Study Unit 2 – Airplane Instruments, Engines, and Systems

Page 44, Subunit 2.1, new question: A new question regarding deviation in a magnetic compass was added by the FAA, and subsequent questions were renumbered.

Deviation in a magnetic compass is caused by the

A. northerly turning error.
B. certain metals and electrical systems within the aircraft.
C. the difference in location of true north and magnetic north.

Answer (B) is correct. (PHAK Chap 7)

DISCUSSION: The compass in an airplane will align with any magnetic field. Magnetic fields created by metals and the electrical system of the aircraft will hinder the ability of the compass to align with the earth’s magnetic field. This phenomenon is known as deviation. Since deviation error varies by heading, a compass correction card is fitted, providing the pilot with the deviation for a given heading.

Answer (A) is incorrect. Northerly turning error is a product of the pulling-vertical component of the earth’s magnetic field. Answer (C) is incorrect. Variation is the error associated with the difference in the location of true and magnetic north.

Page 48, Subunit 2.3, Question 18: The answer explanations were altered to comply with question stem and answer foil changes by the FAA.

18. (Refer to Figure 4 on page 49.) (Figure 4 can also be seen in color on the inside back cover.) Which color marking identifies the never-exceed speed?

A. Lower upper limit of the yellow green arc.
B. Upper limit of the white arc.
C. The red radial line.

Answer (C) is correct. (PHAK Chap 7)

DISCUSSION: The never-exceed speed is indicated by a red line and is found at the upper limit of the yellow arc. Operating above this speed may result in structural damage. The red radial line represents the never-exceed speed (V\text{NE}). Operating an aircraft beyond V\text{NE} may result in severe structural damage.

Answer (A) is incorrect. The lower limit of the yellow arc is the beginning of the caution range. The upper limit of the green arc represents normal operating speed (V\text{N}). Answer (B) is incorrect. The upper limit of the white arc is the maximum speed at which flaps may be extended flap extension speed (V\text{FE}).
Study Unit 3 – Airports, Air Traffic Control, and Airspace

Page 67, Subunit 3.2, 7. and 8.: New material and an image were added to clarify vehicle roadway markings and the yellow demarcation bar.

7. Vehicle Roadway Markings
   a. Vehicle roadway markings define pathways for vehicles to cross areas of the airport used by aircraft.
      1) Vehicle roadway markings exist in two forms, as indicated by letter C in Figure 65 on the outside back cover.
         a) The edge of vehicle roadway markings may be defined by a solid white line or white zipper markings.
      2) A dashed white line separates opposite-direction vehicle traffic inside the roadway.

8. Yellow Demarcation Bar
   a. The yellow demarcation bar is a 3-ft.-wide, painted yellow bar that separates a displaced threshold from a blast pad, stopway, or taxiway that precedes the runway.

(Refer to Figure 60 on the inside front cover.) The radius of the procedural outer area of Class C airspace is normally

A. 10 NM.
B. 20 NM.
C. 30 NM.

Answer (B) is correct. (AIM Chap 3)

DISCUSSION: A 20-NM radius procedural outer area surrounds the primary airport in Class C airspace. This area is not charted and generally does not require action from the pilot.

Answer (A) is incorrect. Each Class C airspace is individually tailored to the specific area; however, most Class C airspace consists of a charted 5-NM radius core area that extends from the surface to 4,000 ft. AGL and a charted 10-NM radius shelf that extends from 1,200 ft. AGL to 4,000 ft. AGL. Answer (C) is incorrect. A 30-NM outer area does not surround Class C airspace; however, a 30-NM Mode C veil does surround Class B airspace.

Page 76, Subunit 3.1, new question: A new question regarding Class C airspace was added by the FAA, and subsequent questions were renumbered.
Page 79, Subunit 3.2, new questions: New questions regarding airport markings were added by the FAA, and subsequent questions were renumbered.

