter 16: POWERPLANT

1. 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.

2. How is autothrust disconnected to avoid thrust surges?

Autothrust instinctive disconnect pb.

3. 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.

4. When is continuous ignition provided automatically?

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

5. Under what conditions may a manual start be required?

After aborting a start because of:
- Stall
- EGT overlimit
- Low start air pressure

When expecting a start abort because of:
- Degraded bleed performance due to a hot condition or at a high altitude airfield.
- A mature engine in hot condition or at a high altitude airfield.
- Marginal performance of external pneumatic power.
- Tailwind greater than 10 knots.

6. What takes place when we push the MAN START button?

- The start valve opens if the ENG MODE selector is set to CRANK or IGN/START and N_2 < 20%.
- Both pack valves close during the start sequence.
- The blue ON light illuminates.

Note: The start valve closes automatically when $N_2 \geq 50\%$.

7. 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.**

8. What is the minimum oil quantity for dispatch?

12.5 quarts

9. 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.

10. 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%.

11. 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.

12. Is there a mechanical connection between the thrust levers and the engines?

There is no mechanical connection between the levers and engines. The position of each lever (TLA) is electronically measured and transmitted to the FADEC, which computes the thrust rating limit.

13. How many channels does the FADEC computer have?

Each FADEC is a dual channel (A&B) computer providing full engine management. One channel is always active while the other is a backup designed to takeover automatically in case of primary channel failure.

14. If a thrust lever is set between two detents, 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.

Chapter 16: APU

1. 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.

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

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

3. When would the APU MASTER SW pb FAULT light illuminate?

This amber light illuminates and a caution appears on the ECAM when an automatic APU shutdown occurs.

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

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

5. 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.

6. What does the APU START pb green AVAIL light signify?

This light illuminates when N is above 99.5% or 2 seconds after N reaches 95%.

7. How many APU fire extinguisher bottles are installed?

One

8. Will the APU bleed valve close automatically during climb? Will it reopen during descent?

No

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

APU MASTER SW pb amber FAULT light will illuminate.

10. With battery power only, what would be the indications of an APU fire test?

- APU FIRE pb illuminated
- SQUIB and DISCH lights illuminated

11. After depressing the APU MASTER pb, the START pb is pressed. At this time the START pb illuminates blue. What does that mean?

- When the flap is completely open, the APU starter is energized.
- 1.5 seconds after the starter is energized, the ignition is turned ON.
- When N = 55%, the starter is de-energized and the ignition is turned OFF.
- 2 seconds after N reaches 95%, or when N is above 99%, The ON light on the START pb goes out.
- The APU may now supply bleed air and electrical power to aircraft systems.
- 10 seconds later, the APU page disappears from the ECAM display.

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

APU SHUT OFF pb on External Power Panel.

Chapter 8: FIRE PROTECTION

1. What are the components of the APU fire detection system?

The APU is equipped with two identical detection loops each of which contain one heat sensing element and a FDU, located in the APU compartment. The APU is equipped with one fire extinguisher.

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

If one smoke detector fails, the system remains operational with the other detector.

3. When are the cargo fire bottle squibs armed?

When the Smoke Detection Control Unit issues a smoke warning.

4. Where are the engine fire loops installed?

Engine heat sensing units are located in:

- Pylon nacelle
- Engine core
- Fan section

5. If an APU fire occurs on the ground, what must be done to shut down the APU and extinguish the fire?

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

6. How many fire extinguisher bottles are available for fighting an engine fire?

Two

7. How many cargo smoke detectors must sense smoke to issue a warning?

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.

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.

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

8. 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.

9. 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.

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

10. 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.

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

12. How do you know when an engine fire extinguisher bottle has discharged?

AGENT DISCH illuminates amber when its fire extinguisher bottle has lost pressure.

Chapter 9: FUEL

1. 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).

2. The outer wing tank transfer valves (A319&320) automatically open when the wing inner cell fuel quantity drops to __1,650__ pounds?

3. 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.

4. Can either wing tank feed either or both engines?

The crossfeed valve permits one engine to be fed by both sides or both engines to be fed from one side. The valve is operated by two electric motors.

5. What is the normal fuel feed sequencing?

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.

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.

