Instructor Resources

**Exam Question Bank**

**Answer Key**

# Human Factors

## Enhancing Pilot Performance

**Dale Wilson**

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## Enhancing Pilot Performance

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AVIATION SUPPLIES & ACADEMICS
NEWCASTLE, WASHINGTON

*Human Factors: Enhancing Pilot Performance*—Exam Question Bank: Answer Key
by Dale Wilson



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# Chapter 1: The Aviation Safety Record

## Exam Question Bank—Answer Key

## Multiple Choice

1. _____ are/is the number one cause (at almost 40 percent) of accidental deaths (unintended injury deaths) in the United States.
   a. January 1, 1913
   b. Heart disease
   **c. Transportation accidents** *(see page 3)*
   d. Firearm accidents

2. About 85 percent of U.S. aviation fatalities involve _____ aircraft.
   a. commercial airline
   b. air carrier
   c. military
   **d. general aviation (GA)** *(see page 3)*

3. _____ accounts for more than 90 percent of the U.S. civil aircraft fleet.
   **a. General aviation (GA)** *(see page 4)*
   b. Commercial
   c. Air carrier
   d. Experimental

4. The sterile cockpit rule requires avoiding nonessential activities (including extraneous conversations) that could distract a flight crew from completing the essential duties required for the safe operation of their aircraft during the critical phases of flight. This rule applies at altitudes _____.
   **a. generally below 10,000 feet** *(see page 6)*
   b. below 10,000 feet while in cruise flight
   c. above 10,000 feet
   d. at all altitudes

5. During the past 20 years, the U.S. and Canada commercial jet accident rate was below _____ accidents per million departures.
   **a. 0.5** *(see page 7, fig 1-1)*
   b. 1.0
   c. 2.0
   d. 4.0

6. **About 80 percent of U.S. GA fatal accidents involve _____ flight operations.**

   a. instructional
   b. aerial application
   **c. personal and instruction** *(see page 8)*
   d. skydiving and banner towing

7. **An aviation _____ is generally defined as an accident or incident.**

   a. hazard
   **b. occurrence** *(see page 17, endnote #25)*
   c. threat
   d. accident

8. **An aircraft _____ is an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.**

   a. occurrence
   b. incident
   c. hazard
   **d. accident** *(see page 17, endnote #25)*

9. **_____ is defined as an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.**

   **a. An incident** *(see page 17, endnote #25)*
   b. An accident
   c. An occurrence
   d. A threat

10. **The five most common type or category of GA accidents in order of *decreasing* occurrence (listed first to fifth) are _____.**

    **a. 1. LOC-I, 2. CFIT, 3. SCF-PP, 4. FUEL, and 5. UNK** *(see page 8)*
    b. 1. CFIT, 2. LOC-I, 3. UNK, 4. FUEL, and 5. SCF-PP
    c. 1. UNK, 2. CFIT, 3. SCF-PP, 4. FUEL, and 5. LOC-I
    d. 1. LOC-I, 2. FUEL, 3. SCF-PP, 4. CFIT, and 5. UNK

11. **_____ involves an unintended departure of an aircraft from controlled flight.**

    a. A collision with obstacles during takeoff or landing (CTOL)
    b. A runway incursion (RI)
    **c. Loss of control in flight (LOC-I)** *(see page 9)*
    d. Controlled flight into terrain (CFIT)

**12. About three-quarters of all GA accidents are caused by _____.**

a. CFIT
b. LOC
c. fuel starvation/exhaustion
**d. pilot error** *(see page 10)*

**13. Most GA pilot-caused accidents occur during _____.**

a. takeoff
**b. the landing** *(see page 10 and fig 1-2)*
c. approach
d. cruise

**14. The most common type of GA landing accident involves _____**

a. loss of airspeed
b. animal strike
**c. loss of directional control** *(see page 10 and fig 1-3)*
d. runway surface contamination

**15. The highest proportion GA *fatal* accidents involve _____.**

**a. weather** *(see page 10-11 and fig 1-2)*
b. approaches to landing
c. fuel management
d. maneuvering

**16. The most prevalent type of GA *fatal* weather-related accident is _____.**

a. thunderstorms
**b. VFR flight into IMC** *(see page 11)*
c. airframe icing
d. turbulence

**17. A study conducted by the University of Illinois in the 1950s found that pilots with insufficient instrument flying ability lose control of their airplane in an average of only _____ once they lose outside visual references.**

a. 10 minutes
b. 7.5 minutes
c. 10 seconds
**d. 178 seconds** *(see page 11)*

18. **In 2015, _____ percent of U.S. VFR flight into IMC accidents were fatal.**

a. 10
b. 33
c. 50
**d. 95** *(see page 11)*

19. **The five most common type or category of worldwide air carrier accidents between 2009 and 2018 in order of decreasing occurrence (listed first to fifth) are _____.**

**a. 1. LOC-I, 2. CFIT, 3. UNK, 4. RE, and 5. SCF-PP** *(see page 11, fig 1-4)*
b. 1. UNK, 2. LOC-I, 3. SCF-PP, 4. FUEL, and 5. CFIT
c. 1. SCF-PP, 2. CFIT, 3. RE, 4. UNK, and 5. LOC-I
d. 1. LOC-I, 2. FUEL, 3. SCF-PP, 4. CFIT, and 5. UNK

20. **A _____ occurs when an aircraft departs the end (overrun) or the side (veers off) of the runway during a takeoff or landing.**

a. runway incursion (RI)
b. CFIT
**c. runway excursion (RE)** *(see page 12)*
d. MAC

21. **Between 2009 and 2018, almost one-half of the world's commercial turbojet airplane *fatal* accidents occurred during the _____, a phase that accounts for only about 4 percent of flight time.**

a. takeoff
b. climb
**c. final approach and landing** *(see page 12-13, fig 1-5)*
d. cruise

22. **Most airline and GA accidents result from _____.**

a. mechanical problems
b. adverse weather
**c. errors committed by the flight crews/pilots** *(see page 13)*
d. maintenance

23. **GA and air carrier LOC-I and RE accidents are primarily caused by _____.**

**a. the actions or inactions of the pilots involved** *(see page 14)*
b. mechanical problems
c. adverse weather
d. maintenance

24. **Pilots in LOC-I accidents often experience a _____ reflex; a surprised reaction that results in an involuntary delayed response, no response, or even an incorrect one.**

    a. subtle

    b. hypoxia

    c. spatial

    **d. startle** *(see page 14)*

## True/False

1. **Land modes of transportation (e.g., cars, trucks, motorcycles, buses, bicycles) account for only about 5 percent of all U.S. transportation fatalities.**

    a. True

    **b. False** *(see page 3)*

2. **Aircraft accidents account for less than 0.15 percent of all U.S. transportation fatalities.**

    **a. True** *(see page 3)*

    b. False

3. **About 15 percent of U.S. aviation fatalities occur in the GA sector and the remaining 85 percent involve commercial air carriers.**

    a. True

    **b. False** *(see page 3)*

4. **In comparison to all other transportation modes, commercial air-carrier flying is the safest mode of passenger transport in the United States.**

    **a. True** *(see page 4)*

    b. False

5. **The odds of dying while riding a motorcycle are 3,000 times greater than flying on a U.S. commercial air carrier.**

    **a. True** *(see page 4)*

    b. False

6. **The most dangerous part of the flight in a commercial air carrier in the United States is the drive to the airport.**

    **a. True** *(see page 4)*

    b. False

7. Three airline organizational safety tools used to enhance safety—aviation safety action programs (ASAP), flight operational quality assurance (FOQA), and line operations safety audits (LOSA)—have been described as "what the crew is saying" (ASAP), "what the airplane is saying" (FOQA), and "what a fly on the wall on the flight deck would say" (LOSA).

   **a. True** *(see page 17, endnote #17)*

   b. False

8. According to Boeing's *Statistical Summary of Commercial Jet Airplane Accidents*, between 1959 and 2018, the worldwide turbojet fleet (maximum certificated takeoff weight of more than 60,000 pounds) was responsible for about 2,000 accidents that claimed the lives of almost 32,000 people.

   **a. True** *(see page 7)*

   b. False

9. The proportion of worldwide *fatal* turbojet air carrier accidents increased from an average of 13 percent between 1959 and 2018 to about 35 percent from 2009 to 2018.

   a. True

   **b. False** *(see page 7)*

10. The term "defining event" is sometimes used to describe the type, or category, of an accident.

    **a. True** *(see page 8)*

    b. False

11. The NTSB identifies the probable cause (or causes) of an accident and its contributing factors; the latter being those situations or circumstances that are central to the accident cause.

    **a. True** *(see page 8)*

    b. False

12. A U.S. Government Accountability Office (GAO) analysis covering 12 years, found the percentage of fatal accidents involving *personal flying* was disproportionate to the number of hours it was responsible for—it accounted for only an estimated 40 percent of GA activity yet was responsible for 77 percent of the accidents.