(Refer to Figure 66 on the inside back cover.) (Refer to E.)
This sign is a visual clue that

A. confirms the aircraft's location to be on taxiway “B.”
B. warns the pilot of approaching taxiway “B.”
C. indicates “B” holding area is ahead.

Answer (A) is correct. (AIM Chap 3)

DISCUSSION: The taxiway location sign consists of a yellow letter on a black background with a yellow border. This sign confirms the pilot is on taxiway “B.” Answer (B) is incorrect. A direction sign with a yellow background, a black letter, and an arrow pointing to taxiway “B” would be required to warn a pilot that (s)he is approaching taxiway “B.” Answer (C) is incorrect. A taxiway location sign defines a position on a taxiway, not a holding area.

(Refer to Figure 66 on the inside back cover.) (Refer to F.)
This sign confirms your position on

A. runway 22.
B. routing to runway 22.
C. taxiway 22.

Answer (A) is correct. (AIM Chap 2)

DISCUSSION: A runway position sign has a black background with a yellow inscription and a yellow border. The inscription on the sign informs the pilot (s)he is located on Runway 22.

Answer (B) is incorrect. A direction sign with a yellow background and black inscription would be required to inform a pilot (s)he is routing to Runway 22. Answer (C) is incorrect. Only runways are numbered. Taxiways are always identified by a letter.

From the cockpit, this marking confirms the aircraft to be

A. on a taxiway, about to enter runway zone.
B. on a runway, about to clear.
C. near an instrument approach clearance zone.

Answer (B) is correct. (AIM Chap 2)

DISCUSSION: When the runway holding position line is viewed from the runway side, the pilot is presented with two dashed bars. The PIC must ensure the entire aircraft has cleared the runway holding position line prior to coming to a stop.

Answer (A) is incorrect. A pilot entering a runway from a taxiway is presented with the two solid bars on the runway holding position marking, not the dashed lines. Answer (C) is incorrect. The marking depicted is a runway holding position marking and is not related to any form of clearance zone.

The ‘yellow demarcation bar’ marking indicates

A. runway with a displaced threshold that precedes the runway.
B. a hold line from a taxiway to a runway.
C. the beginning of available runway for landing on the approach side.

Answer (B) is correct. (AIM Para 2-3-6)

DISCUSSION: A demarcation bar is a 3-ft.-wide-yellow stripe that separates a runway with a displaced threshold from a blast pad, stopway, or taxiway that precedes the runway.

Answer (A) is incorrect. A white stripe separates the displaced threshold from the runway. The demarcation bar is a yellow stripe that separates the displaced threshold from the blast pad, stopway, or taxiway that precedes the displaced threshold. Answer (C) is incorrect. The yellow demarcation bar delineates the beginning of the displaced threshold, which is not a landing surface.

(Refer to Figure 65 on the outside back cover.) Which marking indicates a vehicle lane?

A. A.
B. C.
C. E.

Answer (B) is correct. (AIM Para 2-3-6)

DISCUSSION: Vehicle roadway markings define a route of travel for vehicles to cross areas intended for use by aircraft. The roadway is defined by solid white lines, with a dashed line in the middle to separate traffic traveling in opposite directions. White zipper markings may be used instead of solid white lines to define the edge of the roadway at some airports.

Answer (A) is incorrect. This marking represents a surface painted holding position sign, not a vehicle lane. In this instance, the marking indicates the aircraft is holding short of Runway 19. Answer (C) is incorrect. This marking represents a standard taxiway holding position and is used by ATC to hold aircraft short of an intersecting taxiway.
Study Unit 4 – Federal Aviation Regulations

Page 112, Subunit 4.8, 91.203: The following material was changed for clarification and to more clearly align with FAR 91.203.

91.203 Civil Aircraft: Certifications Required

1. The aircraft’s airworthiness certificate, registration certificate, and operating limitations must be aboard an aircraft during flight. No person may operate a civil aircraft unless the aircraft has a U.S. airworthiness certificate displayed in a manner that makes it legible to passengers and crew.

