

# PRACTICE EXAM 7 — FULL 125-QUESTION SIMULATION

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1. Why does sweeping a wing rearward delay the onset of compressibility effects to a higher Mach number?

- A. It increases the wing's structural rigidity at high speed
- B. Only the chordwise airflow component drives compressibility, and sweep reduces it
- C. It increases the air density flowing over the upper surface
- D. It eliminates the boundary layer along the wing

2. A jet's stall speed, expressed as a true airspeed, increases with altitude. The underlying reason is that:

- A. the speed of sound rises with altitude, raising the stall speed
- B. the engines produce less thrust at altitude
- C. thinner air requires a higher true airspeed to generate the same lift
- D. the wing's coefficient of lift decreases at altitude

3. A loaded aircraft has a total weight of 160,000 lb and a total moment of 100,000,000 in-lb. The CG aft of the datum is:

- A. 600 inches
- B. 625 inches
- C. 650 inches

D. 580 inches

4. Why must a twin-engine jet usually descend (driftdown) after an engine failure at high cruise altitude?

A. The remaining engine's available thrust is insufficient to maintain cruise altitude

B. The autopilot automatically commands a descent on one engine

C. The cabin cannot remain pressurized on a single engine

D. The fuel system cannot feed both tanks to one engine

5. Why is the second takeoff climb segment considered the most critical for performance?

A. It is the only segment with no gradient requirement

B. It is flown with the gear extended and full reverse available

C. It demands the steepest required gradient (2.4 percent) at a low speed with takeoff flaps

D. It is flown after the flaps are fully retracted at cruise thrust

6. Why does the time of useful consciousness decrease so sharply with altitude?

A. The cabin temperature falls, slowing the metabolism

B. The aircraft's true airspeed increases with altitude

C. The autopilot inhibits oxygen flow at high altitude

D. The partial pressure of oxygen drops rapidly, starving the body and brain

7. Why is reducing the angle of attack the primary action in a high-altitude stall recovery?
- A. Because adding thrust would shift the CG dangerously aft
  - B. Because the autothrottle disables thrust during a stall
  - C. Because the engines are limited to idle above FL300
  - D. Because thin air provides little excess thrust, so reducing AOA is the only reliable way to break the stall
8. Why does a swept wing tend to produce a nose-up pitching moment as it approaches the stall?
- A. The wing root stalls first, shifting lift aft
  - B. The wingtips stall first, and being aft of the CG, the lift loss there shifts the center of lift forward
  - C. The horizontal stabilizer loses effectiveness first
  - D. The leading-edge slats deploy asymmetrically
9. Why does the maximum zero fuel weight limit exist?
- A. To protect the wing root from excessive bending, since fuselage payload adds bending stress that wing fuel would otherwise relieve
  - B. To limit the landing gear impact loads at touchdown
  - C. To cap the cabin differential pressure at altitude
  - D. To prevent the CG from moving too far aft in cruise
10. Why is a forward CG associated with a higher stall speed?

- A. It shifts the center of lift aft of the wing
- B. It reduces the aircraft's total weight in flight
- C. It decreases the wing's coefficient of lift directly
- D. The increased tail download effectively raises the load the wing must support

11. Why does wing anti-ice slightly reduce engine thrust?

- A. It increases the aircraft's drag through the leading edges
- B. It diverts bleed air from the engine, reducing the energy available for thrust
- C. It cools the combustor below its optimum temperature
- D. It forces the autothrottle to reduce N1 automatically

12. Why are transport aircraft built with multiple independent hydraulic systems?

- A. To reduce the total weight of hydraulic fluid carried
- B. To allow each control surface a single dedicated source
- C. So the loss of one — or more — systems still leaves enough power to control and land
- D. To simplify maintenance by isolating each component

13. Why is cabin pressure regulated by the outflow valve rather than by varying the inflow?

- A. The inflow from the packs is relatively constant, so metering the air leaving the cabin gives precise pressure control
- B. The packs cannot vary their airflow under any condition

- C. The outflow valve also controls the cabin temperature
- D. Bleed air pressure is too low to regulate the cabin directly

14. Why does freezing rain produce especially rapid and dangerous clear ice?

- A. It contains only small droplets that freeze instantly
- B. The large supercooled droplets flow back over the surface before freezing into a hard, smooth layer, and it signals warmer air aloft
- C. It occurs only at temperatures below  $-20^{\circ}\text{C}$
- D. It forms exclusively aft of the protected leading edges

15. Why is clear air turbulence not detectable by airborne weather radar?

- A. It occurs only above the radar's maximum range
- B. Radar is automatically inhibited near the jet stream
- C. Radar detects precipitation, but CAT is clear-air wind shear with no precipitation to reflect
- D. The cold air near the tropopause absorbs the radar energy

16. Why does volcanic ash cause jet engine flameout and failure?

- A. The fine ash melts in the hot section and resolidifies on turbine components
- B. It chemically reacts with the fuel to prevent combustion
- C. It depletes the oxygen available for combustion
- D. It clogs only the fuel filters with abrasive particles

17. Why does the Mach number of a jet increase as it climbs at constant true airspeed?

- A. Air density increases with altitude
- B. The wing's critical Mach number decreases
- C. The indicated airspeed rises with altitude
- D. The speed of sound decreases as temperature falls, so a constant TAS yields a higher Mach number

18. Why is the coffin corner dangerous to a jet near its maximum altitude?

- A. The cabin loses pressurization at that altitude
- B. The engines cannot produce maximum continuous thrust there
- C. The low-speed stall and high-speed Mach boundaries converge, leaving only a few knots of margin
- D. The autopilot disconnects automatically at the aerodynamic ceiling

19. Why does Mach tuck worsen if uncorrected?

- A. The yaw damper applies increasing corrective rudder
- B. The wing loses all lift as the shock forms
- C. The engines spool up automatically at high Mach
- D. The nose-down pitch increases speed, which strengthens the shock and shifts lift further aft

20. Why must both the captain and the dispatcher agree to a release before a domestic Part 121 flight may depart?

- A. Operational control is shared jointly between them under Part 121
- B. The dispatcher physically controls the aircraft remotely
- C. The captain lacks authority until airborne
- D. ATC requires dual sign-off for every scheduled flight

21. Why is L/D MAX the speed flown during an engine-out driftdown?

- A. It is the never-exceed speed for the configuration
- B. It produces the maximum induced drag
- C. It corresponds to the minimum control speed
- D. It minimizes the rate of descent, letting the aircraft level off as high as possible

22. Why does a microburst pose a reversing wind hazard to an aircraft on final?

- A. It produces a steady crosswind from one direction
- B. The central downdraft spreads outward, giving a headwind on entry and a tailwind on exit
- C. It carries the aircraft smoothly above the glidepath
- D. It produces only an updraft with no horizontal component

23. Why is the windshear escape flown without changing the aircraft's configuration?

- A. Changing gear or flaps during the escape can compromise the climb and is hazardous when energy is critical
- B. The gear and flaps are jammed by the shear

- C. Configuration changes are illegal below 10,000 feet
- D. The autopilot prevents configuration changes during the maneuver