    **a. True** *(see page 8)*

    b. False

13. **In GA, the phase of flight that has the highest number of accidents also has the lowest number of fatalities.**

    **a. True** *(see page 10, fig 1-2)*

    b. False

14. **LOC-I in airline operations, as for GA flights, are fatal 90 percent of the time.**

    **a. True** *(see page 12)*

    b. False

15. **Up until the 1990s, CFIT had claimed the lives of more than 9,000 passengers and airline crew members since commercial passenger jet operations began in the mid-1950s.**

    **a. True** *(see page 12)*

    b. False

16. **During a recent five-year period, runway excursions (REs) were the number one cause of worldwide commercial air transport turbojet and turboprop accidents—responsible for 26 percent of all accidents—yet accounted for less than 1 percent of all fatalities.**

    **a. True** *(see page 12)*

    b. False

17. **Just over 60 percent of worldwide commercial jet fatal accidents occur during takeoff, initial climb, final approach, and landing—phases that account for only about 6 percent of flight time.**

    **a. True** *(see page 12-13, fig 1-5)*

    b. False

18. **Almost half of all worldwide commercial jet fatal accidents occur during takeoff and initial climb—phases that account for only 6 percent of flight time.**

    a. True

    **b. False** *(see page 12-13, fig 1-5)*

19. **During 2013, the only year during the five-year period (2012-2017) that the U.S. air carrier fatal accident rate was greater than zero, the GA *fatal* accident rate was about 100 times greater.**

    **a. True** *(see page 5 and 12, table 1-2)*

    b. False

## Essay

1. What is an accident *rate*? Why is it important to know the *rate* of accidents as opposed to just the *number* of accidents?

2. What are some reasons why scheduled commercial airline flying is safer than GA?

3. When comparing the safety record between GA and air carriers, the GA accident rate looks much worse when using "passenger-miles" as the denominator instead of using "departures." Why?

4. What do you think of this quote from David Beaty's book, *The Naked Pilot:* "the machine, the technology, has advanced more in a hundred years than man's brain has in a hundred thousand."?

# Chapter 2: Flight Crew Error

## Exam Question Bank

## Multiple Choice

1. _____ is an undesired aircraft position, condition, or attitude that compromises safety and, if not corrected, could lead to an incident or an accident.

   **a. an undesired aircraft state** *(see page 19)*

   b. a threat

   c. an error

   d. a mistake

2. An unstable approach is an example of _____.

   a. a slip

   b. a lapse

   **c. an undesired aircraft state** *(see page 19)*

   d. an event cascade

3. Inadvertently raising the landing gear handle instead of the flap handle is an example of a _____.

   **a. slip** *(see page 20)*

   b. mistake

   c. lapse

   d. violation

4. Forgetting to set the flaps to the appropriate flap setting before takeoff or landing is an example of a _____.

   **a. lapse** *(see page 20)*

   b. slip

   c. mistake

   d. event horizon

5. According to the HFACS model, when we fail to correctly interpret stimuli (inputs) received from the outside world through our eyes, ears and other senses, we may commit a _____ error.

   a. skill-based

   b. decision

   c. routine

   **d. perceptual** *(see page 20)*

6. **According to the HFACS model, when we make an error involving psychomotor performance, such as stick and rudder skills or knobology skills, we may commit a(an) _____ error.**

   a. perceptual
   b. decision
   c. exceptional
   **d. skill-based** *(see page 21)*

7. **According to the HFACS model, if we allow our airplane to fly too low because we misperceived our approach angle while conducting a visual approach in impoverished visual conditions, we have committed a _____ error.**

   a. skill-based
   b. decision
   **c. perceptual** *(see page 20-21)*
   d. routine

8. **_____ errors were the second leading cause of pilot-error-induced commercial air-taxi accidents in the United States over a twenty-year period between 1983 and 2002.**

   a. Skill-based
   b. Perceptual
   **c. Decision** *(see page 21)*
   d. Exceptional

9. **According to the HFACS model, when we improperly follow or choose not to use a checklist, we are committing a _____ error.**

   a. skill-based
   **b. perceptual** *(see page 21-22)*
   c. decision
   d. routine

10. **_____ are those unintended mistakes, slips, and lapses that afflict all humans, while _____ involve intentional noncompliance with regulations and procedures that are designed to ensure safe flight operations.**

    a. Errors; violations
    **b. Violations; errors** *(see page 20, 23)*
    c. Errors; errors
    d. Violations; violations

11. **_____ violations involve somewhat habitual noncompliance with rules and regulations, while _____ violations are rare.**

    a. Exceptional; routine

    **b. Routine; exceptional** *(see page 23)*

    c. Persistent; routine

    d. Rare; continual

12. **If you operate your aircraft above its maximum certificated takeoff weight to avoid having to deal with the headache of off-loading passengers or baggage, you are committing a _____.**

    a. skill-based error

    b. routine perceptual error

    **c. violation** *(see page 23)*

    d. physiological error

13. **The _____ perspective to human error suggests that some errors may be linked to a medical or physiological condition.**

    a. cognitive

    b. psychosocial

    c. organizational

    **d. aeromedical** *(see page 24)*

14. **The inability of a pilot to carry out the duties required to fly an aircraft is sometimes called _____.**

    a. orientation

    **b. incapacitation** *(see page 24)*

    c. discombobulation

    d. alienation

15. **The _____ approach to human error suggests that limitations in human information processing causes errors.**

    a. aeromedical

    **b. cognitive** *(see page 24)*

    c. psychosocial

    d. organizational

16. **The _____ approach to human error suggests that breakdowns in interactions with other people lead to flight crew errors.**

    **a. psychosocial** *(see page 25)*

    b. cognitive

    c. aeromedical

    d. behavioral

17. **The _____ approach to human error suggests that people make errors, or, more correctly, commit violations, because they are rewarded for doing so.**

    a. aeromedical

    b. cognitive

    **c. behavioral** *(see page 25)*

    d. psychosocial

18. **The _____ approach to human error suggests fallible decisions and errors made by upper-, mid-, and lower-level management within an organization can unintentionally lead to errors made by front-line personnel such as pilots and mechanics.**

    a. behavioral

    b. aeromedical

    c. cognitive

    **d. organizational** *(see page 25)*

19. **James Reason's organizational accident model is sometimes called the _____ model of accident causation, because holes in defenses can lead to an accident ort incident.**

    **a. Swiss cheese** *(see page 25-26, fig 2-2)*

    b. grilled cheese

    c. cheddar cheese

    d. udderly safe

20. **_____ conditions—or error-producing conditions—at the sharp end of an aviation operation (e.g., pilots, maintainers, ground crew) are created by fallible decisions made by people higher up in the system who are removed in both time and space from the front end of the organizational spear.**

    a. Active

    **b. Latent** *(see page 26)*

    c. Deliberate

    d. Utterly safe

21. **According to James Reason's model, _____ accidents in high-technology industries like commercial air transportation are rare, have multiple defenses, are often catastrophic involving large numbers of people, and are usually caused by not only the actions of a single front-line operator, but by others within the organization who are removed from the accident.**

    **a. organizational** *(see page 26)*

    b. individual

    c. light airplane

    d. single-seat aircraft

22. **The _____ approach to human error suggests that a failure of a subcomponent affects the performance of the overall system, including the performance of the human operator at the front end of it.**

    a. aeromedical

    **b. systems** *(see page 28)*

    c. cognitive

    d. psychosocial

23. **The 5M systems model consists of man, _____, medium, mission, and management.**

    a. mocha

    **b. machine** *(see page 28)*

    c. maintenance

    d. monitoring

24. **In the 5M systems model, time of day (dark or light), weather conditions, cabin temperature/humidity, and terrain would fall under the _____ category.**

    a. man

    **b. medium** *(see page 28)*

    c. management

    d. maintenance

25. **The SHELL systems model consists of software, hardware, environment, _____-others, and liveware-flight crew.**

    a. livewire

    b. medium

    c. mission

    **d. liveware** *(see page 29 and table 2-1)*

26. **In the SHELL systems model, time of day (dark or light), weather conditions, cabin temperature/humidity, and terrain would fall under the _____ category.**

a. software
b. hardware
**c. environment** *(see page 29, endnote #25)*
d. liveware

27. **Standard operation procedures (SOPs), checklists, manuals and charts are part of the _____ in the SHELL model.**

a. environment
b. mission
c. liveware
**d. software** *(see page 29, table 2-1)*

28. **Employer, manager, maintenance technicians, cabin crew, passengers, and ATC are part of the _____ in the SHELL model.**

a. environment
b. hardware
c. medium
**d. liveware-others** *(see page 29, table 2-1)*

29. **The FAA's PAVE systems model consists of the pilot, the aircraft, the environment, and _____ pressures.**

**a. external** *(see page 30)*
b. internal
c. atmospheric
d. oil

30. **In FAA's PAVE systems model, a pilot's physiological and mental state, currency, and proficiency, would fall under the _____ category.**

a. machine
**b. pilot** *(see page 30)*
c. environment
d. management

## True/False

1. An error occurs when a person fails to perform the correct action or performs the wrong action for a given circumstance.

   **a. True** *(see page 19)*

   b. False

2. Flight crew error is specifically defined as action or inaction that leads to a deviation from crew or organizational intentions or expectations.