2. To operate a civil aircraft, a valid U.S. registration issued to the owner of the aircraft must be on board.

Page 156, Subunit 4.9, 91.519: A question regarding pre-takeoff briefing of passengers was added by the FAA, and subsequent questions were renumbered.

Pre-takeoff briefing of passengers for a flight is the responsibility of

A. all passengers.
B. the pilot.
C. a crewmember.

Answer (B) is correct. (FAR 91.519)

DISCUSSION: Before each takeoff, the pilot in command of an airplane carrying passengers shall ensure that all passengers have been orally briefed on smoking, the use of safety belts and shoulder harnesses, location and means of opening a passenger door as a means of emergency exit, location of survival equipment, ditching procedures and the use of the flotation equipment, and the normal and emergency use of oxygen equipment if installed in the airplane.

Answer (A) is incorrect. It is the responsibility of the pilot in command to brief the passengers; passengers cannot self-brief. Answer (C) is incorrect. A pilot in command can delegate the role of the pre-takeoff briefing to a crew member, but (s)he is ultimately the one responsible for ensuring the briefing has been completed.

Page 157, Subunit 4.10, 830.15, Question 197: To clarify the question, the FAA now specifies the NTSB as the agency to contact in the event of an accident.

197. The operator of an aircraft that has been involved in an accident is required to file an NTSB accident report within how many days?

A. 5.
B. 7.
C. 10.

Answer (C) is correct. (NTSB 830.15)

DISCUSSION: The operator of an aircraft shall file a report on NTSB Form 6120.1/2 within 10 days after an accident, or after 7 days if an overdue aircraft is still missing. A report on an incident for which notification is required shall be filed only as required.

Answer (A) is incorrect. NTSB Form 6120.1/2 is required within 10 (not 5) days after an accident. Answer (B) is incorrect. NTSB Form 6120.1/2 is required within 10 (not 7) days after an accident.
Study Unit 5 – Airplane Performance and Weight and Balance

Page 169, Subunit 5.1, new question: A new question regarding density altitude was added by the FAA, and subsequent questions were renumbered.

A pilot and two passengers landed on a 2,100 foot east-west gravel strip with an elevation of 1,800 feet. The temperature is warmer than expected and after computing the density altitude it is determined the takeoff distance over a 50 foot obstacle is 1,980 feet. The airplane is 75 pounds under gross weight. What would be the best choice?

A. Takeoff to the west because the headwind will give the extra climb-out time needed.
B. Try a takeoff without the passengers to make sure the climb is adequate.
C. Wait until the temperature decreases, and recalculate the takeoff performance.

Answer (C) is correct. (PHAK Chap 10)

DISCUSSION: The majority of pilot-induced accidents occur during the takeoff and landing phases of flight. In this instance, the pilot in command of this aircraft has an important decision to make. The takeoff distance over a 50-foot obstacle appears on initial inspection to be possible (1,980 feet on a 2,100-foot runway). It is important to remember, however, the performance charts are based on ideal conditions and created by testing brand new aircraft with optimal performance and highly experienced test pilots at the controls. It would be ill-advised for this pilot to attempt to take off. The pilot should wait for the temperature to decrease and recalculate the takeoff performance.

Answer (A) is incorrect. There are no winds provided in this question and no guarantee the takeoff performance to the west would be improved in any way. Answer (B) is incorrect. The decision to attempt a takeoff without the passengers and ensure climb performance is flawed in a few ways. Charts provided in the aircraft information manual should be used to determine climb performance prior to a flight. Coming to the realization the climb performance is not sufficient to clear terrain features and obstacles once airborne is a position no pilot wants to find him/herself in. If the pilot did attempt to take off without the passengers and the climb performance was adequate, there is absolutely no reason to believe the performance would be sufficient when the passengers are added and the weight of the aircraft is increased.

Page 170, Subunit 5.2, new question: A new question regarding density altitude computations was added by the FAA, and subsequent questions were renumbered.

