COMMERICAL PILOT QUESTIONS AND EXPLANATIONS

Note: The FAA may randomly change the order of the answer choices without changing the content of the questions. For example, a question in this course may indicate that the correct choice is Answer C, and the same question presented on a FAA Knowledge Test might have the correct answer choice as Answer A.

AERODYNAMICS

6048   PLT032
Accelerating past critical Mach may result in the onset of compressibility effects such as
A. high speed stalls.
B. P-factor.
C. control difficulties.

6048 (Ans. C)
Mach 1.0 is the speed of sound and the speed at which compressibility effects alter aerodynamic forces. The critical Mach number for an airplane is the lowest Mach speed at which the local airflow over some part of the aircraft reaches a speed of Mach 1.0 although the airplane may be flying much slower than the speed of sound. Critical Mach will occur before an airplane achieves Mach 1.0 and its value depends on airframe and wing design.

As an airplane accelerates past its critical Mach number, shock waves form on the wing substantially changing the drag and airflow over the wing. Airplanes not designed for transonic and supersonic speeds are limited to a Maximum Operating Mach speed (M\text{MO}) set below Critical Mach number (M\text{ACH}_{\text{CRIT}}) to avoid the formation of the shockwaves and the controllability issues that result from airflow separation and moving the center of lift aft. If the speed is allowed to increase beyond M\text{ACH}_{\text{CRIT}} in such aircraft, the aft center of lift can create an uncontrollable down-pitching called Mach Tuck.” The down pitch can exceed the elevator control authority causing a “Mach Tuck” steep, sometimes uncontrollable dive.

Answer A is incorrect because although a portion of the wing airflow may experience separation and stall, the reason for not accelerating past critical Mach is loss of control. Answer B is incorrect because P-factor is a slow speed phenomenon of propeller-driven aircraft.
An idea of the magnitude of the load factor in many maneuvers can be determined by
A. a G meter.
B. control pressures.
C. the degree that the pilot is pressed down into the seat.

Load factor is the ratio of the total airload acting on the airplane to the gross weight of the airplane and is expressed in terms of “G”. It is the result of centrifugal force and gravity. A load factor of 2 means the total load on the structure of the airplane is two times its gross weight. An idea of the magnitude of the load factor can be determined by the degree that the pilot, or anyone, is pressed down into the seat. If you subject an airplane to a load factor of 2 Gs during a maneuver, you'll be pushed down into the seat with a force equal to two times your weight.

Answer A is incorrect because a G meter will give you the exact magnitude of the load factor, not just an idea. Also, most small non-aerobatic airplanes do not have a G meter installed. Answer B is incorrect because the feel of the controls, or control pressures, are not affected by G forces but by the speed of the air over the control surfaces.

The tendency toward Dutch roll occurs with which type of wing and why?
A. A rectangular wing with a high angle of incidence.
B. A tapered wing with increased dihedral.
C. A sweepback wing having weak directional stability and increased dihedral.

Any aircraft that experiences a yawing moment in flight will experience a coupled rolling moment due to the advanced wing generating more lift than the retreated wing. This difference in lift is exaggerated in swept wing aircraft making them more prone to experiencing Dutch roll.

Answers A and B are incorrect because swept wings are aerodynamically more prone to Dutch roll for the reason stated above. Rectangular and tapered wings regardless of dihedral or angle of incidence are not likely to produce Dutch roll.

Within what Mach range do transonic flight regimes usually occur?
A. .50 to .75 Mach.
B. .75 to 1.20 Mach.
C. 1.20 to 2.50 Mach.

The transonic flight regime occurs from 0.75 to 1.20 Mach and is the speed at which an aircraft transitions from subsonic to speeds above the speed of sound, or supersonic speeds.

Answer A is incorrect because 0.50 to 0.75 Mach is subsonic and below transonic flight. Answer C is incorrect because 1.20 to 2.50 Mach is supersonic, which is above transonic speeds.
6055 PLT107

Which is a purpose of wing-mounted vortex generators?

A. Delays the onset of drag divergence at high speeds and aids in maintaining aileron effectiveness at high speeds.
B. Increases the onset of drag divergence and aids in aileron effectiveness at low speed.
C. Breaks the airflow over the wing so the stall will progress from the root out to the tip of the wing.