   **a. True** *(see page 19)*

   b. False

3. A mistake occurs when you fail to formulate the correct assessment and/or action needed for the situation.

   **a. True** *(see page 19)*

   b. False

4. A slip is when you have properly understood the situation and determined the best course of action, but you unintentionally fail to carry out the action correctly.

   **a. True** *(see page 20)*

   b. False

5. A lapse is when you have properly understood the situation and determined the best course of action, but you forget to carry it out altogether.

   **a. True** *(see page 20)*

   b. False

6. According to the HFACS model, a pilot who succumbs to a visual illusion while conducting a landing approach at night is demonstrating a decision error.

   a. True

   **b. False** *(see page 20, 21)*

7. According to the HFACS model, if we fail to effectively manipulate the flight controls and power/thrust to achieve a stabilized approach, we have committed a skill-based error.

   **a. True** *(see page 21)*

   b. False

8. **Exceptional violations involve somewhat habitual noncompliance with rules and regulations.**

   a. True

   **b. False** *(see page 23)*

9. **Exceptional violations almost always involve "extreme" noncompliance with rules and regulations, while routine violations almost always involve "mild" noncompliance.**

   a. True

   **b. False** *(see page 23)*

10. **Most pilots deliberately fail to follow a rule or procedure in order to cause an accident.**

    a. True

    **b. False** *(see page 23)*

11. **Committing an error in flight because you were incapacitated from abdominal pain would be an example of an aeromedical explanation for human error.**

    **a. True** *(see page 24)*

    b. False

12. **Committing an error in flight because you forgot to extend the landing gear before landing is an example of the cognitive explanation for human error.**

    **a. True** *(see page 24)*

    b. False

13. **Committing an error in flight because a controller tells you your "read-back is correct" when it isn't, is an example of the cognitive explanation for human error.**

    a. True

    **b. False** *(see page 24-25)*

14. **Crew resource management (CRM) is a set of behaviors used by airline crews that promote coordination and teamwork for the purpose of facilitating safe and efficient flight operations.**

    **a. True** *(see page 25)*

    b. False

15. **A recent study of 113 U.S. Part 121 air carrier accidents and incidents that occurred between 2002 and 2012 found 61 percent of accidents and 39 percent of incidents involved breakdowns in CRM.**

    **a. True** *(see page 25)*

    b. False

16. Multiple barriers, or defenses, used to prevent an accident are known as defenses-in-depth: if one fails, there are several more to guard against an accident or incident.

    **a. True** *(see page 26)*

    b. False

17. A system is set of components that act together as a whole to achieve a common goal.

    **a. True** *(see page 28)*

    b. False

18. A system includes several subsystems—people, equipment, facilities, tools, procedures—in which the human operator is just one component in the overall system.

    **a. True** *(see page 28)*

    b. False

19. Aircraft design, ease of operation, limitations, and maintenance are part of the software in the SHELL model.

    a. True

    **b. False** *(see page 29, table 2-1)*

20. Somewhat like the organizational approach, a systems approach to human error looks at all the elements in the overall system—not just errors committed by front-line operators—to identify factors that may contribute to errors committed by those at the front end of the system.

    **a. True** *(see page 30)*

    b. False

21. Investigators into the Ontario Fokker F-28 that crashed after the crew attempted to takeoff with snow and ice on the wings on a slush-covered runway in Dryden, Ontario, did not use a systems approach to determine the cause(s) of the accident.

    a. True

    **b. False** *(see page 30,31)*

## Essay

1. Why do you think pilots err?

2. Why do you think pilots commit violations?

3. Explain the basic ideas of James Reason's organizational accident model.

4. What is a "systems" approach to determining accident causation, and why is that approach better than simply assigning blame to the pilot?

5. What do you think of this quote from James Reason: "…our position and motion senses as well as our capacity for processing information remain those of a self-propelled animal designed to travel at around three to four miles per hour through a mainly two-dimensional world under conditions of normal terrestrial gravity. In short, man was intended to walk, run and climb the occasional tree; but no more."

6. According to some, advances in technology, artificial intelligence, and machine learning will eventually lead to fully self-flying, commercial passenger-carrying aircraft and the complete removal of one or both flight crewmembers from the flight deck. What are the positives and negatives of this idea? What are your opinions on the matter?

# Chapter 3: Aviation Human Factors

## Exam Question Bank

## Multiple Choice

1. **_____ is an undesired aircraft position, condition, or attitude that compromises safety and, if not corrected, could lead to an incident or an accident.**
   a. an undesired aircraft state
   b. a threat
   c. an error
   d. a mistake

2. **_____ is a multidisciplinary field that seeks to optimize the effectiveness of human-machine systems through design that accommodates the limitations and capabilities of the human operator, thereby reducing human error and maximizing human performance, safety, efficiency, and comfort.**
   a. Anthropometry
   b. Cognitive psychology
   c. Industrial/organizational (I/O) psychology
   **d. Human factors** *(see page 38)*

3. **The scientific study of the relationship between the flight crew and the flight environment, with the goal of optimizing the relationship between the two, is a good definition of _____ for pilots.**
   a. physiology
   **b. human factors** *(see page 38)*
   c. psychology
   d. anthropology

4. **_____ attempts to accommodate the limitations and capabilities of the human operator.**
   a. Anthropometry
   **b. User-centered design** *(see page 39)*
   c. Cognitive psychology
   d. I/O psychology

5. **_____ is the study of the measurement of the size and shape of the human body.**
   **a. Anthropometry** *(see page 40)*
   b. Human factors
   c. User-centered design
   d. Cognitive physiology

6. **The reference point in space where the position of a pilot's eyes are located when the seat is adjusted accordingly and which provides not only the best access to the flight controls but also an optimum viewing angle for both cockpit instrumentation and the outside environment, is known as the _____.**

   a. engineering eye position
   b. anthropological position
   **c. design eye reference point** *(see page 41)*
   d. event horizon

7. **The field of "aerospace _____" examines the effects of the flight environment and other factors on normal physiological functioning and flight crew performance.**

   a. anthropometry
   b. human factors
   **c. physiology** *(see page 41)*
   d. cognitive physiology

8. **Some of the earliest aviation problems that contributed to the development of the discipline of human factors involved human _____.**

   a. cognitive physiology
   b. I/O psychology
   c. thinking
   **d. physiology** *(see page 41)*

9. **Both Paul Bert and James Glaisher studied the effects of _____.**

   a. high-G flight on the human body in the early 1900s
   b. spatial disorientation on pilot performance in the 1900s
   c. spatial disorientation on pilot performance in the early 1900s
   **d. high-altitude flight on the human body in the late 1800s** *(see page 41)*

10. **Who was the first to fly with a pressure suit to combat the effects of decompression sickness while attaining a height of 50,000 feet?**

    a. Lieutenant James Doolittle
    **b. Wiley Post** *(see page 42)*
    c. Three French aeronauts
    d. James Glaisher

11. **Who was the first to successfully accomplish flight by sole reference to the aircraft flight instruments—the first "blind" flight—in a Consolidated NY-2 biplane operating out of Mitchel Field in Garden City, New York in 1929?**

    a. Wiley Post
    b. Three French aeronauts
    **c. Lieutenant James Doolittle** *(see page 42)*
    d. James Glaisher

12. **The scientific study of human thought and behavior is known as _____.**

    **a. psychology** *(see page 42)*
    b. behavioral psychology
    c. engineering
    d. social psychology

13. **The scientific study of how humans think and process information is the domain of _____ psychology.**

    a. experimental
    b. social
    c. engineering
    **d. cognitive** *(see page 43)*

14. **Compared to an overall GA fatal accident rate of less than about 20 percent, in 2015 _____ percent of U.S. VFR flight into IMC accidents were fatal.**

    a. 10
    b. 33
    c. 50
    **d. 95** *(see page 46)*

15. **The scientific study of how people's thoughts and behaviors are influenced by others is the domain of _____ psychology.**

    **a. social** *(see page 43, table 3-2 and page 46)*
    b. cognitive
    c. behavioral
    d. engineering

16. **_____ influence is the actual or perceived influence exerted by other people on us to feel, think, or behave in a certain manner.**

    a. Cognitive
    b. Behavioral
    **c. Social** *(see page 46)*
    d. Engineering

17. A _____ flight deck is a group that consists of at least a captain and an FO.

    a. weird

    **b. crewed** *(see page 47)*

    c. crude

    d. sad

18. _____ consists of a set of behaviors designed to overcome the limitations of flight crew performance by practicing skills such as communication, assertiveness, and teamwork to facilitate safe and efficient flight operations on a crewed flight deck.

    **a. Crew resource management (CRM)** *(see page 47)*

    b. Single-pilot resource management (SRM)

    c. Line operations safety audits (LOSA)

    d. Flight operational quality assurance (FOQA)

## True/False

1. During a 22-month period in WWII, more than 400 airplanes were lost because pilots confused the landing gear and flaps controls.

    **a. True** *(see page 37)*

    b. False

2. Modern flight deck workstation design uses principles explored within the discipline of physical ergonomics.

    **a. True** *(see page 40)*

    b. False

3. Poor design of the fuel display and the location of the fuel control selector valve played a role in the tragic accident involving singer-songwriter John Denver's Long-EZ homebuilt aircraft.