(Refer to Figure 8 on page 172.) What is the effect of a temperature increase from 35 to 50 °F on the density altitude if the pressure altitude remains at 3,000 feet MSL?

A. 1,000-foot increase.
B. 1,100-foot decrease.
C. 1,300-foot increase.

Answer (A) is correct. (PHAK Chap 10)

DISCUSSION: Increasing the temperature from 35°F to 50°F, given a constant pressure altitude of 3,000 ft., requires you to find the 3,000-ft. line on the density altitude chart at the 35°F level. At this point, the density altitude is approximately 1,950 feet. Then move up the 3,000-ft. line to 50°F, where the density altitude is approximately 2,950 feet. There is an approximate 1,000-ft. increase (2,950 – 1,950 feet). Note that 50°F is just about standard, and pressure altitude is very close to density altitude.

Answer (B) is incorrect. An 1,100-foot decrease would require a temperature decrease of 18°F to 17°F, not a 15°F increase to 50°F. Answer (C) is incorrect. An 1,300-ft. increase would be caused by a temperature increase of 20°F (not 15°F).
Study Unit 6 – Aeromedical Factors and Aeronautical Decision Making (ADM)

Page 197, Subunit 6.2, new question: A new question regarding hyperventilation was added by the FAA, and subsequent questions were renumbered.

A pilot experiencing the effects of hyperventilation should be able to restore the proper carbon dioxide level in the body by

A. slowing the breathing rate, breathing into a paper bag, or talking aloud.
B. breathing spontaneously and deeply or gaining mental control of the situation.
C. increasing the breathing rate in order to increase lung ventilation.

Answer (A) is correct. (PHAK Chap 16)

DISCUSSION: A stressful situation can often lead to hyperventilation, which results from an increased rate and depth of respiration that leads to an abnormally low amount of carbon dioxide in the bloodstream. By slowing the breathing rate, breathing into a paper bag, or talking aloud, a pilot can overcome the effects of hyperventilation and return the carbon dioxide level in the bloodstream to normal.

Answer (B) is incorrect. Breathing deeply further aggravates the effects of hyperventilation. Answer (C) is incorrect. Increasing the rate of breathing will further aggravate the effects of hyperventilation.

Page 197, Subunit 6.3, new question: A new question regarding spatial disorientation was added by the FAA, and subsequent questions were renumbered.

A lack of orientation with regard to the position, attitude, or movement of the aircraft in space is defined as

A. spatial disorientation.
B. hyperventilation.
C. hypoxia.

Answer (A) is correct. (PHAK Chap 16)

DISCUSSION: Spatial disorientation is a state of temporary confusion resulting from misleading information being sent to the brain by various sensory organs. Thus, the pilot should ignore sensations of muscles and the inner ear and kinesthetic senses (those that sense motion), especially during flight in IMC when outside visual cues are taken away.

Answer (B) is incorrect. Hyperventilation occurs when an excessive amount of carbon dioxide is passed out of the body and too much oxygen is retained. This occurs when breathing rapidly and especially when using supplemental oxygen. Answer (C) is incorrect. Hypoxia is the result of an oxygen deficiency in the bloodstream and may cause lack of clear thinking, fatigue, euphoria, and, shortly thereafter, unconsciousness.

Study Unit 7 – Aviation Weather

Page 210, Subunit 7.4, new question: A new question regarding fronts was added by the FAA, and all subsequent questions were renumbered.

The destination airport has one runway, 08-26, and the wind is calm. The normal approach in calm wind is a left hand pattern to runway 08. There is no other traffic at the airport. A thunderstorm about 6 miles west is beginning its mature stage, and rain is starting to reach the ground. The pilot decides to

A. fly the pattern to runway 08 since the storm is too far away to affect the wind at the airport.
B. fly the normal pattern to runway 08 since the storm is west and moving north and any unexpected wind will be from the east or southeast toward the storm.
C. fly an approach to runway 26 since any unexpected wind due to the storm will be westerly.