24. A jet cruises at a true airspeed of 450 knots where the local speed of sound is 542 knots. Its Mach number is approximately:

- A. 0.74
- B. 0.79
- C. 0.83
- D. 0.88

25. Why does a SID's obstacle protection depend on the aircraft meeting the published climb gradient?

- A. The autopilot only engages above the gradient
- B. The obstacle clearance was designed assuming the aircraft climbs at least at that rate
- C. ATC vectors the aircraft only if the gradient is met
- D. The gradient determines the maximum certificated altitude

26. Why is induced drag highest at low airspeed?

- A. Parasite drag overwhelms it at low speed
- B. A higher angle of attack is needed to maintain lift, increasing the induced-drag penalty
- C. The shock wave forms at low speed
- D. Skin friction increases as speed decreases

27. Why does an aft (but legal) CG slightly improve cruise fuel efficiency?

- A. It increases the wing's coefficient of lift
- B. It raises the stall speed, reducing drag
- C. It increases the tail download required
- D. It reduces the tail download and the associated trim drag

28. Why is the assumed-temperature (flex) method able to use reduced thrust while still meeting performance requirements?

- A. The engine is fooled into producing less thrust by a hotter "assumed" temperature, while the cooler real air keeps actual performance adequate
- B. It increases the takeoff flap setting to compensate
- C. It shortens the takeoff roll by delaying rotation
- D. It transfers thrust from one engine to the other

29. Why does a stable atmosphere produce poor visibility?

- A. It generates heavy showery precipitation
- B. It promotes vigorous vertical mixing
- C. It resists vertical motion, trapping haze, smoke, and moisture near the surface
- D. It produces towering cumulus clouds

30. Why does a Part 121 air carrier PIC require a first-class medical certificate?

- A. Because the ATP knowledge test demands it
- B. Because the aircraft is pressurized
- C. Because the highest level of medical fitness is required to command an air carrier flight
- D. Because the flight crosses international borders

31. Why does a deferred MEL item still permit dispatch when it is placarded and the procedures are followed?

- A. Because the FAA waives the requirement on request
- B. Because the MEL identifies items the aircraft can safely operate without, under defined conditions
- C. Because the captain alone judges the item non-essential
- D. Because the item is removed from the aircraft entirely

32. Why is hypoxia particularly insidious?

- A. It produces obvious physical pain immediately
- B. It affects only older pilots
- C. It is immediately reversible without oxygen
- D. It impairs judgment before the victim recognizes that anything is wrong

33. Why does the jet stream blow strongest in winter?

- A. The temperature contrast between air masses is greatest then
- B. The tropopause is higher over the poles in winter

- C. Surface friction increases over snow
- D. The Coriolis effect strengthens in cold months

34. Why is the priority hierarchy "aviate, navigate, communicate" emphasized in training?

- A. Because radios fail more often than flight controls
- B. Because navigation is less important than communication
- C. Because crews who let communication displace flying the aircraft have caused accidents
- D. Because ATC requires communication to be deprioritized

35. Why is the descent during an emergency descent normally flown at the maximum appropriate speed?

- A. To minimize the time spent at hypoxia-threatening altitude
- B. To preserve the maximum range to a diversion
- C. To keep the cabin pressurized longer
- D. To avoid exceeding the minimum control speed

36. Why does a non-precision approach use an MDA that the aircraft must not descend below without visual references?

- A. Because the glideslope guides the aircraft below it automatically
- B. Because radar vectors replace the need for an MDA
- C. Because the MDA is the published glideslope intercept altitude

D. Because there is no vertical guidance, the MDA guarantees obstacle clearance until the runway is in sight

37. Why does an aircraft fly at a higher true airspeed for a given indicated airspeed as it climbs?

- A. The wing area increases at altitude
- B. Lower air density requires a higher true airspeed to produce the same dynamic pressure and lift
- C. The angle of attack must be reduced to zero
- D. The speed of sound increases with altitude

38. Why is RNP more capable than basic RNAV for demanding procedures?

- A. It uses only ground-based VOR stations
- B. It can fly direct routes between waypoints
- C. It continuously monitors its own performance and alerts the crew if accuracy cannot be met
- D. It has a lower required accuracy in all phases

39. Why does a Convective SIGMET automatically imply severe turbulence, severe icing, and low-level wind shear?

- A. These hazards are issued only as separate AIRMETS
- B. Thunderstorms inherently produce these hazards, so they are not issued separately
- C. The 2-hour validity requires bundling all hazards
- D. The hazards apply only to light aircraft

40. Using a surface temperature of  $+15^{\circ}\text{C}$  and the standard lapse rate of  $2^{\circ}\text{C}$  per 1,000 feet, the approximate temperature at FL280 (28,000 feet) is:

- A.  $-15^{\circ}\text{C}$
- B.  $-28^{\circ}\text{C}$
- C.  $-56^{\circ}\text{C}$
- D.  $-41^{\circ}\text{C}$

41. Why does the maximum landing weight limit exist separately from the maximum takeoff weight?

- A. The gear and airframe can only absorb so much load at the certified touchdown descent rate
- B. The cabin cannot pressurize above the landing weight
- C. The runway is always shorter at the destination
- D. The fuel system limits weight at landing

42. Why is closed-loop communication used on the flight deck?

- A. Confirming receipt ensures the sender knows the message was understood, preventing miscommunication
- B. It limits radio calls to the pilot flying only
- C. It restricts communication to emergencies
- D. It allows only the captain to issue commands

43. Why does a temperature inversion create very stable conditions?

- A. It produces a steep lapse rate that promotes convection
- B. It cools rapidly with altitude, increasing instability
- C. It oscillates between warm and cold layers
- D. Warmer air sitting atop cooler air strongly resists any vertical motion

44. Why is the moist adiabatic lapse rate lower than the dry adiabatic rate?

- A. Saturated air is denser and cools faster
- B. Condensation in rising saturated air releases latent heat that partly offsets the cooling
- C. The moist rate applies only in the stratosphere
- D. Water vapor accelerates the cooling

45. Why is the pilot monitoring's role considered as important as the pilot flying's?

- A. The PM manipulates the controls during the approach
- B. The PM sets thrust without cross-checking
- C. Active monitoring catches automation and flight-path errors before they become consequential
- D. The PM assumes control whenever the autopilot is on

46. Why does a high-pressure system produce fair weather?

- A. Air rises and converges, condensing moisture
- B. It circulates counterclockwise and inward

- C. Descending, diverging air warms and dries, suppressing cloud formation
- D. It traps moisture beneath an inversion

47. Why must oxygen be donned before troubleshooting in a high-altitude depressurization?

- A. The pressurization controller cannot be reset in flight
- B. ATC requires oxygen before any radio call
- C. The cabin crew must be briefed first
- D. The time of useful consciousness is only seconds, so there is no time to diagnose first

48. Why does excess approach speed dramatically increase the landing distance?

- A. The aircraft floats and touches down faster, and stopping distance grows with the square of speed
- B. It reduces the groundspeed at touchdown
- C. It increases lift, shortening the landing
- D. It has no effect on a dry runway