6055 (Ans. A)

Wing-mounted vortex generators are used to delay the drag divergence caused by supersonic flow over portions of the wing. They are mounted forward of the point where the supersonic shock wave begins to form. Because of the low aspect ratio of the vortex generators, they develop strong tip vortices that draw in high-energy air from outside the boundary layer into the more slowly moving air close to the skin reducing the area of turbulent flow. This helps aileron effectiveness at high speeds.

Answer B is incorrect because vortex generators do not increase the onset of drag divergence (they actually delay it). Answer C is incorrect because stall strips installed on the leading edge of the wing serve to break the airflow over the wing so the stall will progress from the root out to the tip, not vortex generators.

6056 PLT214

What is the result of a shock-induced separation of airflow occurring symmetrically near the wing root of a sweptwing aircraft?

A. A high-speed stall and sudden pitchup.
B. A severe diving moment or "Mach tuck".
C. Severe porpoising.

6056 (Ans. B)

Shock-induced separation of airflow occurring symmetrically near the wing root of a sweptwing may result in a Mach tuck, a severe diving moment due to the center of pressure moving aft on the wing and a decrease of downwash on the tail.

Answer A is incorrect because pitch-up occurs as a result of airflow separation due to high angles of attack on sweepback wing planforms. The wing tip stalls first, which causes the downwash to be increased at the tail further aggravating the pitch instability. Answer C is incorrect because pilot induced oscillations typically cause severe porpoising as a result of control system and human pilot response lag.

6057 PLT 214

What is the condition that may occur when gusts cause a sweptwing-type airplane to roll in one direction while yawing in the other?

A. Mach buffet.
B. Wingover.
C. Dutch roll.

6057 (Ans. C)

Dutch roll is a coupled lateral-directional oscillation that is usually dynamically stable but is objectionable because of the oscillatory nature. The response of the airplane to a disturbance from equilibrium is a combined rolling-yawing oscillation in which the airplane rolls in one direction while yawing in the other.

Answer A is incorrect because Mach buffet refers to vibration on the tail surfaces caused by a turbulent wake behind the wing. Answer B is incorrect because a wingover describes a maneuver performed by pitching the aircraft up to a high angle of attack, banking steeply to the left or right until the aircraft slows and pivots about the vertical axis to a nose down attitude with a 180° change in direction.
6058  PLT473
What is the purpose of an anti-servo tab?

A. Move the flight controls in the event of manual reversion.
B. Reduce control forces by deflecting in the proper direction to move a primary flight control.
C. Prevent a control surface from moving to a full-deflection position due to aerodynamic forces.

6058 (Ans. C)
The purpose of an anti-servo tab is to prevent a control surface from moving to a full-deflection position due to aerodynamic forces. It moves in the same direction as the control surface, which produces a stabilizing force and increased control force pressure.

Answer A is incorrect because a control tab is used to move the flight controls in the event of manual reversion. Answer B is incorrect because a servo tab is used to reduce control forces by deflecting in the proper direction to move a primary flight control.

6059  PLT477
Reaching the critical angle of attack means that the wing will
A. continue to have smooth airflow.
B. stall.
C. have separation of airflow over the trailing edge.

6059 (Ans. A)
The critical angle of attack is the highest angle of attack in which air flows smoothly over most of the wing with no separation. Anything beyond the critical angle will result in some flow separation which becomes greater as the angle of attack increases beyond the critical angle.

Answers B and C are incorrect because by definition, the critical angle of attack is that angle at which there is still smooth air flow over the wings. Any increase in the angle of attack will begin air flow separation and finally stall.

6060  PLT477
An airplane moving at the speed of sound is
A. in supersonic flight.
B. moving at Mach 1.0.
C. at critical Mach

6060 (Ans. B)
The speed of sound is considered to be Mach 1.0. This is the ratio of the true airspeed of the airplane to the speed of sound in the same atmospheric conditions. (The speed of sound varies with temperature.)

Answer A is incorrect because the supersonic regime of flight occurs between Mach 1.20 to 5.00. Answer C is incorrect because critical Mach is the speed of an airplane in which airflow over any part of the wing first reaches Mach 1.0 even though the aircraft is not yet traveling at Mach 1.0 or greater.