    **a. True** *(see page 41)*

    b. False

4. One of the first known fatalities caused by physiological limitations in flight occurred in a gas-filled balloon named the *Zenith* in 1875.

    **a. True** *(see page 41, 42)*

    b. False

5. **When we say that aircraft accidents are sometimes caused by psychological limitations of pilot performance, we are primarily talking about mental illness or psychiatric disorders that the pilot may have.**

   a. True

   **b. False** *(see page 42)*

6. **Less than 0.3 percent of 2,758 civilian fatal aircraft accidents in the United States during a recent ten-year period were caused by suicide, and none involved commercial airline operations.**

   **a. True** *(see page 42-43)*

   b. False

7. **Flight-crew-caused aircraft accidents are mostly the result of inadvertent errors that flight crews make—errors that arise from the normal physiological and psychological limitations inherent in the human condition.**

   **a. True** *(see page 43)*

   b. False

8. **Cognitive psychology uses an "information processing approach" to understand human thought and behavior and uses the computer as a metaphor, postulating that inputs (stimuli or information) from the environment are received by our senses and are processed before an output (response) is made.**

   **a. True** *(see page 43-44)*

   b. False

9. **Olfaction is the sense of taste, and gustation is the sense of smell.**

   a. True

   **b. False** *(see page 45, table 3-3)*

10. **The somatosensory sense detects our overall position from movement of body parts in relation to each other. The receptors in the body's skin, muscles, and joints respond to gravitational acceleration and accelerations experienced in flight.**

    **a. True** *(see page 45, table 3-3)*

    b. False

11. **Incidents and accidents have occurred as a result of call-sign confusion, which occurs when controllers issue, and/or pilots respond to, a clearance intended for another aircraft with a similar call sign.**

    **a. True** *(see page 45)*

    b. False

12. Expectations of other people, including passengers, company dispatch, and upper airline management can influence you—consciously or unconsciously—to take unnecessary risks, even if you pride yourself on flying by the rules.

    **a. True** *(see page 46)*

    b. False

13. The main emphasis of your *Human Factors* textbook is to help you to better understand the engineering side of the human factors discipline—not so much the physiological, psychological, and psychosocial aspects of individual pilot performance.

    a. True

    **b. False** *(see page 47)*

## Essay

1. In your own words, define what the human factors discipline is as it applies to pilots in the flight environment.

2. The field of aviation/aerospace physiology examines the effects of the flight environment and other factors on normal physiological functioning and flight crew performance. These include factors common to all people (e.g., illness, colds, influenza, sleep deprivation, fatigue, alcohol and drugs, and poor physical fitness) but also unique physiological phenomena that normally only pilots experience. Please describe some of these unique physiological factors that only pilots typically experience.

3. Briefly define/explain what the discipline of anthropometry is and how its findings are used in aviation human factors.

4. Briefly define/explain what flight physiology is and how its findings are used in aviation human factors.

5. Briefly define/explain the information processing approach to understanding human behavior (cognitive psychology) and how its findings are used in aviation human factors.

# Chapter 4: Hypoxia and Hyperventilation

## Exam Question Bank

## Multiple Choice

1. **The term _____ is used to describe any physiological or psychological condition that renders a flight crew member incapable of performing his or her normal flight duties, including the ability to safely control the aircraft.**

   **a. incapacitation** *(see page 54)*

   b. accommodation

   c. adaptation

   d. captivation

2. **The percentage of oxygen in the troposphere by volume is approximately _____ percent.**

   a. 1

   b. 3

   **c. 21** *(see page 55)*

   d. 78

3. **The air we breathe consists mainly of _____.**

   a. $O_3$

   b. argon

   **c. $N_2$** *(see page 55)*

   d. $O_2$

4. **99.9 percent of the atmosphere's mass lies below approximately 164,000 feet MSL, while _____ percent lies below 53,000 feet MSL.**

   **a. 90** *(see page 56, fig 4-2)*

   b. 50

   c. 20

   d. 10

5. **Half the weight of the earth's atmosphere (i.e., 50 percent of its mass) lies below _____ feet MSL.**

   a. 10,000

   **b. 18,000** *(see page 56, fig 4-2)*

   c. 53,000

   d. 164,000

6. **The _____ zone extends from the surface to 10,000 feet MSL.**

   a. disturbance

   **b. physiological efficient** *(see page 58 and table 4-1)*

   c. space equivalent

   d. physiological deficient

7. **The physiological deficient zone extends from _____ feet to 50,000 feet.**

   a. 5,000

   **b. 10,000** *(see page 58 and table 4-1)*

   c. 18,000

   d. 22,000

8. **The _____ zone extends from 50,000 feet to upper limits of the atmosphere.**

   a. physiological efficient

   b. physiological deficient

   **c. space equivalent** *(see page 58 and table 4-1)*

   d. compensatory

9. **The altitude at which water within the blood "boils" or changes into water vapor is known as _____ Line.**

   **a. Armstrong's** *(see page 58)*

   b. the Zip

   c. Van Karman's

   d. the Trop

10. **At what altitude does water within the body begin to boil?**

    a. 10,000 feet MSL

    b. 50,000 feet MSL

    c. 100,000 feet MSL

    **d. 63,000 feet MSL** *(see page 58)*

11. **_____ Law states that the total pressure in a gas equals the sum of the partial pressures of the individual gases.**

    **a. Dalton's** *(see page 58)*

    b. Boyle's

    c. Graham's

    d. Henry's

12. **If sea-level pressure is 1,000 mb (or hPa), the partial pressure of oxygen ($O_2$) is approximately _____ hPa (mb).**

    **a. 210** *(see page 58 and table 4-2)*

    b. 10

    c. 780

    d. 5

13. **The process by which a living organism exchanges gases with its environment is known as _____.**

    a. ionization

    **b. respiration** *(see page 59)*

    c. expiration

    d. inspiration

14. **The process of breathing in oxygen and breathing out carbon dioxide is called _____.**

    **a. respiration** *(see page 59)*

    b. inspiration

    c. expiration

    d. sublimation

15. **There are three types of respiration where $O_2$ and $CO_2$ are exchanged in the body: _____ respiration, _____ respiration, and cellular respiration.**

    a. cellular; internal

    **b. internal; external** *(see page 59)*

    c. internal; internal

    d. external; external

16. **_____ respiration involves the exchange of $O_2$ and $CO_2$ between the atmosphere and the lungs.**

    **a. External** *(see page59)*

    b. Cellular

    c. Internal

    d. Normal

17. **Inhaling air is almost effortless thanks to _____ Law.**

    a. Dalton's

    **b. Boyle's** *(see page 59)*

    c. Henry's

    d. Graham's

18. _____ Law states that the volume of a gas is inversely proportional to the pressure exerted on it.

a. Dalton's
**b. Boyle's** *(see page 59)*
c. Henry's
d. Graham's

19. The two Laws best used to describe the automatic process of breathing air into and out of the lungs are _____ Law and _____ Law.

**a. Boyle's; Graham's** *(see page 59)*
b. Dalton's; Boyle's
c. Henry's; Graham's
d. Dalton's; Henry's

20. The exchange of gases in the lungs and blood take place in the _____.

a. heart
b. ravioli
**c. alveoli** *(see page 60-61 and fig 4-6)*
d. bronchioli

21. The two Laws best used to describe the moving of oxygen and carbon dioxide between the blood and the lungs are _____ Law and _____ Law.

a. Dalton's; Boyle's
b. Henry's; Graham's
c. Dalton's; Henry's
**d. Graham's; Fick's** *(see page 61)*

22. The bringing of oxygen through bloodstream to the cells of the body and removal of $CO_2$ from cells to the bloodstream is called _____ respiration.

a. internal
**b. cellular** *(see page 61)*
c. external
d. expiration

23. An iron-rich protein in the red blood cells that is responsible for transporting oxygen is called _____.

a. hypocapnia
b. alkalosis
c. hydrochloric acid
**d. hemoglobin** *(see page 61)*

24. **There are over 25 billion red blood cells in a typical adult male's body, and each red blood cell can transport approximately one _____ $O_2$ molecules.**

a. hundred
b. thousand
c. million
**d. billion** *(see page 62)*

25. **At _____ feet above MSL, 90 percent blood oxygen saturation is maintained, but above this altitude hemoglobin's capacity to "hold on" to oxygen is drastically reduced.**

a. 5,000
**b. 10,000** *(see page 63 and fig 4-7)*
c. 12,500
d. 14,000

26. **_____ is a state of oxygen deficiency in the blood, tissues, and cells enough to cause an impairment of body functions.**

**a. Hypoxia** *(see page 62)*
b. Hyperventilation
c. Anoxia
d. Hypoglycemia

27. **A reduction in the partial pressure of oxygen when flying at higher altitudes can lead to _____ hypoxia.**

**a. hypoxic** *(see page 63)*
b. histotoxic
c. hypemic
d. stagnant

28. **Which of the following symptoms is most likely to occur during the indifferent stage of hypoxia?**

a. loss of consciousness
b. impaired flight control
**c. decrease in night vision** *(see page 63)*
d. death