Answer (C) is correct. (PHAK Chap 11)

DISCUSSION: Flying in, near, or under thunderstorms can subject an aircraft to rain, hail, lightning, and violent turbulence. It is recommended that pilots avoid severe thunderstorms by 20 NM. In this case, the storm is to the west of the airport and reaching the mature stage. The mature stage is characterized by both strong updrafts and downdrafts. The pilot of this aircraft could expect the potential of a strong wind from the west, making Runway 26 the best option. Runway 26 also keeps the aircraft on the eastern side of the airport away from the storm to the west.

Answer (A) is incorrect. Flying a left pattern for Runway 08 would put the aircraft closer to or even under the storm. Answer (B) is incorrect. Flying a left pattern for Runway 08 would put the aircraft closer to or even under the storm. The pilot can expect the winds to be from the west, not the east. Westerly winds would favor Runway 26.
Study Unit 9 – Navigation: Charts and Publications

Page 248, Subunit 9.2, 4.: The following additions and revisions to this material clarify any ambiguity and elaborate on Class E airspace.

4. The lower limits of Class E airspace is controlled airspace that is not defined as Class A, Class B, Class C, or Class D.
   
a. Surface around airports marked by segmented (dashed) magenta (red) lines The lower limits of Class E airspace are defined on terminal and sectional charts.
   1) The surface in areas marked by segmented (dashed) magenta lines.
   2) 700 ft. AGL in areas marked by shaded magenta lines.
   3) 1,200 ft. AGL in areas marked by shaded blue lines.
   4) 1,200 ft. AGL in areas defined as Federal Airways. Blue lines between VOR facilities labeled with the letter “V” followed by numbers, e.g., V-120.
   5) A specific altitude defined in En route Domestic Areas defined by blue “zipper” marks.

b. 700 ft. AGL in areas marked by magenta shading If not defined, the floor of Class E airspace begins at 14,500 ft. MSL or 1,200 ft. AGL, whichever is higher.

c. 1,200 ft. AGL for areas designated as federal airways and other areas marked by blue-shading Class E airspace extends up to, but does not include, 18,000 ft. MSL.
   1) In much of the contiguous U.S., the floor of Class E airspace is no higher than 1,200 ft. AGL anywhere.
      a) Therefore, the blue shading is not shown because it would extend beyond the edge of the chart.
      b) In these areas, unless the floor of Class E airspace is indicated by chart symbols to be below 1,200 ft. AGL, it is understood to be at 1,200 ft. AGL.
   2) Airways are depicted as light blue lines between VOR facilities and are labeled with the letter “V” followed by numbers, i.e., V-120.
   3) Federal airways extend up to 17,999 ft. MSL and are 8 NM wide.

d. If none of the above apply, the floor of Class E airspace begins at 14,500 ft. MSL.

Page 264, Subunit 9.2, new question: A new question regarding airspace and altitudes was added by the FAA, and subsequent questions were renumbered.

(Refer to Figure 21 on page 277.) (Refer to area 1.) The NALF Fentress (NFE) Airport is in what type of airspace?

A. Class C.
B. Class E.
C. Class G.

Answer (B) is correct. (ACL)

DISCUSSION: The NALF Fentress airport (NFE) is surrounded by a dashed magenta line, indicating Class E airspace from the surface.

Answer (A) is incorrect. Class C airspace is surrounded by a solid magenta line. The line surrounding NALF Fentress airport (NFE) is dashed magenta. Answer (C) is incorrect. The dashed magenta line surrounding NALF Fentress airport (NFE) indicates Class E begins at the surface. A shaded magenta line would be required to indicate Class G airspace from the surface up to 700 ft. AGL.
Page 264, Subunit 9.2, Question 10: The answer explanation has been altered for clarification on Class G airspace.

10. (Refer to Figure 27 on page 283.) (Refer to area 1.) Identify the airspace over Lowe Airport.