49. Why is the dispatch release invalid without agreement from both the captain and the dispatcher?

- A. ATC requires both signatures
- B. The chief pilot must break any tie
- C. The release is advisory only
- D. Operational control is jointly shared, so neither may be overridden by the other

50. Why does a swept wing require higher takeoff and landing speeds than a straight wing?

- A. It carries more fuel, raising the stall speed
- B. It produces less lift for a given angle of attack at low speed
- C. It has a lower critical Mach number at low speed
- D. It increases the wing's structural weight

51. Why is a microburst especially treacherous despite its small size?

- A. It is several miles wide and lasts for hours
- B. Its reversing wind field, though brief and under a mile across, can exceed an aircraft's climb capability
- C. It appears clearly on the navigation display
- D. It is confined to altitudes above FL180

52. Why does the FMS blend multiple navigation sensors rather than rely on one?

- A. To reduce the aircraft's electrical load
- B. To allow manual position entry by the crew
- C. Combining GPS, inertial, and radio inputs yields a more accurate and reliable position than any single source
- D. To eliminate the need for a navigation database

53. Why does the electrical system shed non-essential loads when generating capacity is lost?

- A. To preserve power to the essential and battery buses feeding flight-critical systems
- B. To increase the total power available to all buses
- C. To recharge the battery faster
- D. To transfer hydraulic power to the electric pumps

54. Why is the balanced field length the most runway-efficient condition?

- A. It uses 60 percent of the runway regardless of weight
- B. It meets all four climb gradients simultaneously
- C. The chosen V1 makes stopping and going require exactly the same distance
- D. It places V2 at the runway midpoint

55. Why is the EGT limit the critical parameter to respect at high thrust and during start?

- A. It indicates fan rotational speed
- B. Exceeding it allows turbine components to overheat and be damaged rapidly
- C. It sets the thrust on most turbofans
- D. It measures fuel flow to the combustor

56. Why does a cold front produce a narrow band of intense weather compared with a warm front?

- A. It moves slowly and overrides the cold air gently
- B. It produces a wide stratiform deck ahead of the surface front

C. It traps moisture beneath an inversion

D. It undercuts and lifts the warm air steeply, concentrating the weather in a narrow zone

57. Why does the maximum unaugmented FDP shrink for early-morning, multi-segment duty periods?

A. Both the circadian low and a high segment count increase fatigue

B. Early starts always lengthen the FDP

C. The segment count has no effect on the FDP

D. The FDP is a single fixed value

58. Why are pitot tubes and static ports electrically heated rather than bleed-air heated?

A. Bleed air is unavailable at the sensor locations

B. Electrical heating provides precise, localized protection essential to accurate flight data

C. Electrical heating is cheaper to install only

D. Bleed air would freeze the sensors

59. Why does the air over the top of a wing always move faster than the aircraft itself?

A. The curved upper surface accelerates the airflow, which is why local flow reaches Mach 1.0 before the aircraft does

B. The wing pushes air downward, slowing the aircraft

C. The boundary layer increases the local density

D. The engines accelerate the air over the wing

60. Why is a Restricted ATP holder limited to second-in-command duties?

- A. The R-ATP cannot be used for any air carrier flight
- B. The holder lacks an instrument rating
- C. The reduced hour requirement reflects less experience than the full 1,500-hour PIC standard
- D. The R-ATP expires after one year

61. Why is the driftdown after an engine failure flown to a "net" level-off altitude that clears terrain by a margin?

- A. The autopilot computes the net altitude automatically
- B. ATC assigns the net altitude
- C. The net altitude is always 10,000 feet
- D. The regulatory margin ensures terrain clearance even if real performance falls slightly short

62. Why does the lift equation make velocity the dominant variable?

- A. Velocity enters as a square, so small speed changes have an outsized effect on lift
- B. Velocity enters as a linear term only
- C. Velocity is unrelated to the coefficient of lift
- D. Velocity affects only parasite drag, not lift

63. Why must a flight carry a 45-minute reserve even when no alternate is required?

- A. To allow a return to the departure airport
- B. To cover the climb fuel only
- C. To satisfy the alternate fuel requirement
- D. To provide a final contingency margin for unexpected delays at the destination

64. Why does anti-ice differ fundamentally from de-ice?

- A. Anti-ice removes ice cyclically after it forms
- B. De-ice prevents ice from forming continuously
- C. Anti-ice prevents ice from forming; de-ice removes ice after it accumulates
- D. They are interchangeable terms for the same system

65. Why is the tropopause significant to airline flying?

- A. It is where the jet stream and the most severe CAT are found, and where temperature stops falling
- B. It is the lowest altitude at which weather occurs
- C. It is a constant 10,000 feet worldwide
- D. It is where temperature increases most rapidly with altitude

66. Why does a high-altitude jet need a yaw damper?

- A. To coordinate turns during manual flight only
- B. To suppress the Dutch roll oscillation that sweep aggravates

- C. To reduce rudder forces in crosswinds
- D. To counteract Mach tuck at high speed

67. Why is freezing rain a sign of worsening rather than improving icing conditions?

- A. It indicates the aircraft has descended below the freezing level
- B. It means supercooled droplets are absent
- C. It only forms rime ice, which is easily shed
- D. It indicates a layer of warmer air aloft feeding continued, severe icing

68. Why does a forward CG reduce maneuverability while improving stability?

- A. It moves the center of lift aft, lightening the controls
- B. It reduces the tail download required
- C. The greater tail download stiffens pitch response, making the aircraft more stable but less responsive
- D. It lowers the stall speed, easing control

69. Why is the second-segment climb gradient often the limiting factor for takeoff weight?

- A. It is the least demanding of the four segments
- B. It requires the steepest gradient at a relatively low speed with takeoff flaps, one engine inoperative
- C. It is flown with the flaps fully retracted
- D. It has no gradient requirement at all

70. Why does a low-pressure system bring unsettled weather?

- A. Descending air warms and dries
- B. It circulates clockwise and outward
- C. It traps moisture beneath an inversion
- D. Rising, converging air cools and condenses moisture, forming clouds and precipitation

71. Why is "trust your instruments" the rule when spatially disoriented?

- A. The vestibular senses produce false attitude and motion cues without visual references, but the instruments do not
- B. The instruments are required by regulation
- C. Closing the eyes resets the inner ear
- D. Bodily sensations are more reliable than instruments

72. Why does sweep raise the critical Mach number?

- A. It increases low-speed lift
- B. It reduces the effective airflow velocity the wing experiences, delaying local Mach 1.0
- C. It eliminates the spanwise flow
- D. It lowers the aircraft's weight

73. Why must the crew land as soon as possible during a serious in-flight fire rather than complete every checklist first?