6064  PLT266
One purpose of spoilers on a jet aircraft is to
A. increase lift.
B. reduce stall speed.
C. increase drag.

6064 (Ans. C)
Spoilers are rectangular-shaped devices mounted in front of flaps but not in front of ailerons on the top surface of wings on jet aircraft. Their purpose, when deployed, is to increase drag for aerodynamic braking and to destroy lift as the main gear touches down. This action aids in more quickly transferring the weight of the aircraft from the wings to the wheels and greatly increases the effectiveness of the wheel brakes. (Don’t confuse spoilers with speed brakes which are normally used to produce drag when rapid deceleration is needed to slow down to landing gear and flap speeds.)

Answer A is incorrect because spoilers “spoil” lift, not increase lift, and increase drag. Answer B is incorrect because spoilers are used primarily at touchdown and then their use would have no relationship to stall speed.
Among the conditions to consider when planning a daytime VFR flight to another airport is/are
A. LAHSO operations.
B. pilot-controlled lighting capability.
C. types of instrument approaches available.

LAHSO (Land And Hold Short Operations) procedures at your destination airport must be considered during your flight planning. You need to decide if you can accept or must decline a LAHSO clearance should you be offered one by ATC. If the available landing distance compromises safety, you'll want to know that before you get there.

Answer B is incorrect because you probably won't need pilot-controlled lighting since this is a daytime flight. Answer C is incorrect because this is a VFR flight and unless unexpected IMC develops at the destination airport, you won't need to do an instrument approach.

Figure 62 illustrates taxiway designation and direction signs. Letters show the taxiway name or designation and the arrows indicate the direction of the taxiway out of the intersection.

Answer A is incorrect because a taxiway sign visible when exiting a runway is a destination sign. The signs look the same but this type of sign's position at the runway exit would indicate that the destination taxiway is in the direction of the arrow. Answer C is incorrect because this type of sign would also be a destination sign. It would indicate that the destination is a runway, not a direction out of a taxiway intersection.

When you report “minimum fuel” to the controller when reaching your destination, it means that you cannot accept any undue delay (holding, following a slower aircraft). This is not an emergency situation but an advisory and does not give you traffic priority. You continue to monitor your fuel status because if your remaining fuel suggests that you need traffic priority, you then declare an emergency due to low fuel.

Answer A is incorrect because you need to closely monitor your fuel remaining and determine if an emergency situation has developed due to low fuel. Answer C is incorrect because reporting “minimum fuel” is not considered an emergency. If the situation deteriorates to “low fuel”, then you should declare an emergency.
You could accept a LAHSO clearance if you have sufficient
A. ALD.
B. ARD.
C. RVR.

6063 (Ans. A)
When a controller gives you a LAHSO (Land And Hold Short Of) clearance, your acceptance of this clearance means that you have sufficient ALD (Available Landing Distance) based on the performance data for your aircraft and so are able to Land And Hold Short Of an intersecting taxiway or runway.

Answer B is incorrect because it is not an acronym for any LAHSO procedure or requirement. Answer C is incorrect because RVR (Runway Visual Range) is a device that measures how far down a runway one can see in ground obscuration conditions.

FEDERAL AVIATION REGULATIONS

6053 (Ans. B)
If instructed by ground control to taxi to Runway 9, the pilot may proceed
A. via taxiways and across runways to, but not onto, Runway 9.
B. to the first intersecting runway where further clearance is required.
C. via taxiways and across runways to Runway 9, where an immediate takeoff may be made.

Answer A is incorrect because when cleared to taxi to a runway a pilot may NOT taxi cross intersecting runways without further clearance from the controller. Answer C is incorrect because a clearance to taxi is never a clearance to taxi onto the active runway and take off.

6061 (Ans. C)
On an instrument approach, when should you continue the approach and land after descending below the authorized DA/DH?
A. If the approach lights and the runway environment are in sight.
B. When the flight visibility is at or above the approach minimums or you are 100 feet above the touchdown zone elevation.
C. When the flight visibility is at or above the required approach minimums.

By regulation, no pilot may operate an aircraft below the authorized MDA or continue an approach below the authorized DA/DH unless the flight visibility is not less than the visibility prescribed in the standard instrument approach being used. (FAR 91.175(c)(2)).

Answer A is incorrect because the approach light system is one required visible reference to continue the approach to land but not unless the flight visibility is at or above the required approach minimums. In addition, the "runway environment" is not a legal visible reference. Answer B is incorrect because if you do have the required flight visibility you may not descend below 100 feet above the touchdown zone elevation using the approach light system as a visible reference unless the red terminating bars or the red side row bars are also distinctly visible and identifiable.
6065  PLT366  
Which incident involving propellers is reportable to the NTSB under Part 830?
A. A ground strike.  
B. Separation of a blade in flight.  
C. Loss of the propeller governor control.  