29. **A reduction in the oxygen-carrying capacity of the blood could lend to _____ hypoxia.**

a. hypoxic
**b. hypemic** *(see page 63, table 4-3, 68)*
c. histotoxic
d. stagnant

30. **Carbon monoxide (CO) in the blood can lead to _____ hypoxia.**

a. histotoxic
b. hypoxic
c. stagnant
**d. hypemic** *(see page 63, table 4-3, 68)*

31. **Pulling positive G's can result in _____ hypoxia**

a. hypemic
b. histotoxic
**c. stagnant** *(see page 63, table 4-3, 69)*
d. hypoxic

32. **Consumption of alcohol can lead to _____ hypoxia.**

a. stagnant
**b. histotoxic** *(see page 63, table 4-3, 69)*
c. hypemic
d. anemic

33. **Beginning around 10,000 feet MSL, a person's pulse rate, circulation, and breathing rate in the _____ stage of hypoxia begins to increase to make up for oxygen reduction.**

a. critical
b. indifferent
**c. compensatory** *(see page 64)*
d. disturbance

34. **Probably the most dangerous symptom of hypoxia (besides unconsciousness) is _____; and one of its most dangerous characteristics is _____.**

**a. euphoria; its insidious onset** *(see page 65)*
b. hot and cold flashes; its insidious onset
c. euphoria; cyanosis
d. its insidious onset; hypoxia

35. **The time between loss of oxygen supply and the loss of ability to successfully take corrective action is called the time of _____ consciousness (TUC)—also known as effective performance time (EPT).**

**a. useful** *(see page 65-66)*
b. useless
c. normal
d. enlightened

36. **EPTs (or TUC times) are drastically reduced when flying at altitudes above 12,500 feet MSL and range from about _____ minutes at 18,000 feet to only about _____ seconds at 37,000 feet.**

**a. 20; 20** *(see page 66, fig 4-8)*

b. 60; 60

c. 20; 100

d. 60; 200

37. **Hyperventilation will naturally begin as one climbs to or through 10,000 feet in the _____ stage of hypoxia.**

a. critical

b. disturbance

**c. compensatory** *(see page 66)*

d. indifferent

38. **Hyperventilation is caused by _____.**

**a. exhaling too much $CO_2$** *(see page 66)*

b. inspiring too much oxygen

c. too little oxygen

d. inhaling too much $CO_2$

39. **_____ leads to hypocapnia which leads to alkalosis.**

a. Decompression sickness (DCS)

b. Hypoxia

**c. Hyperventilation** *(see page 66)*

d. Anoxia

40. **Which factor does NOT contribute to hyperventilation?**

**a. Slow breathing** *(see page 66-67)*

b. Compensatory stage of hypoxia

c. Rapid breathing

d. Anxiety and stress

41. **Muscle activity with hyperventilation will be _____. With hypoxia it will be _____.**

a. flaccid; spastic

b. spastic; spastic

**c. spastic; flaccid** *(see page 67)*

d. weak; flaccid

42. **With hypoxia, the skin may appear somewhat _____; with hyperventilation it may appear somewhat _____.**

a. pale and clammy; blue
b. blue; cyanotic
c. pale and clammy; cyanotic
**d. cyanotic; pale and clammy** *(see page 67)*

43. **With hypemic hypoxia there is _____ oxygen in the lungs but _____ oxygen-carrying ability in the blood.**

a. sufficient; sufficient
**b. sufficient; insufficient** *(see page 68)*
c. insufficient; sufficient
d. insufficient; insufficient

44. **Steep turns, rapid recoveries from dives, or other aerobatic maneuvers can reduce blood flow (and $O_2$) to the brain. This is known as _____ hypoxia.**

a. hypoxic
b. hypemic
c. histotoxic
**d. stagnant** *(see page 69)*

45. **_____ hypoxia results when the body's cells/tissues fail to utilize the oxygen, due to the presence of alcohol, drugs, or poisons.**

**a. histotoxic** *(see page 69)*
b. hypoxia
c. stagnant
d. hypemic

46. **Physical activity in flight _____ the altitude at which hypoxic symptoms will first manifest themselves.**

a. increases
b. neutralizes
**c. lowers** *(see page 70)*
d. counters

47. **You may be more susceptible to _____ hypoxia after donating blood.**

**a. hypemic** *(see page 71)*
b. hypoxic
c. histotoxic
d. stagnant

48. **A continuous flow regulator provides a continuous flow of _____ even when the user is exhaling.**

**a. 100 percent oxygen** *(see page 71)*

b. 50 percent oxygen and 50 percent air

c. 50 percent oxygen

d. 100 percent air

49. **The continuous flow $O_2$ mask using a rebreather bag can be used up to _____ feet MSL.**

a. 18,000

**b. 25,000** *(see page 71)*

c. 34,000

d. 40,000

50. **A diluter-demand regulator provides oxygen to the mask _____.**

a. when inhaling and exhaling

**b. only during inhalation** *(see page 71)*

c. only during exhalation

d. only when above 25,000 feet

51. **A diluter-demand oxygen system mixes its oxygen with outside air increasing the percentage of oxygen until it is 100 percent at _____ feet.**

a. 18,000

b. 25,000

**c. 34,000** *(see page 71)*

d. 40,000

52. **Oxygen systems that use nasal cannulas can normally be used up to only _____ feet MSL.**

**a. 18,000** *(see page 71)*

b. 25,000

c. 34,000

d. 40,000

53. **In an unpressurized cabin, breathing 100 percent oxygen at _____ feet is the equivalent of alveolar $O_2$ pressure at sea level, while breathing 100 percent oxygen at _____ feet is the equivalent of alveolar $O_2$ pressure at 10,000 feet.**

**a. 34,000; 40,000** *(see page 71)*

b. 10,000, zero

c. 40,000; 34,000

d. zero; 10,000

54. **14 CFR §25.841 requires air in the cabin of commercial airliners be compressed to a cabin pressure altitude of not more than _____ feet when the airplane is flying at its maximum operating altitude.**

a. 5,000

**b. 8,000** *(see page 72)*

c. 10,000

d. 12,500

55. **A gradual decompression occurs when the cabin pressure equalizes with that of the outside environment within _____.**

a. less than 0.5 seconds

b. 0.5 to 10 seconds

**c. more than 10 seconds** *(see page 72)*

d. less than 10 seconds

56. **A rapid decompression occurs when the cabin pressure equalizes with that of the outside environment within _____.**

a. less than 0.5 seconds

**b. 0.5 to 10 seconds** *(see page 72)*

c. more than 10 seconds

d. more than 20 seconds

57. **An explosive decompression occurs when the cabin pressure equalizes with that of the outside environment within _____.**

**a. less than 0.5 seconds** *(see page 72)*

b. 0.5 to 10 seconds

c. more than 10 seconds

d. less than 10 seconds

58. **_____ decompressions are potentially the most dangerous type of decompressions since the crew may not notice the cabin altitude is going up.**

a. Explosive

b. Rapid

**c. Gradual** *(see page 72)*

d. Sudden

59. **The biggest threat to an airline crew and passengers from a sudden decompression at FL350 is _____.**

**a. hypoxia** *(see page 73)*

b. flying debris

c. cold temperatures

d. being sucked out the window

60. **U.S. commercial flight crews must use supplemental $O_2$ at cabin altitudes above 10,000 feet (§121.327) or when flying in excess of 30 minutes (§135.89) between 10,000 and _____ feet.**

a. 11,000

**b. 12,000** *(see page 73, table 4-8)*

c. 13,000

d. 14,000

61. **U.S. §91.211 requires pilots to use supplemental $O_2$ between cabin altitudes of _____ to 14,000 feet (10,000 to 13,000 feet in Canada, CAR 605.31) when flying in excess of 30 minutes.**

a. 10,000

b. 12,000

**c. 12,500** *(see page 73, table 4-8)*

d. 13,000

62. **Which practice is usually the *most* effective method of treating hyperventilation?**

a. Talking or singing

b. Speeding up rate of breathing

**c. Breathing in and out of a paper bag that is sealed over the nose and mouth** *(see page 74)*

d. Opening fresh air vents

63. **A commonly used acronym to check for proper functioning of onboard oxygen equipment is the PRICE check, which stands for pressure, _____, indicator, connections and emergency supply (regulations for airline flights require the latter).**

**a. regulator** *(see page 76)*

b. risk discombobulator

c. real capacitor

d. regenerator

## True/False

1. **Of all the gases in the atmosphere, nitrogen is the most critical in maintaining life.**

a. True

**b. False** *(see page 55)*

2. **As you climb (or descend) through the atmosphere, pressure changes more rapidly at higher altitudes (e.g., between 30,000 and 40,000 feet) than at lower altitudes (e.g., between 5,000 and 15,000 feet).**

a. True

**b. False** *(see page 56)*

3. As you climb in the troposphere, the percentage of oxygen decreases.

   a. True

   **b. False** *(see page 58)*

4. An excess of $CO_2$ levels in the blood sends a signal to the brain to begin inhalation.

   **a. True** *(see page 59)*

   b. False

5. Each alveolus in the lungs is surrounded by a network of tiny capillaries each having a wall only one cell in thickness (1/50,000th of an inch) that allows $O_2$ and $CO_2$ to diffuse back and forth.