- A. The destination is always closer than a diversion
- B. Checklists are not required during a fire
- C. ATC mandates an immediate landing
- D. Fire and smoke can escalate faster than a checklist can be completed

74. Why does the dispatcher retain the authority to amend or cancel a release in flight?

- A. The dispatcher physically controls the aircraft remotely
- B. The dispatcher can override ATC clearances
- C. As a co-holder of operational control, the dispatcher shares responsibility for the flight's safety
- D. The dispatcher outranks the captain

75. Why is a standard holding inbound leg longer (1.5 minutes) above 14,000 feet?

- A. The higher true airspeed at altitude covers more distance, requiring a longer timed leg
- B. ATC requires longer legs above 14,000 feet
- C. The fuel burn is higher at altitude
- D. The autopilot cannot fly a 1-minute leg at altitude

76. Why does a microburst's initial headwind tempt a dangerous error?

- A. It produces an immediate stall warning
- B. The rising airspeed invites a power reduction, but the shear then reverses to a sinking tailwind

- C. It carries the aircraft below the glidepath at once
- D. It triggers an automatic go-around

77. Why is the maximum differential pressure the limiting structural parameter for pressurization?

- A. The cabin altitude must equal the flight altitude
- B. The packs cannot supply more air
- C. The airframe can only withstand so much pressure difference between inside and outside
- D. The outflow valve cannot open beyond a fixed point

78. Why does a jet's optimum cruise altitude rise as fuel burns off?

- A. The engines produce more thrust as the aircraft lightens
- B. A lighter aircraft is most efficient at a higher altitude, prompting step climbs
- C. The cabin pressurization improves at altitude
- D. The Mach limit increases as weight decreases

79. Why does reducing thrust on takeoff (when conditions allow) benefit the operator?

- A. It shortens the takeoff roll
- B. It increases the climb gradient
- C. It improves passenger comfort only
- D. It lowers engine wear and maintenance cost while still meeting performance requirements

80. Why is the chordwise airflow component, not the spanwise component, responsible for compressibility on a swept wing?

- A. The chordwise flow crosses the wing perpendicular to the leading edge, where airflow accelerates to local Mach 1.0
- B. The spanwise flow produces all the lift
- C. The chordwise flow relieves wing-bending stress
- D. The spanwise flow drives the shock wave

81. Why does the FAA test Part 117 fatigue rules so heavily on the ATP exam?

- A. They are the simplest rules to memorize
- B. They apply only to international flights
- C. Fatigue was a key factor in the accident that prompted the rules, making them safety-critical
- D. They are rarely encountered in practice

82. Why does an engine failure at or after V1 require continuing the takeoff?

- A. The aircraft cannot stop on the remaining runway, so it must fly
- B. The brakes are inoperative after V1
- C. The gear cannot be retracted before V1
- D. ATC clearance is required to reject

83. Why does the wing fuel relieve wing-bending stress?

- A. Its downward weight opposes the upward lift that tries to bend the wingtips up
- B. It shifts the CG aft to reduce trim drag
- C. It increases the tail download at cruise
- D. It lowers the maximum zero fuel weight

84. Why does a jet's TAS far exceed its indicated airspeed at high altitude?

- A. The wing area increases at altitude
- B. The speed of sound rises at altitude
- C. Lower air density means a given indicated (dynamic-pressure) airspeed corresponds to a much higher true airspeed
- D. The engines accelerate the aircraft automatically

85. Why is a Decision Altitude, rather than an MDA, used on an ILS approach?

- A. The ILS provides lateral guidance only
- B. The ILS is a non-precision approach
- C. The MDA is the glideslope intercept altitude
- D. The ILS provides vertical guidance, so the pilot decides to land or go around at the DA

86. Why does the cabin-altitude warning activate before the passenger oxygen masks deploy?

- A. The masks deploy first, then the warning sounds

B. The warning (~10,000 ft cabin altitude) alerts the crew earlier so they can act before masks deploy (~14,000 ft)

C. Both occur at exactly the same cabin altitude

D. The warning activates only after a depressurization is confirmed

87. Why does a PIREP have unique value among weather products?

A. It is a long-range forecast issued twice daily

B. It is an automated surface observation

C. It is the only real-time, direct observation of conditions actually encountered aloft

D. It provides a graphical depiction of fronts

88. Why does a hot, high-elevation airport degrade takeoff performance?

A. High density altitude reduces both engine thrust and aerodynamic performance

B. The runway is always shorter at elevation

C. The cabin cannot pressurize at elevation

D. The wing produces more lift in thin air

89. Why must the crew maintain directional control as the first priority during an engine-out continued takeoff?

A. The flaps must be retracted before anything else

B. The checklist demands it first

- C. The autopilot cannot engage with an engine out
- D. Asymmetric thrust can overcome rudder authority below VMCA at low speed

90. Why is RVSM limited to the FL290–FL410 band?

- A. Below FL290 there is no traffic
- B. This is the busy high-altitude band where halving the vertical separation most increases usable altitudes, with equipment to do so safely
- C. Above FL410 the air is too thin to fly
- D. RVSM applies to all altitudes equally

91. Why does stable air produce stratiform rather than cumuliform clouds?

- A. The resistance to vertical motion spreads cloud out into flat, layered forms
- B. Stable air promotes vigorous convection
- C. Stable air contains no moisture
- D. Stable air always produces clear skies

92. An aircraft's CG is at fuselage station 940 inches, with the leading edge of the MAC at station 910 and a MAC length of 100 inches. The CG as a percentage of MAC is:

- A. 9.4 percent MAC
- B. 25 percent MAC
- C. 30 percent MAC

D. 40 percent MAC

93. Why does the FAA require the PIC to determine airworthiness before flight, even though maintenance handles upkeep?

A. The PIC performs all inspections personally

B. The PIC signs the airworthiness certificate daily

C. The PIC may defer any item judged minor

D. The PIC is the last line of defense and bears final responsibility for the safety of the flight

94. Why does a Convective SIGMET have only a 2-hour validity?

A. It covers only a small area

B. AIRMETs replace it after 2 hours

C. Thunderstorm activity changes rapidly, so the forecast must be reissued frequently

D. It applies only to light aircraft

95. Why does an aft CG reduce longitudinal stability?

A. The center of gravity moves closer to the center of lift, reducing the stabilizing moment

B. It increases the tail download required

C. It raises the stall speed

D. It moves the center of lift forward

96. Why is the L/D MAX speed central to so many performance points?

- A. It is the never-exceed speed
- B. At minimum total drag, the aircraft is most efficient, underlying range, glide, and driftdown
- C. It produces maximum induced drag
- D. It is the minimum control speed

97. Why does the standard atmosphere place the tropopause temperature at about  $-56.5^{\circ}\text{C}$ ?

- A. Temperature rises to that value in the stratosphere
- B. It is the surface temperature minus the cabin differential
- C. It is a value chosen arbitrarily for cabin design
- D. It is where the steady tropospheric cooling stops, near 36,000 feet

98. Why does a swept wing benefit from wing fences and vortex generators?

- A. They raise the critical Mach number further
- B. They control spanwise flow to reduce the tendency to stall at the tips first
- C. They eliminate the need for trailing-edge flaps
- D. They lower the maximum takeoff weight

99. Why must the crew don oxygen and smoke goggles first when smoke fills the cockpit?

- A. To brief the passengers before acting
- B. To ventilate the smoke through the masks
- C. A crew overcome by smoke loses the aircraft, so protecting their own function comes first
- D. To shut down the engines safely