   A. Class G airspace -- surface up to but not including 1,200 feet AGL; Class E airspace -- 1,200 feet AGL up to but not including 18,000 feet MSL.
   B. Class G airspace -- surface up to but not including 18,000 feet MSL.
   C. Class G airspace -- surface up to but not including 700 feet MSL; Class E airspace -- 700 feet to 14,500 feet MSL.

   Answer (A) is correct. (ACL)

   **DISCUSSION:** Lowe Airport is located 2 inches left of 1 on Fig. 27. In the lower left-hand corner of the figure, there is a portion of a blue shaded ring. According to the chart legend, this indicates that Class E airspace begins at 1,200 ft. AGL within this ring. Therefore, the Class G airspace would extend from the surface to 1,200 ft. AGL, followed by Class E airspace up to, but not including, 18,000 ft. MSL.

   Answer (B) is incorrect. The Class G airspace above Lowe Airport ends at 1,200 ft. AGL (the beginning of Class E airspace), not 18,000 ft. MSL. Answer (C) is incorrect.

   Class G airspace above Lowe Airport extends to 1,200 ft. AGL (not MSL) would be indicated by the lack of any airspace symbols surrounding the airport (without which, Class G airspace is understood to begin at 1,200 ft. AGL) shaded blue line in the bottom left corner of the chart excerpt. Class G airspace up to 700 ft. AGL (not MSL) would be indicated by magenta shading surrounding Lowe Airport. Additionally, Class E airspace above Lowe Airport extends to 18,000 ft. MSL, not 14,500 ft. MSL.

Study Unit 11 - Cross-Country Flight Planning

Page 311, Subunit 11.3, Question 13: The following question was altered by the FAA to conform more accurately to the *Pilot’s Handbook of Aeronautical Knowledge* and the *Airplane Flying Handbook*.

13. When executing an emergency approach to land in a single-engine airplane, it is important to maintain a constant glide speed because variations in glide speed

   A. increase the chances of shock cooling the engine.
   B. increase the airplane’s rate of descent and decrease gliding distance. Assure the proper descent angle is maintained until entering the flare.
   C. nullify all attempts at accuracy in judgment of gliding distance and landing spot.

   Answer (C) is correct. (AFH Chap 8)

   **DISCUSSION:** A constant gliding speed should be maintained because variations of gliding speed nullify all attempts at accuracy in judgment of gliding distance and the landing spot.

   Answer (A) is incorrect. Shock cooling the engine can occur when you significantly increase the speed beyond the best glide speed. Answer (B) is incorrect. Changes in a constant glide speed may or may not increase an airplane’s rate of descent and decrease gliding distance, depending on a variety of circumstances. Guarantee a certain descent angle. The angle of descent will be based on many environmental factors. While this statement is potentially valid, it is not the best answer option available for this question.

Page 322, Subunit 11.8, new question: A new question regarding time en route was added by the FAA, and subsequent questions were renumbered.

How far will an aircraft travel in 7.5 minutes with a ground speed of 114 knots?

   A. 14.25 NM.
   B. 15.00 NM.
   C. 14.50 NM.

   Answer (A) is correct. (Fl Comp)

   **DISCUSSION:** To determine the distance traveled in 7-1/2 minutes at 114 kt., first determine the distance traveled per minute (114 ÷ 60 = 1.9). In 1 minute, the aircraft travels 1.9 NM. Thus, in 7.5 minutes, the plane will have traveled 14.25 NM (1.9 × 7.5 = 14.25). Alternatively, put 114 on the outer scale of your flight computer over the index on the inner scale. Find 7.5 minutes on the inner scale, above which is 14.25 miles.

   Answer (B) is incorrect. The airplane would require a groundspeed of 120 kt. to travel 15.00 NM in 7.5 minutes.

   Answer (C) is incorrect. The airplane would require a groundspeed of 116 kt. to travel 14.50 NM in 7.5 minutes.