IDG cooling is accomplished by fuel. Some fuel from the high pressure pump passes through the IDG heat exchanger and returns to the respective wing outer cell (A319/320) or wing tank (A321) through a fuel return valve. The fuel return valve is controlled by the FADEC which regulates IDG temperature.

A319/320: If the outer cell is full, the recirculated fuel overflows to the inner cell. To prevent wing tank overflow when the center tank is supplying fuel, the center tank pumps automatically stop when the wing inner cell is full. This allows the wing tanks to feed the engines until approximately 1,100 lbs of fuel has been used from the applicable wing tank(s); at which time the center tank pumps resume operation.

MODE SEL FAULT (A319/A320/A321): Amber light illuminates, and ECAM caution appears when center tank has more than 550 lbs of fuel and the left or right wing tank has less than 11,000 lbs.

ACT FAULT (A321): Amber light illuminates and ECAM caution appears when the center tank has less than 6,614 lbs of fuel and one ACT has more than 550 lbs of fuel.

6. What is the maximum fuel imbalance between the left and right wing tanks (outer + inner)?

2,500 lb

7. How do you know when the crossfeed valve is fully open?

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

Chapter 7: ELECTRIC

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

- Engine generators
- External power
- APU generator
- Emergency generator (RAT)
- Batteries

2. What does the EMER GEN red FAULT light indicate?

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

3. What does the amber FAULT light in either BAT 1, BAT 2 pb indicate?

The charging current for the corresponding battery is outside limits. In this case the battery contactor opens.

4. How long must the IDG pb 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.

5. What does the FAULT light indicate in the AC ESS FEED pb?

The AC ESS BUS is not electrically supplied.

6. Are there any procedures in the Pilot's Handbook which direct us to use the EMER GEN TEST switch?

None that I know of.

7. Can the aircraft batteries be depleted?

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

8. If the blue ON light is present in the EXT PWR pb and a green AVAIL light on the APU START pb, what is the source of electrical power (with engines shut down)?

EXT PWR

9. What is the purpose of the static inverter?

In the event of total AC power loss, if the aircraft speed is above 50 kts, an inverter is connected to the HOT BAT 1 bus and inverts DC current to single phase AC current which is supplied to the ESS AC bus. This switching will occur regardless of the position of the BAT pbs. If the airspeed is less than 50 kts, both BAT pbs must be in auto position for the switching to occur.

10. What does the AVAIL light in the EXT PWR pb mean?

AVAIL light illuminates green if:

- External power is plugged in, and
- External power parameters are normal.

11. If an IDG is disconnected in flight, can it be re-connected?

Pressing the IDG pb disconnects the IDG from its driveshaft. Only maintenance personnel can reconnect it.

12. What is the normal source of power for the AC ESS BUS?

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.

13. What is the AUTO function of the GALLEY pb?

Main galley, secondary galley, and in-seat power supply are supplied. 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)

14. Can the APU generator power all AC and DC busses on the ground?

The APU can supply the entire electrical system on the ground.

PART TWO (TGS in Class Outline)

Chapter 10: Pneumatics/Air Conditioning/ Pressurization

1. When would the LO selection on the PACK FLOW selector be used?

PACK FLOW Selector (A319/320)
- LO: if number of pax is less than 50 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

2. If bleed air is being supplied by the APU, or if one pack fails, what will be the pack flow rate?

During single pack operation or if the APU is supplying bleed air for air conditioning, pack controllers select high flow (A319/320) or normal flow (A321) automatically, regardless of selector position.

3. When does the pressurization system switch auto-controllers?

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. After each landing, the two controllers swap roles.

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

FMGS data is used.

5. What are the three supply zones for conditioned air?

- Flight deck
- Forward cabin
- Aft cabin

6. In flight, what happens if HP bleed air pressure is insufficient?

Air is normally bled from the Intermediate Pressure stage of the high pressure compressor. When IP stage pressure and temperature are insufficient, a high pressure bleed valve opens to supply bleed air from the High Pressure stage. In flight, if the pressure is insufficient even with the HP stage valve open, the engine speed is automatically increased to provide adequate air pressure.

7. When is the RAM AIR pushbutton used?

During flight, if both packs fail, or in case of smoke in the cabin, a ram air inlet may be opened allowing ambient air to enter the mixing unit.

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

No

9. When operating pressurization in AUTO, if the pilot suspects the selected controller is malfunctioning, is it possible to 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.

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.