100. Why is a balanced field takeoff defined by equal accelerate-stop and accelerate-go distances?

- A. At that  $V_1$ , whether the crew stops or continues after an engine failure, the same runway is used and no more
- B. It guarantees a 60 percent landing margin
- C. It places the aircraft at  $V_2$  at the midpoint
- D. It meets all four climb gradients

101. Why does the lift equation show that climbing reduces available lift unless airspeed increases?

- A. The coefficient of lift falls with altitude
- B. The wing area shrinks with altitude
- C. The angle of attack must reach zero
- D. Air density ( $\rho$ ) falls with altitude, reducing lift unless true airspeed rises to compensate

102. Why is task saturation dangerous in the cockpit?

- A. A crew absorbed in one problem may neglect to fly the aircraft, risking controlled flight into terrain
- B. It improves focus on the primary task

- C. It is required during emergencies
- D. It enhances closed-loop communication

103. Why does an engine fire warrant immediate engine shutdown and extinguisher discharge?

- A. To restart the engine quickly
- B. To increase thrust on the affected engine
- C. Cutting off fuel and air starves the fire while the extinguisher suppresses it
- D. To descend below 10,000 feet first

104. Why does the speed of sound decrease with altitude in the troposphere?

- A. Air density increases with altitude
- B. The speed of sound depends on temperature, which falls with altitude
- C. The wing's critical Mach number drops
- D. The engines slow the airflow at altitude

105. Why does the FAA require an ATP-CTP course before the ATM knowledge test?

- A. The course teaches the specific test questions
- B. The course replaces the practical test
- C. The course is required only for international pilots
- D. Congress mandated structured training in advanced aerodynamics, CRM, and high-altitude operations after a fatal accident

106. Why does an aircraft on the back side of the drag curve require more thrust to fly slower?

- A. Induced drag and the angle of attack both rise sharply as speed decreases below L/D MAX
- B. Parasite drag dominates at low speed
- C. The shock wave forms at low speed
- D. The engines lose efficiency at low speed only

107. Why is a clearway said to extend the takeoff distance available?

- A. It extends the accelerate-stop distance
- B. It is a paved overrun for stopping
- C. It is an obstacle-free area beyond the runway over which the aircraft may complete the initial climb to screen height
- D. It extends only the takeoff run available

108. Why does the FAA cap cumulative flight and duty time over rolling windows under Part 117?

- A. To limit fuel consumption
- B. To simplify scheduling
- C. To match international standards only
- D. To prevent chronic fatigue from accumulating over days and weeks

109. Why does a jet slow to L/D MAX, rather than speed up, during an engine-out driftdown?

- A. Higher speed clears terrain faster
- B. L/D MAX minimizes the descent rate, maximizing the level-off altitude and terrain clearance
- C. L/D MAX is the maximum operating speed
- D. It maintains the cruise altitude on one engine

110. A crew decodes a high-level winds aloft group "775550" and recognizes the wind exceeds 100 knots. The direction-and-speed portion "7755" decodes to:

- A. 077° at 55 knots
- B. 177° at 155 knots
- C. 027° at 155 knots
- D. 270° at 155 knots

111. Why does an inversion trap pollutants and reduce visibility near the surface?

- A. The warm layer aloft acts as a lid, preventing vertical mixing
- B. It produces showery precipitation that clears the air
- C. It promotes strong convection
- D. It cools rapidly with altitude

112. Why does the FAA require a dispatch release for each domestic Part 121 flight?

- A. To record the passenger manifest
- B. To list the cabin crew schedule

- C. To document the agreed operational details and confirm shared operational control before departure
- D. To replace the airworthiness certificate

113. Why does sweep reduce the lift produced for a given angle of attack at low speed?

- A. It increases the wing's structural weight
- B. The wing experiences a lower effective airspeed, reducing the lift generated
- C. It eliminates the boundary layer
- D. It increases the air density over the wing

114. Why is the descent speed reduced after a suspected structural decompression?

- A. To avoid aerodynamic loads that could aggravate the damage
- B. To keep the cabin pressurized longer
- C. To maximize range to a diversion
- D. To stay above the minimum control speed

115. Why does the FMS drive the autopilot and autothrottle to fly a planned lateral and vertical path?

- A. To eliminate the need for any crew monitoring
- B. To replace the standby instruments
- C. To integrate navigation and guidance, reducing workload and increasing precision
- D. To average the crew's manual entries

116. Why is "follow the rules; they are usually right" the antidote to anti-authority?

- A. It encourages the pilot to act faster
- B. It counters the impulse to disregard rules and advice with respect for established procedures
- C. It reminds the pilot that accidents can happen to anyone
- D. It restores the pilot's sense of control

117. Why does volcanic ash demand complete avoidance rather than reduced-thrust penetration?

- A. It dissipates within minutes
- B. It is visible on weather radar for navigation
- C. It only affects the windshield
- D. There is no safe concentration; the ash will damage the engines and is not detectable by radar

118. Why does a steep authority gradient compromise safety?

- A. It provides ideal command balance
- B. It discourages the first officer from voicing safety concerns
- C. It has no effect on communication
- D. It encourages excessive first-officer input

119. Why does the aircraft become Mach-limited (rather than stall-limited) as the top of the coffin corner is approached from the high-speed side?

- A. The Mach limit's corresponding true airspeed falls with altitude as the speed of sound drops
- B. The stall speed decreases with altitude
- C. The engines produce more thrust at altitude
- D. The cabin differential pressure increases

120. Why does a STAR improve traffic flow into a busy terminal area?

- A. It replaces the approach entirely
- B. It connects parallel airways
- C. It provides a standardized, published transition from the en route structure to the approach with set crossings
- D. It links the holding fix to the missed approach point

121. A weight of 12,000 lb is shifted 120 inches on an aircraft with a total weight of 180,000 lb. The CG moves:

- A. 6 inches
- B. 12 inches
- C. 16 inches
- D. 8 inches

122. Why does the FAA emphasize Threat-and-Error Management in CRM training?

- A. It transfers decision-making to the automation

- B. Anticipating threats and trapping errors prevents them from progressing to an undesired aircraft state
- C. It eliminates the need for checklists
- D. It assigns operational control to the dispatcher

123. Why does a swept-wing jet experience Dutch roll more readily than a straight-wing aircraft?

- A. Sweep increases roll stability relative to yaw stability, promoting the coupled oscillation
- B. Sweep eliminates the vertical stabilizer's effect
- C. Sweep increases the aircraft's weight
- D. Sweep reduces the wing's lift entirely

124. Why does the FAA require instrument currency to include holding and course tracking, not just approaches?

- A. Holding and approaches are the same skill
- B. Only approaches are tested on the checkride
- C. These are core IFR skills whose proficiency degrades without recent practice
- D. Course tracking is required only for oceanic flight

125. Why is the dry adiabatic lapse rate ( $\approx 3^\circ\text{C}/1,000\text{ ft}$ ) steeper than the standard environmental lapse rate ( $\approx 2^\circ\text{C}/1,000\text{ ft}$ )?