   **a. True** *(see page 61 and fig 4-6)*

   b. False

6. After taking a breath, the higher partial pressure oxygen in the alveoli diffuses into the blood and the higher partial pressure $CO_2$ in the blood diffuses back into the alveoli.

   **a. True** *(see page 61 and fig 4-6)*

   b. False

7. Cellular respiration brings $O_2$ through the lungs to the blood and $CO_2$ from the bloodstream back through the lungs.

   a. True

   **b. False** *(see page 60-61)*

8. Hemoglobin (Hb) combines with $O_2$ to form oxyhemoglobin ($O_2Hb$) which enables blood to carry about 70 times the amount of $O_2$ than if $O_2$ was in simple solution in the blood.

   **a. True** *(see page 61)*

   b. False

9. Hypoxic hypoxia is also called altitude hypoxia, or hypobaric hypoxia, because flying at higher altitudes is the major cause of this type of hypoxia.

   **a. True** *(see page 63)*

   b. False

10. The retina of the eye has the highest oxygen demand and the lowest deprivation tolerance of any human structure.

    **a. True** *(see page 63)*

    b. False

11. The name used to describe the disturbance stage of hypoxia is a misnomer since hypoxic disturbances, or symptoms, can also occur well below the 15,000-foot bottom threshold of this stage.

    **a. True** *(see page 64)*

    b. False

12. Signs of hypoxia can be observed by others and are therefore considered objective, while symptoms of hypoxia are felt by an individual and are considered subjective.

    **a. True** *(see page 64)*

    b. False

13. The first symptom of hypoxia could be unconsciousness.

    **a. True** *(see page 64)*

    b. False

14. The "blueberry effect," where lips, fingernails, and other extremities turn bluish, is a sign that a person may be hypoxic.

    **a. True** *(see page 65)*

    b. False

15. The sense of touch, pain, and hearing may be diminished if hypoxic.

    **a. True** *(see page 65)*

    b. False

16. Psychomotor functions, such as muscle co-ordination and fine muscular movements may be negatively affected, and a person may have trouble speaking and may stammer if hypoxic.

    **a. True** *(see page 65)*

    b. False

17. The average adult brain accounts for about two percent of a person's body weight yet it needs at least 20 percent of the body's $O_2$ intake to function effectively.

    **a. True** *(see page 65)*

    b. False

18. A person experiencing hypoxia may experience basic personality traits and emotions that are like what they experience from alcohol intoxication.

    **a. True** *(see page 66)*

    b. False

19. The word “hyperventilation” means overbreathing.

    **a. True** *(see page 66)*

    b. False

20. Hyperventilation leads to an abnormal gain of carbon dioxide ($CO_2$) in the body.

    a. True

    **b. False** *(see page 66)*

21. The presence of muscle spasms indicates hypoxia, not hyperventilation.

    a. True

    **b. False** *(see page 67)*

22. Fear or anxiety is a major cause of hyperventilation; therefore, it is more likely to occur among your inexperienced and uninformed passengers.

    **a. True** *(see page 74*

    b. False

23. The signs and symptoms of hypoxia and hyperventilation are usually different from each other.

    a. True

    **b. False** *(see page 67)*

24. Carbon monoxide has an affinity for hemoglobin (Hb) that is 200 to 300 times greater than oxygen and combines with hemoglobin to form carboxyhemoglobin (COHb).

    **a. True** *(see page 68)*

    b. False

25. Fatal aircraft accidents have resulted from pilots being exposed to CO from leaky heating systems in small aircraft.

    **a. True** *(see page 68)*

    b. False

26. The average cigarette smoker is at a physiological altitude of about 5,000 feet higher than a non-smoker.

    **a. True** *(see page 70)*

    b. False

27. According to incident data, most decompressions are gradual, few are rapid, and fewer still are explosive.

    **a. True** *(see page 72)*

    b. False

28. **Larger cabins are more likely to experience explosive decompressions (e.g., following a window failure).**

    a. True

    **b. False** *(see page 72)*

29. **In most decompressions, the major threat to health and safety does not occur during the decompression event itself, but after it takes place.**

    **a. True** *(see page 73)*

    b. False

30. **Because of the degassing effect, EPT/TUC times are reduced by one-half if a rapid decompression occurs.**

    **a. True** *(see page 73)*

    b. False

31. **Flight at and above 50,000 feet MSL requires sealed cabin or pressure suit.**

    **a. True** *(see page 73, table 4-8)*

    b. False

32. **Supplemental oxygen use in the United States is not required for pilots operating under Part 91 regulations when flying at or below 12,500 feet MSL. However, that doesn't mean it is safe; between 10,000 feet 12,500 feet MSL your body is trying to compensate from reduced $O_2$ partial pressure, and you will likely experience deleterious hypoxia symptoms if flying long enough at or near the upper altitude of this regulation.**

    **a. True** *(see page 74)*

    b. False

33. **Hypoxia and hyperventilation can occur simultaneously.**

    **a. True** *(see page 74)*

    b. False

34. **Indifference, apathy, or euphoria are considered by specialists to be "bad" hypoxia symptoms, while headaches, nausea, hot and cold flashes, or tingling of the skin are considered "good" symptoms.**

    **a. True** *(see page 74)*

    b. False

35. **If you donate blood, Transport Canada recommends that you wait at least 48 hours before resuming flying activities and the FAA recommends that you not fly for 24 hours if you give one unit (about a pint), or 72 hours if you give more than one unit of blood.**

    **a. True** *(see page 75)*

    b. False

36. Aviator's breathing oxygen is drier and purer than $O_2$ used for other purposes.

    **a. True** *(see page 76)*

    b. False

37. You should avoid using petroleum-based lip balms when using oxygen.

    **a. True** *(see page 76)*

    b. False

38. The general procedure should your aircraft experience a sudden decompression at an airline cruising altitude is for you and your crew to troubleshoot the cause, then conduct an emergency descent to a safe altitude, then don oxygen masks (ensuring they are delivering a 100 percent supply of oxygen).

    a. True

    **b. False** *(see page 77)*

## Essay

1. List and very briefly describe at least three serious physiological effects (signs or symptoms) of hypoxia.

2. What is meant by "good" and "bad" symptoms of hypoxia? Aren't they all bad? List some of the good symptoms of hypoxia and some of the bad symptoms.

3. After flying for three hours in a light aircraft at 12,000 feet, your passenger experiences mental confusion, nausea, and dizziness. You are not sure if he is experiencing hypoxia or hyperventilation. What procedures should you implement to assist him?

4. List and briefly explain at least three strategies you can take to avoid hypoxia and recover from it should you experience it.

5. List and briefly explain the procedures you should follow if your aircraft experiences a sudden decompression at FL370.

# Chapter 5: Trapped and Evolved Gases

## Exam Question Bank

## Multiple Choice

1. _____ Law states that the amount of gas dissolved in a solution is directly proportional to the pressure of the gas over the solution.

   **a. Henry's** *(see page 81)*
   b. Dalton's
   c. Boyle's
   d. Graham's

2. A gas under enough pressure will _____, and when the pressure is reduced it will _____ back into gaseous form.

   a. dissolve; go into solution
   b. evolve; come out of solution
   c. evolve; dissolve
   **d. dissolve; evolve** *(see page 81)*

3. The _____ involve $N_2$ bubbling into the joints and muscles of the knees, shoulders, elbows, wrists or hands, ankles or feet, and rarely the hips.

   **a. bends** *(see page 82)*
   b. staggers
   c. chokes
   d. creeps

4. $N_2$ bubbles near the nerves of the skin causes the _____.

   a. bends
   b. chokes
   **c. creeps** *(see page 83)*
   d. staggers

5. A prickling, tingling, or itching of the skin caused by altitude decompression sickness (DCS) is called _____.

   a. scotoma
   **b. paresthesia** *(see page 83)*
   c. a headache
   d. aphasia

6. **$N_2$ bubbles in the lungs can cause the _____.**

   a. bends
   b. staggers
   **c. chokes** *(see page 83)*
   d. creeps

7. **The _____ (neurological manifestations) are the least common symptoms of DCS but are very serious and can result in death.**

   a. creeps
   **b. staggers** *(see page 83)*
   c. chokes
   d. bends

8. **A loss of vision in part of the visual field due to DCS, is known as _____.**

   a. aphasia
   b. paresthesia
   c. headache
   **d. scotoma** *(see page 83)*

9. **_____ is the inability to use or understand words and can occur with DCS.**

   a. A scotoma
   b. The creeps
   **c. Aphasia** *(see page 83)*
   d. Incontinence

10. **DCS is normally only a problem above _____ feet but occasionally can occur as low as 18,000 feet.**

    a. 10,000
    **b. 25,000** *(see page 83)*
    c. 35,000
    d. 45,000

11. **Trapped gases in the body's cavities can best be explained by _____ law.**

    a. Henry's
    b. Dalton's
    **c. Boyle's** *(see page 84)*
    d. Charlie's

12. _____ Law states that the volume of gas is inversely proportional to its pressure.

a. Henry's
b. Dalton's
**c. Boyle's** *(see page 84)*
d. Charlie's

13. Compared to sea level, the volume of trapped gas in the body increases by a factor of _____ at 43,000 feet MSL.

a. 2
b. 4
**c. 6** *(see page 84-85 and fig 5-3)*
d. 8

14. During a climb to altitude you are most likely to experience trapped gas problems in the _____.

a. middle ear and GI tract
b. middle ear and sinuses
c. sinuses and teeth
**d. GI tract and teeth** *(see page 85)*

15. During a descent you are most likely to experience trapped gas problems in the _____.

**a. middle ear and sinuses** *(see page 85)*
b. GI tract and sinuses
c. middle ear and teeth
d. GI tract and teeth

16. Trapped gas in the _____ is probably the most common problem associated with trapped air during altitude changes.

a. teeth
b. sinuses
**c. middle ear** *(see page 86)*
d. joints and muscles

17. _____ involves trapped gas in the middle ear.