Chapter 6: Ice and Rain Protection

1. On approach, when should WING anti-ice be selected OFF?

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

2. When will 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.

3. What part of each wing is anti-iced with pneumatic bleed air?

The three outboard slats on each wing.

4. What happens to the heat at the drain masts when the aircraft is on the ground?

On the ground, the heat is reduced to prevent injury to ground personnel.

5. What happens when Wing Anti-Ice is on and a bleed leak is detected?

They close automatically:

- Upon touchdown,
- If a leak is detected, or
- If electrical power is lost.

6. What affect does Engine Anti-Ice have on engine performance?

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.

Chapter 13: Instruments/Navigation/Communication

1. If a TERR pb FAULT light illuminated, would that affect the basic GPWS modes?

This amber light illuminates, along with an ECAM caution, if the terrain detection function fails. The terrain is not shown on the ND. The basic EGPWS modes 1 to 5 are still operative.

2. With the RDCR GND CTL pb in AUTO when does the CVR and Digital Flight Data Recorder (DFDR) energize?

At the first engine start.

3. If ACP #1 (Captain's) should fail, how would the pilot restore communications?

Select CAPT 3 on the Audio Switching panel. The captain uses his acoustic equipment and the third occupant’s ACP.

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

Any ND mode except PLAN.

5. 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.

6. What does the ON BATT light indicate?

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.

7. Where is ILS #1 displayed?

- ILS 1: CAPT PFD and F/O ND
- ILS 2: F/O PFD and CAPT ND

8. 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.

9. Why is it very important to maintain a "lights out" condition on the ECAM control panel during flight?

To ensure any current cautions or warnings are displayed immediately on the ECAM.

10. 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.

11. What information from the ADR is displayed on the PFD?

The Air Data Reference displays:

- Barometric altitude
- Speed
- Mach number

Note: The displayed vertical speed information is normally inertial. If inertial data is not available, barometric information replaces it automatically. In this case, the window around the numerical value becomes amber.

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. How do we know the ILS has been properly tuned and identified?

ILS identification is decoded by the ILS receiver, and displayed in magenta on the lower left of the ND.

14. When would the RMP 1 be used to tune an ILS?

In the event number 1 FMGC/MCDU fails.

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

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

16. Where is the information normally displayed by DMC #1? DMC #2?

- DMC 1: PFD 1, ND 1, upper ECAM DU
- DMC 2: PFD 2, ND 2, lower ECAM DU
- DMC 3: Spare which can replace DMC 1 or DMC 2

17. Can any communications radio be controlled from any RMP?

Any one RMP can tune any one of the aircraft radios. A green light to the left of the radio key indicates which radio is selected for tuning.

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

Only RMP 1 is operational in EMER ELEC CONFIG.

19. What does the speed trend arrow on the PFD airspeed scale indicate?

Points to the speed value which will be attained in 10 seconds, if the acceleration / deceleration remains constant.

20. What would a steady FAULT light in the #1 IR indicate?

FAULT

- Steady: The respective IR is lost.
- Flashing: Attitude and heading information may be recovered in ATT mode.

ALIGN

- Steady: Respective IR is operating normally in align mode.
- Flashing

21. What would a flashing IR FAULT light indicate?

Attitude and heading information may be recovered in ATT mode.

22. What is the purpose of the T.O. INHIBIT or LDG INHIBIT message?

During takeoff and landing T.O. INHIBIT or LDG INHIBIT memos are displayed in magenta to remind the crew that most of the failure titles and the associated checklists are suppressed. This prevents unnecessary distractions during critical phases of flight.

- The T.O. memo appears 2 minutes after the second engine is started or when the T.O. CONFIG TEST pb is pressed with one engine running. The memo is removed when takeoff power is applied.
- The LDG memo appears below 2,000’ RA and disappears after touchdown (80 knots).

23. What does the green F on the speed scale indicate on the PFD?

- F – Minimum Flap Retraction Speed, appears when flap selector is in position 3 or 2.
- S – Minimum Slat Retraction Speed, appears when the flap selector is in position 1.

24. What is green dot speed?

Engine-out operating speed in clean configuration. This green dot appears when the aircraft is flying in the clean configuration, showing the speed corresponding to the best lift-to-drag ratio.

25. What information does the Inertial Reference (IR) provide to the PFD?

- Attitude
- Heading
- Track
- Flight Path Vector