- A. The dry rate applies only in the stratosphere
- B. The standard rate includes condensation effects

C. The two rates are identical

D. The dry rate describes a rising unsaturated parcel cooling by expansion, with no heat added

## Answer Key

1. B — Only the chordwise airflow component (perpendicular to the leading edge) drives compressibility, and sweep reduces it, so local flow reaches Mach 1.0 at a higher aircraft Mach number. This delays compressibility and raises critical Mach.

2. C — Thinner air at altitude requires a higher true airspeed to generate the same lift, so the stall speed expressed as TAS rises with altitude. This is one of the two boundaries that converge in the coffin corner.

3. B — CG equals total moment  $\div$  total weight:  $100,000,000 \div 160,000 = 625$  inches aft of datum. This division is the core of every weight-and-balance computation.

4. A — At high cruise altitude the remaining engine's available thrust is insufficient to maintain altitude, forcing a driftdown to a lower sustainable altitude. Thin air limits single-engine thrust.

5. C — The second segment demands the steepest required gradient (2.4 percent) at a low speed with takeoff flaps and one engine inoperative, making it the most critical. It frequently limits takeoff weight.

6. D — The partial pressure of oxygen drops rapidly with altitude, starving the body and brain, so the time of useful consciousness collapses to seconds at high cruise. This is why immediate oxygen is the rule.

7. D — Thin air provides little excess thrust, so reducing the angle of attack is the only reliable way to break a high-altitude stall, accepting altitude loss. The "power out" reflex is appropriate only at low altitude.

8. B — A swept wing stalls at the tips first; because the tips are aft of the CG, the lift loss there shifts the center of lift forward, producing a nose-up pitch. Wing fences mitigate this.

9. A — The MZFW protects the wing root from excessive bending: fuselage payload adds bending stress that wing fuel would otherwise relieve. Capping non-fuel weight limits maximum wing-root stress.

10. D — A forward CG requires more tail download, which effectively raises the load the wing must support, increasing the stall speed. It improves stability but degrades performance.

11. B — Wing anti-ice diverts bleed air from the engine, reducing the energy available for thrust, so anti-ice use slightly lowers thrust. This is the cross-system trade the crew manages.

12. C — Multiple independent hydraulic systems ensure that the loss of one — or more — still leaves enough power to control and land the aircraft. Critical surfaces are powered by more than one system.

13. A — The inflow from the packs is relatively constant, so metering the air leaving the cabin through the outflow valve gives precise pressure control. Closing the valve raises pressure; opening it lowers it.

14. B — Freezing rain's large supercooled droplets flow back over the surface before freezing into a hard, smooth clear-ice layer, and it signals warmer air aloft — the most hazardous icing. It indicates worsening conditions.

15. C — Weather radar detects precipitation, but CAT is clear-air wind shear with no precipitation to reflect, so it is invisible to radar. PIREPs and forecasts are the best available warning.

16. A — The fine volcanic ash melts in the engine's hot section and resolidifies on turbine components, causing flameout and failure. It is also radar-invisible and must be avoided entirely.

17. D — The speed of sound decreases as temperature falls with altitude, so a constant true airspeed divided by a smaller speed of sound yields a higher Mach number. A jet can approach its Mach limit by climbing.

18. C — Near maximum altitude the low-speed stall and high-speed Mach boundaries converge, leaving only a few knots of margin. Any load-factor increase can trigger stall or Mach buffet.

19. D — Mach tuck is self-reinforcing because the nose-down pitch increases speed, which strengthens the shock wave and shifts lift further aft. Mach trim systems normally prevent it.

20. A — Operational control is shared jointly between the captain and the dispatcher under Part 121, so both must agree to the release. Either can prevent or divert the flight.

21. D — Driftdown is flown at L/D MAX because it minimizes the rate of descent, letting the aircraft level off as high as possible on one engine. This maximizes terrain clearance.

22. B — A microburst's central downdraft spreads outward, giving a headwind on entry and a tailwind on exit, with a downdraft between. The reversing field can exceed an aircraft's climb capability.

23. A — Changing gear or flaps during the windshear escape can compromise the climb and is hazardous when energy is critical, so the configuration is held. Maximum thrust and the escape pitch are flown instead.

24. C — Mach number is  $TAS \div \text{local speed of sound}$ :  $450 \div 542 \approx 0.83$ . This places the aircraft in the high subsonic cruise range.

25. B — A SID's obstacle clearance was designed assuming the aircraft climbs at least at the published gradient, so meeting it is required for the protection to hold. Failing the gradient voids the guarantee.

26. B — At low airspeed a higher angle of attack is needed to maintain lift, which increases the induced-drag penalty. This is why induced drag is highest at low speed.

27. D — An aft (but legal) CG reduces the tail download and the associated trim drag, slightly improving cruise fuel efficiency. The trade-off is reduced longitudinal stability.

28. A — The assumed-temperature method fools the engine into producing less thrust by feeding it a hotter "assumed" temperature, while the cooler, denser real air keeps actual performance adequate. This reduces engine wear.

29. C — Stable air resists vertical motion, trapping haze, smoke, and moisture near the surface, which produces poor visibility. Unstable air mixes vertically and gives good visibility.

30. C — A Part 121 air carrier PIC requires a first-class medical because the highest level of medical fitness is required to command an air carrier flight. It is not tied to the test, pressurization, or borders.

31. B — A deferred MEL item permits dispatch because the MEL identifies items the aircraft can safely operate without, under defined conditions (placard, procedures, limitations). It is not an FAA waiver or captain's discretion.

32. D — Hypoxia is insidious because it impairs judgment before the victim recognizes that anything is wrong, with early symptoms like euphoria appearing without distress. This is why immediate oxygen is the rule.

33. A — The jet stream is strongest in winter because the temperature contrast between air masses is greatest then. Jet streams form along sharp temperature boundaries.

34. C — The hierarchy is emphasized because crews who let communication or other tasks displace flying the aircraft have caused accidents. Flying the aircraft always comes first.

35. A — The emergency descent is flown at maximum appropriate speed to minimize the time spent at hypoxia-threatening altitude. Speed is reduced only if structural damage is suspected.

36. D — Because a non-precision approach has no vertical guidance, the MDA guarantees obstacle clearance until the runway is in sight; descending below it without references is prohibited. The MDA is the protected floor.

37. B — Lower air density requires a higher true airspeed to produce the same dynamic pressure and lift, so TAS exceeds indicated airspeed at altitude. This is a direct consequence of the lift equation.

38. C — RNP continuously monitors its own performance and alerts the crew if accuracy cannot be met, which basic RNAV cannot do. This self-monitoring enables demanding procedures.

39. B — Thunderstorms inherently produce severe turbulence, severe icing, and low-level wind shear, so a Convective SIGMET implies them without separate issuance. The hazards travel with the storm.

40. D — Using  $2^{\circ}\text{C}$  per 1,000 feet from  $+15^{\circ}\text{C}$ :  $15 - (2 \times 28) = 15 - 56 = -41^{\circ}\text{C}$  at 28,000 feet. The standard lapse rate gives a straightforward linear estimate.