**a. Barotitis media** *(see page 85-86)*
b. Barodontalgia
c. Barosinusitis
d. Baronostalgia

18. **Why do your ears "pop" on ascent?**

    **a. Higher pressure in middle ear** *(see page 86)*
    b. Lower pressure in middle ear
    c. Lower pressure in inner ear
    d. Higher pressure in outer ear

19. **Trapped gas in the _____ ear is more of a problem on _____.**

    **a. middle; descent** *(see page 86)*
    b. middle; ascent
    c. inner; ascent
    d. outer; descent

20. **A delayed ear block can occur after landing from breathing 100 percent oxygen in flight. This is known as _____.**

    a. bad luck
    **b. oxygen ear** *(see page 86)*
    c. barodontalgia
    d. barosinusitis

21. **Sometimes higher-than-normal middle ear pressures from an ear block or from performing a Valsalva maneuver can stimulate the vestibular apparatus in the inner ear inducing temporary dizziness or a spinning sensation. This is known as _____.**

    **a. pressure vertigo** *(see page 86)*
    b. oxygen ear
    c. barodontalgia
    d. barovestibulitis

22. **_____ involves trapped gas in the sinuses.**

    a. Pressure vertigo
    **b. Barosinusitis** *(see page 87)*
    c. Barodontalgia
    d. Barotitis media

23. **_____ involves trapped gas in the teeth.**

    a. Pressure vertigo
    b. Barosnusitis
    **c. Barodontalgia** *(see page 87)*
    d. Barotitis media

24. **In a dive to only 33 feet below the surface, the external pressure exerted on the body, and subsequently the amount of nitrogen absorbed in the body's tissues and fluids, increases by a factor of _____.**

    a. 1

    **b. 2** *(see page 88)*

    c. 3

    d. 4

25. **Flight after scuba-diving is not recommended for at least _____.**

    a. 2 hours

    b. 12 hours after a decompression (controlled ascent) dive

    **c. 24 hours after a decompression (controlled ascent) dive** *(see page 88)*

    d. 1 week

26. **Flight after scuba-diving is not recommended for at least _____.**

    a. 2 hours

    **b. 12 hours after a non-decompression dive** *(see page 88)*

    c. 24 hours after a non-decompression dive

    d. 1 week

27. **_____ is the process of ridding the body of excess nitrogen before flights above 18,000 feet by breathing 100 percent oxygen for at least 30 minutes. It is generally only used by military flight crews and astronauts.**

    a. Postoxygenation

    **b. Denitrogenation** *(see page 88)*

    c. Urination

    d. Coagulation

## True/False

1. **Evolved gas disorders are caused by gasses in solution, principally $N_2$ evolving into a gaseous state, forming bubbles in the tissues and blood.**

    **a. True** *(see page 81)*

    b. False

2. **The creeps is the most common symptom of decompression sickness among aircrew.**

    a. True

    **b. False** *(see page 82)*

3. **Taking deep breaths is the best way to fight the symptoms of the chokes.**

   a. True

   **b. False** *(see page 83)*

4. **Less than 1 percent of DCS symptoms occur at 18,000 feet.**

   **a. True** *(see page 83, 84)*

   b. False

5. **Pilots with high body fat and a higher body mass index (BMI) are at greater risk of experiencing altitude DCS.**

   **a. True** *(see page 83)*

   b. False

6. **Compared to pilots over 42 years of age, 18- to 21-year-old pilots are three times more likely to experience altitude DCS.**

   a. True

   **b. False** *(see page 83)*

7. **Exercising or moving your joints reduces the symptoms of DCS and raises the altitude at which DCS symptoms will occur.**

   a. True

   **b. False**

8. **Pressure build-up in the middle ear will occur faster, and clearing the ears will be harder, when descending the same distance in the lower altitudes (e.g., between 5,000 feet and sea-level) compared to higher altitudes (e.g., between 20,000 and 15,000 feet MSL).**

   **a. True** *(see page 86)*

   b. False

9. **The eustachian tube is effectively a one-way valve making it more difficult to clear your ears on ascent.**

   a. True

   **b. False** *(see page 86)*

10. **The greatest pain with trapped gas in the sinuses is likely to be encountered at lower altitudes (compared to higher altitudes) since this is where the rate of pressure change is the most.**

    **a. True** *(see page 87)*

    b. False

11. **The onset of a toothache with altitude gain rarely occurs in flight.**

    **a. True** *(see page 87)*

    b. False

12. **Sometimes you may think you are experiencing toothache, but it could be referred pain from the maxillary sinuses when you have a bad cold or sinus infection.**

    **a. True** *(see page 87)*

    b. False

13. **Congestion in the frontal sinuses can cause pain after landing—pain that feels like an ice pick in the forehead.**

    **a. True** *(see page 87)*

    b. False

14. **DCS can occur at altitudes much lower than 18,000 feet if a pilot or passenger has recently been scuba diving.**

    **a. True** *(see page 88)*

    b. False

15. **Regardless of the type of dive (controlled ascent or not) flight after scuba-diving is not recommended for at least 24 hours if flying above 8,000 feet MSL (even if the cabin altitude is pressurized to 8,000 feet or below).**

    **a. True** *(see page 88, 89)*

    b. False

16. **It is strongly recommended that you avoid exercise for at least 24 hours after being exposed to DCS altitudes.**

    **a. True** *(see page 89)*

    b. False

17. **It is strongly recommended that you avoid drinking alcohol for at least 12 hours after being exposed to DCS altitudes—you may erroneously think your symptoms are only those of alcohol intoxication.**

    **a. True** *(see page 89)*

    b. False

18. **If you feel your ears are plugging up frequently during descent, you should perform the Valsalva maneuver less often to prevent excessive pressure build-up in the middle ear especially if the rate of descent is steep.**

    a. True

    **b. False** *(see page 90)*

19. You should never use the Valsalva maneuver to clear your ears during a climb.

    **a. True** *(see page 90)*

    b. False

20. You should avoid eating too much and too quickly before flight to avoid trapped gas in the GI tract.

    **a. True** *(see page 90)*

    b. False

21. You could experience an eardrum rupture if you don't properly clear your ears on descent.

    **a. True** *(see page 90)*

    b. False

22. If you experience an ear blockage, you should consider re-ascending back up to a higher altitude, administering nose spray, and then slowly descend while performing the Valsalva maneuver more frequently.

    **a. True** *(see page 90)*

    b. False

23. Trapped gas in the GI tract can be avoided by eating raw apples and drinking sodas before flight.

    a. True

    **b. False** *(see page 90)*

## Essay

1. Briefly describe what causes DCS and what altitudes it normally manifests itself.

2. List and briefly explain at least three countermeasures you as a pilot can use to avoid DCS.

3. List and briefly describe the procedures you should follow if your aircraft experiences a sudden decompression at FL370.

4. List and briefly describe at least three physiological effects (symptoms) of trapped gas in the body.

5. List at least three strategies for reducing the severity of trapped gas in each of the following: the GI tract, sinuses, and middle ear.