6065 (Ans. B)  
Separation, or release, of all or a portion of a propeller blade in flight is a reportable incident to the NTSB. (NTSB 830)  
Answer A is incorrect because a separation caused solely by a ground strike by a propeller blade is not reportable. Answer C is incorrect because loss of the propeller governor results in a low pitch, high RPM condition and is not a reportable incident.

6066  PLT366  
The complete loss of information of what percentage of the electronic display is considered to be a reportable incident by the NTSB?
A. More than 50%.  
B. 25%.  
C. Less than 50%.  

6066 (Ans. A)  
A complete loss of information (excluding flickering) of more than 50% of the electronic navigation and primary flight display and other integrated displays is a reportable incident.  
Answers B and C are incorrect because the rule is more than 50% of the electronic display must have a complete loss of information to have a reportable incident.

6067  PLT366  
Which of the following incidents with a turbine aircraft requires immediate NTSB notification?
A. An engine fire that occurs on the ground.  
B. Sustained loss of thrust in one engine of a large multiengine aircraft.  
C. Compressor blade failure that penetrates the cowl but does not impact any other part of the aircraft.  

6067 (Ans. C)  
Failure of any internal turbine engine component that results in the escape or release of debris other than out the exhaust path requires immediate notification of the NTSB. For example, an uncontained failure of a turbine or a compressor would send debris out the sides of the engine.  
Answer A is incorrect because only in-flight fires, not ground fires, are reportable to the NTSB. Answer B is incorrect because sustained loss of power or thrust is only reportable when it affects two or more engines (in aircraft that weigh more than 12,500 lbs.).

6068  PLT366  
Which situation is reportable to the NTSB if your aircraft is equipped with ACAS Airborne Collision and Avoidance System?
A. Operating on an instrument flight plan while needing to comply with a resolution advisory to avert a substantial risk between aircraft.  
B. When operating VFR in Class B airspace near the primary airport.  
C. When operating VFR in uncontrolled airspace.  

6068 (Ans. A)  
If your aircraft is equipped with one of the (ACAS) Airborne Collision and Avoidance Systems (like TCAS), you are on an instrument flight plan, and you receive a resolution advisory from the ACAS that you and another aircraft are at substantial risk of a collision, this would be a reportable situation. The reason it is reportable is because there would be some significant degree of loss of separation between you and the other aircraft. (The other ACAS involved situation that requires reporting is if a resolution advisory occurred in Class A airspace.)  
Answer B is incorrect because Class A airspace is the only designated airspace that requires a report after an ACAS resolution advisory. Answer C is incorrect because the reporting requirements are that you be on an instrument flight plan, not VFR, or that you are in Class A airspace, not uncontrolled airspace.
A Certificate of Aircraft Registration expires

A. 3 years after the date the certificate was issued.
B. 3 years after the last day of the month the certificate was issued with a 6 month extension.
C. never, a Certificate of Aircraft Registration is issued only once.

By regulation, a Certificate of Aircraft Registration expires 3 years after the date the certificate was issued. FAR 47.40 (3)(c).

Answer B is incorrect because the Certificate of Aircraft Registration expires 3 years after the actual date it was issued, not after the last day of the month it was issued. You may renew the registration anytime within the 6 month period before it expires. Answer C is incorrect because the Certificate of Registration must be renewed every 3 years.

Aircraft Performance

Given:
Pressure altitude ................................18,000 ft
Temperature.............................................-1 °C
Power ........................................2,200 RPM - 20" MP
Best fuel economy usable fuel .................344 lb

What is the approximate flight time available under the given conditions? (Allow for VFR day fuel reserve.)

A. 4 hours 50 minutes.
B. 5 hours 20 minutes.
C. 5 hours 59 minutes.

Enter Figure 12 at 2200 RPM-20" MP. Move right to 20 °C ABOVE STD. TEMPERATURE, minus 1 °C, column and read fuel flow = 59 PPH.
Apply best fuel economy note (43 percent BHP):
59 - 6 = 53 PPH
344 pounds/53 PPH 6 hrs. 29 min.
Conversion/subtract reserve 5 hrs. 89 min.
Less Reserve (VFR Day) --30 min.
Flight time 5 hrs. 59 min.

Answers A and B are incorrect but could be obtained by misinterpretation of data.