41. A — Maximum landing weight exists separately because the gear and airframe can only absorb so much load at the certified touchdown descent rate. This is why MLW is normally below MTOW.

42. A — Closed-loop communication confirms receipt so the sender knows the message was understood, preventing miscommunication. It is the same principle as an ATC readback.

43. D — A temperature inversion places warmer air atop cooler air, which strongly resists any vertical motion, creating very stable conditions. This traps moisture and pollutants below.

44. B — Condensation in rising saturated air releases latent heat that partly offsets the cooling, so the moist rate is lower than the dry rate. This is why saturated parcels cool more slowly.

45. C — The pilot monitoring's active monitoring catches automation and flight-path errors before they become consequential, making the role as important as flying. Monitoring failures have caused accidents.

46. C — A high-pressure system has descending, diverging air that warms and dries, suppressing cloud formation and producing fair weather. Lows do the opposite.

47. D — In a high-altitude depressurization the time of useful consciousness is only seconds, so there is no time to diagnose first — oxygen must be donned immediately. Troubleshooting follows.

48. A — Excess approach speed causes the aircraft to float and touch down faster, and stopping distance grows with the square of speed, so the landing distance increases dramatically. It does not shorten the landing.

49. D — The dispatch release requires agreement from both because operational control is jointly shared, so neither the captain nor the dispatcher may override the other. Both must concur.

50. B — A swept wing produces less lift for a given angle of attack at low speed, requiring higher takeoff and landing speeds and high-lift devices. This is the low-speed cost of sweep.

51. B — A microburst's reversing wind field, though brief and under a mile across, can exceed an aircraft's climb capability, making it treacherous despite its small size. Its short life adds to the danger.

52. C — Combining GPS, inertial, and radio inputs yields a more accurate and reliable position than any single source, which is why the FMS blends sensors. Redundancy improves integrity.

53. A — The electrical system sheds non-essential loads to preserve power to the essential and battery buses that feed flight-critical systems. Shedding does not create more total power.

54. C — At the balanced field length the chosen V1 makes stopping and going require exactly the same distance, the most runway-efficient condition. Either action uses exactly the runway available.

55. B — Exceeding the EGT limit allows turbine components to overheat and be damaged rapidly, which is why EGT is the critical parameter at high thrust and start. Thrust is set with N1 or EPR.

56. D — A cold front undercuts and lifts the warm air steeply, concentrating the weather in a narrow, intense zone. Warm fronts ride up gently, spreading weather over a wide area.

57. A — Both the circadian low and a high segment count increase fatigue, so early-morning, multi-segment duty periods get the shortest maximum FDP. Favorable daytime starts with few segments are longest.

58. B — Pitot tubes and static ports are electrically heated because it provides precise, localized protection essential to accurate flight data. Unheated sensors can give false airspeed and altitude.

59. A — The curved upper surface accelerates the airflow, so the air over the wing always moves faster than the aircraft — which is why local flow reaches Mach 1.0 before the aircraft does. This defines critical Mach.

60. C — A Restricted ATP holder is limited to second-in-command duties because the reduced hour requirement reflects less experience than the full 1,500-hour PIC standard. It permits first-officer duty only.

61. D — The net level-off altitude includes a regulatory margin to ensure terrain clearance even if real performance falls slightly short. Planning to the net path builds in a safety buffer.

62. A — Velocity enters the lift equation as a square, so small speed changes have an outsized effect on lift (and on parasite drag). This makes speed the dominant variable.

63. D — The 45-minute reserve provides a final contingency margin for unexpected delays at the destination, required even when no alternate is needed. It is a non-negotiable safety buffer.

64. C — Anti-ice prevents ice from forming and runs continuously; de-ice removes ice after it accumulates and cycles. The two are not interchangeable.

65. A — The tropopause is significant because it is where the jet stream and the most severe CAT are found, and where temperature stops falling. It marks the top of significant weather.

66. B — A high-altitude jet needs a yaw damper to suppress the Dutch roll oscillation that wing sweep aggravates. An inoperative damper often restricts altitude.

67. D — Freezing rain indicates a layer of warmer air aloft feeding continued, severe icing, so it is a sign of worsening conditions. It produces rapid clear ice, the most dangerous type.

68. C — A forward CG's greater tail download stiffens pitch response, making the aircraft more stable but less responsive. This is the stability-versus-maneuverability trade.

69. B — The second segment requires the steepest gradient (2.4 percent) at a relatively low speed with takeoff flaps, one engine inoperative, so it is often the limiting factor for takeoff weight. It is the most demanding segment.

70. D — A low-pressure system has rising, converging air that cools and condenses moisture, forming clouds and precipitation. This brings unsettled weather.

71. A — When disoriented, the vestibular senses produce false attitude and motion cues without visual references, but the instruments do not — so trusting the instruments is the only reliable defense. "Flying by feel" worsens it.

72. B — Sweep raises the critical Mach number by reducing the effective airflow velocity the wing experiences, delaying local Mach 1.0. This is the high-speed benefit of sweep.

73. D — A serious in-flight fire warrants landing as soon as possible because fire and smoke can escalate faster than a checklist can be completed. The diversion is not deferred for troubleshooting.

74. C — As a co-holder of operational control, the dispatcher shares responsibility for the flight's safety and may amend or cancel the release. The dispatcher cannot fly the aircraft or override ATC.

75. A — The standard holding inbound leg is longer (1.5 minutes) above 14,000 feet because the higher true airspeed at altitude covers more distance, requiring a longer timed leg. Below 14,000 feet, 1 minute suffices.

76. B — A microburst's rising initial airspeed invites a power reduction, but the shear then reverses to a sinking tailwind, leaving the aircraft low and slow. This is the dangerous error to avoid.

77. C — The airframe can only withstand so much pressure difference between inside and outside, making the maximum differential pressure the limiting structural parameter. Pressurization is scheduled never to exceed it.

78. B — A lighter aircraft is most efficient at a higher altitude, so as fuel burns off the optimum altitude rises, prompting step climbs. This keeps the aircraft near its efficient profile.

79. D — Reducing thrust on takeoff (when conditions allow) lowers engine wear and maintenance cost while still meeting performance requirements. The benefit is engine longevity, not a shorter roll.

80. A — The chordwise flow crosses the wing perpendicular to the leading edge, where the airflow accelerates to local Mach 1.0, triggering compressibility. The spanwise flow does not.

81. C — Fatigue was a key factor in the accident that prompted the Part 117 rules, making them safety-critical and heavily tested. They are central to modern airline operations.

82. A — At or after V1 the aircraft cannot stop on the remaining runway, so it must fly. V1 is the last point a reject can succeed.

83. A — Wing fuel's downward weight opposes the upward lift that tries to bend the wingtips up, relieving wing-bending stress at the root. This is the structural reason for the MZFW limit.

84. C — Lower air density means a given indicated (dynamic-pressure) airspeed corresponds to a much higher true airspeed, so a jet's TAS far exceeds its indicated airspeed at altitude. This follows directly from the lift equation.

85. D — The ILS provides vertical guidance, so the pilot decides to land or go around at the Decision Altitude. Non-precision approaches use an MDA because they lack vertical guidance.

86. B — The cabin-altitude warning (~10,000 ft cabin altitude) alerts the crew earlier so they can act before the passenger masks deploy (~14,000 ft). The earlier warning provides reaction time.

87. C — A PIREP is the only real-time, direct observation of conditions actually encountered aloft, making it invaluable for turbulence, icing, and CAT. It is not a forecast or surface observation.

88. A — A hot, high-elevation airport has high density altitude, which reduces both engine thrust and aerodynamic performance because the air is less dense. This degrades takeoff performance.

89. D — During an engine-out continued takeoff, asymmetric thrust can overcome rudder authority below VMCA at low speed, so maintaining directional control is the first priority. Drag reduction comes later.

90. B — RVSM covers FL290–FL410 because this is the busy high-altitude band where halving the vertical separation most increases usable altitudes, with equipment to do so safely. It is not applied at all altitudes.

91. A — Stable air's resistance to vertical motion spreads cloud out into flat, layered (stratiform) forms. Unstable air builds the vertical cumuliform clouds instead.

92. C — Percent MAC =  $(CG \text{ arm} - LEMAC) \div MAC \times 100 = (940 - 910) \div 100 \times 100 = 30$  percent MAC. This converts a CG station into a percentage of the mean aerodynamic chord.

93. D — The PIC is the last line of defense and bears final responsibility for the safety of the flight, so the PIC must determine airworthiness before flight. This holds even though maintenance handles upkeep.

94. C — Thunderstorm activity changes rapidly, so a Convective SIGMET has only a 2-hour validity and must be reissued frequently. The short validity reflects the fast-evolving hazard.

95. A — An aft CG moves the center of gravity closer to the center of lift, reducing the stabilizing moment and longitudinal stability. This makes the aircraft more sensitive in pitch.

96. B — At minimum total drag (L/D MAX) the aircraft is most efficient, which is why that single speed underlies maximum range, best glide, and best driftdown. The application changes; the principle does not.

97. D — The standard tropopause temperature of about  $-56.5^{\circ}\text{C}$  is where the steady tropospheric cooling stops, near 36,000 feet. Above it, temperature is initially isothermal.

98. B — Wing fences and vortex generators control spanwise flow to reduce the swept wing's tendency to stall at the tips first. They do not raise critical Mach, eliminate flaps, or lower takeoff weight.

99. C — A crew overcome by smoke loses the aircraft, so protecting their own function with oxygen and goggles comes first. This priority precedes briefing, ventilating, or shutting down engines.

100. A — At the balanced field V1, whether the crew stops or continues after an engine failure, the same runway is used and no more — the most efficient condition. It does not guarantee a landing margin or place V2 at the midpoint.

101. D — Air density ( $\rho$ ) falls with altitude in the lift equation, reducing lift unless true airspeed rises to compensate. This is why a climbing aircraft must fly faster (TAS) to hold lift.

102. A — Task saturation is dangerous because a crew absorbed in one problem may neglect to fly the aircraft, risking controlled flight into terrain. It degrades, not improves, focus on the primary task.

103. C — Cutting off fuel and air starves the engine fire while the extinguisher suppresses it, which is why immediate shutdown and discharge are the response. Restarting or adding thrust would feed the fire.

104. B — The speed of sound depends on temperature, which falls with altitude in the troposphere, so the speed of sound decreases with altitude. This is why Mach number rises with a constant TAS climb.

105. D — Congress mandated the ATP-CTP after a fatal accident to provide structured training in advanced aerodynamics, CRM, and high-altitude operations before airline flying. It is not test prep or a practical-test replacement.

106. A — On the back side of the drag curve, induced drag and the angle of attack both rise sharply as speed decreases below L/D MAX, so more thrust is needed to fly slower. This is the back-side-of-the-power-curve behavior.

107. C — A clearway is an obstacle-free area beyond the runway over which the aircraft may complete the initial climb to screen height, so it extends the takeoff distance available. A stopway, by contrast, extends ASDA.

108. D — Part 117 caps cumulative flight and duty time over rolling windows to prevent chronic fatigue from accumulating over days and weeks. This complements the per-duty-period limits.

109. B — A jet slows to L/D MAX during driftdown because it minimizes the descent rate, maximizing the level-off altitude and terrain clearance. Speeding up would steepen the descent.

110. D — A direction digit of 77 signals winds over 100 knots: subtract 50 ( $77 - 50 = 270^\circ$ ) and add 100 to the speed ( $55 + 100 = 155$ ). "7755" decodes to  $270^\circ$  at 155 knots.

111. A — An inversion's warm layer aloft acts as a lid, preventing vertical mixing, so pollutants and moisture are trapped near the surface, reducing visibility. It does not produce convection or showers.

112. C — A dispatch release documents the agreed operational details and confirms shared operational control before departure. It is not a passenger manifest or a replacement for the airworthiness certificate.

113. B — Sweep causes the wing to experience a lower effective airspeed, reducing the lift generated for a given angle of attack at low speed. This is the low-speed penalty of sweep.

114. A — Descent speed is reduced after a suspected structural decompression to avoid aerodynamic loads that could aggravate the damage. Normally the descent is flown at maximum appropriate speed.

115. C — The FMS drives the autopilot and autothrottle to integrate navigation and guidance, reducing workload and increasing precision. It does not eliminate the need for monitoring.

116. B — "Follow the rules; they are usually right" counters the anti-authority impulse to disregard rules and advice with respect for established procedures. Each hazardous attitude has a specific antidote.

117. D — There is no safe concentration of volcanic ash; it will damage the engines and is not detectable by radar, so complete avoidance is required. Reduced-thrust penetration is not an option.

118. B — A steep authority gradient (an intimidating captain) discourages the first officer from voicing safety concerns, compromising safety. A healthy gradient keeps clear command while encouraging input.

119. A — The Mach limit's corresponding true airspeed falls with altitude as the speed of sound drops, so the high-speed boundary descends toward the rising stall boundary. This is the high-speed side of the coffin corner.

120. C — A STAR provides a standardized, published transition from the en route structure to the approach with set crossing altitudes and speeds, improving traffic flow. It does not replace the approach or connect airways.

121. D — CG shift equals (weight moved  $\times$  distance moved)  $\div$  total weight:  $(12,000 \times 120) \div 180,000 = 8$  inches. The CG moves toward the direction of the shift.

122. B — TEM is emphasized because anticipating threats and trapping errors prevents them from progressing to an undesired aircraft state. It is the overarching CRM framework.

123. A — Sweep increases roll stability relative to yaw stability, promoting the coupled roll-yaw Dutch roll oscillation. This is why swept-wing jets carry yaw dampers.

124. C — Holding and course tracking are core IFR skills whose proficiency degrades without recent practice, so instrument currency includes them, not just approaches. The full requirement keeps all IFR skills current.

125. D — The dry adiabatic rate describes a rising unsaturated parcel cooling by expansion with no heat added, which is steeper than the average environmental rate. The standard rate is an observed average, not an adiabatic process.