# Chapter 6: Vision

## Exam Question Bank

## Multiple Choice

1. **_____ is a pilot's most important sense when it comes to obtaining information needed to safely fly an aircraft.**
   a. Gustation
   **b. Vision** *(see page 93)*
   c. Audition
   d. Proprioception

2. **Focusing on an object involves changing the shape of the lens of the eye, a process called _____.**
   a. concentration
   b. presbyopia
   **c. accommodation** *(see page 95-96)*
   d. adaptation

3. **The eyes employ a "dual-receptor" system: _____ vision primarily involves cones for the day and _____ vision uses rods during the darkness of night.**
   a. scotopic, photopic
   b. mesopic, scotopic
   **c. photopic, scotopic** *(see page 96)*
   d. photopic; mesopic

4. **Visual _____ is ability to discriminate fine detail.**
   a. conspicuity
   b. annuity
   **c. acuity** *(see page 96)*
   d. perspicuity

5. **Looking directly at an object in daylight conditions involves focal or _____ vision.**
   **a. foveal** *(see page 96-97)*
   b. ambient
   c. peripheral
   d. rod

6. **_____ vision is good at detecting motion and is crucial in determining our orientation in space.**

   a. Focal

   **b. Ambient** *(see page 97)*

   c. Foveal

   d. Central

7. **_____ is a nearsightedness that occurs at high altitudes, in reduced visibility, and at night.**

   a. Adaption

   **b. Empty-field myopia** *(see page 98)*

   c. Autokinesis

   d. Accommodation

8. **The absence of distinctive objects in one's visual field of view causes the eyes to focus at their resting state which, depending on the individual observer, ranges from only about two feet to two yards away. Under which condition below does this not occur?**

   **a. Empty-field myopia** *(see page 98)*

   b. Night myopia

   c. Dark focus

   d. Focusing on a distant object

9. **Your best visual acuity is only good up to a maximum of one to two degrees from the center of the fovea in daylight conditions, which corresponds to size of a _____ held at arm's length.**

   **a. quarter***( see page 99 and fig 6-5 (page 97))*

   b. dime

   c. penny

   d. beach ball

10. **During pure scotopic vision there is/are _____ blind spot(s) in each eye.**

    a. 0

    b. 1

    **c. 2** *(see page 99)*

    d. 3

11. **The _____ occurs when the relative size of target increases very slowly until it's too close—then its relative size increases dramatically.**

    a. peripheral effect

    **b. blossom effect** *(see page 99)*

    c. Coriolis effect

    d. butterfly effect

12. **As light levels drop, the cones stop functioning while the rods continue increasing their sensitivity until the eyes can better see with lower light intensities. This process is called _____.**

a. fixation
b. accommodation
c. sublimation
**d. dark adaptation** *(see page 101)*

13. **The _____ shift describes what happens to color sensitivity when transitioning from photopic vision to scotopic vision.**

a. stick
b. red
**c. Purkinje** *(see page 102)*
d. paradigm

14. **Compared to cones during the day, rods are more sensitive to _____ light and less sensitive to _____ light at night.**

a. red; blue
b. red; green
c. red; blue
**d. blue; red** *(see page 102 and fig 6-9)*

15. **_____ vision occurs when the rods and cones are both activated.**

a. Scotopic
b. Photopic
**c. Mesopic** *(see page 102)*
d. Protopic

16. **It is recommended that _____ light be used for cockpit lighting.**

a. purple
b. red
**c. low-density white** *(see page 102)*
d. a strobe

17. **It is recommended that supplemental oxygen be used at or above _____ feet MSL at night.**

a. zero
**b. 5,000** *(see page 104)*
c. 10,000
d. 15,000

18. **The _____ has/have the highest oxygen demand and lowest oxygen deprivation tolerance of any human structure.**

a. heart

**b. retina** *(see page 104)*

c. lungs

d. toes

19. **At night, using pure night vision, a stationary light appears to move after staring at it for a few moments. This is called _____.**

a. flicker vertigo

b. a black hole

**c. autokinetic effect** *(see page 104)*

d. vertigo

20. **Sunlight passing through an airplane propeller or helicopter rotor blades can create a strobe-light effect at low RPM. This is known as _____.**

**a. flicker vertigo** *(see page 105)*

b. a black hole

c. autokinetic effect

d. vertigo

21. **_____ involves impaired focusing on distant objects.**

**a. Nearsightedness** *(see page 107)*

b. Dark adaptation

c. Presbycusis

d. Farsightedness

22. **_____ occurs when the image is focused behind the retina, causing blurred vision for close objects and clear vision for distant objects.**

a. Nearsightedness

b. Dark adaptation

c. Presbycusis

**d. Farsightedness** *(see page 108)*

23. **_____ is caused by an irregularly shaped cornea or lens that causes blurred vision from images focusing unevenly on the retina.**

**a. Astigmatism** *(see page 108)*

b. Nearsightedness

c. Presbyopia

d. Farsightedness

24. **Vision loss associated with aging is referred to as _____.**

    a. presbycusis
    b. nearsightedness
    c. dark-focus
    **d. presbyopia** *(see page 108)*

25. **Looking slightly to the side of an object during _____ vision projects the image onto the peripheral rods making identification easier.**

    a. photopic
    **b. scotopic** *(see page 110)*
    c. day
    d. mesopic

## True/False

1. **The amplitude of light determines the color of objects, while the wavelength of light determines the intensity (brightness) of the light.**

    a. True
    **b. False** *(see page 94)*

2. **The retina is at the back of the eyeball and contains the photoreceptors—the rods and cones—that convert incoming light energy into neural impulses which are sent to the brain via the optic nerve.**

    **a. True** *(see page 95)*
    b. False

3. **Images that strike your retina are reversed and inverted.**

    **a. True** *(see page 96)*
    b. False

4. **Most cones are located at the center of the retina and are responsible for providing color vision during daylight conditions. The rods are in the periphery of vision and provide black-and-white vision under conditions of low light.**

    **a. True** *(see page 96)*
    b. False

5. **Normal binocular field of view is about 200 degrees horizontal and about 120 degrees vertical.**

    **a. True** *(see page 97 and fig 6-6)*
    b. False

6. 14 CFR §91.113(b) states that "when weather conditions permit, regardless of whether an operation is conducted under instrument flight rules or visual flight rules, vigilance shall be maintained by each person operating an aircraft so as to see and avoid other aircraft." However, the most common cause of midair collisions (MACs) cited by accident investigators is still the failure of pilots to see and avoid other aircraft.

   **a. True** *(see page 98)*

   b. False

7. Using only one eye, a jumbo jet will be undetectable as close as 1.5 miles away if its image falls on its blind spot.

   **a. True** *(see page 98)*

   b. False

8. The FAA's AIM states that an aircraft seven miles away, that appears in sharp focus when looking directly at it with foveal vision, needs to be as close as seven-tenths of a mile away in order to be recognizable when using only peripheral vision.

   **a. True** *(see page 99)*

   b. False

9. If an aircraft appears stationary on your windscreen you could be on a collision course.

   **a. True** *(see page 99)*

   b. False

10. A stationary image that falls on your peripheral vision is difficult to detect.

    **a. True** *(see page 99)*

    b. False

11. Staring directly at a dimly lit object during pure night vision will make seem to disappear.

    **a. True** *(see page 99)*

    b. False

12. The minimum midair collision avoidance reaction time is about 12 seconds.

    **a. True** *(see page 99-100 and fig 6-8)*

    b. False

13. The odds of experiencing a fatal accident in a GA aircraft are more than doubled when flying at night, with night IMC having the highest lethality rate increasing the probability of a fatal accident by five.

    **a. True** *(see page 101)*

    b. False

14. Dark adaptation normally takes about 30 minutes.

    **a. True** *(see page 101)*

    b. False

15. A day at the beach will decrease your dark adaptation time at night.

    a. True

    **b. False** *(see page 101)*

16. It is recommended that you fly with the interior cockpit lights at full-bright settings at night when flying near the vicinity of a thunderstorm.

    **a. True** *(see page 102)*

    b. False

17. Color vision is absent when using pure scotopic vision; colors are seen as various shades of gray.

    **a. True** *(see page 102)*

    b. False

18. It is estimated that the best visual acuity for pure rod vision is about 20/200 using the Snellen visual acuity scale.

    **a. True** *(see page 103)*

    b. False

19. The reason for using supplemental oxygen at night is night air is thinner than day air.

    a. True

    **b. False** *(see page 104)*

20. Females are more likely to suffer from a color deficiency (or color-blindness) than males.

    a. True

    **b. False** *(see page 106)*

21. A person with 20/40 vision can see at 40 feet what the normal person can see at 20 feet.

    a. True

    **b. False** *(see page 107)*

22. If corrective lenses are necessary for 20/20 vision, regulations require pilots to wear them while exercising the privileges of their pilot certificate. The rules also require that Canadian pilots carry an extra pair while flying, but U.S. pilots are not required to carry an extra pair while flying in the United States.

    **a. True** *(see page 108)*

    b. False

23. **Studies have shown that night blindness can be induced within 60 days in normal individuals who have been put on a diet lacking Vitamin A.**

    **a. True** *(see page 109)*

    b. False

24. **The decision to correct your vision with procedures such as photorefractive keratectomy (PRK) and laser-assisted in situ keratomileusis (LASIK) should not be made until you have consulted the FAA literature on the subject and an experienced eye surgeon familiar with flight crew medical requirements.**

    **a. True** *(see page 109)*

    b. False

25. **The use of fast, wide-sweeping eye movements is the most effective way of seeing other aircraft in flight.**

    a. True

    **b. False** *(see page 109)*

26. **A study of MACs revealed that very few were from head-on and 82 percent involved faster aircraft overtaking a slower one from behind.**

    **a. True** *(see page 109)*

    b. False

27. **Studies show that most pilots scan the entire sky when looking for other aircraft.**

    a. True

    **b. False** *(see page 109)*

28. **Refocusing on a distant object (ground feature, wingtip, etc.) during empty-field conditions will help overcome empty-field myopia.**

    **a. True** *(see page 109)*

    b. False

29. **Polarized sunglasses are recommended for aviators.**

    a. True

    **b. False** *(see page 109)*

30. **If you can't avoid exposure to bright lights while taxiing, avoid exposure to bright lights by closing one eye to preserve dark adaptation in the other.**

    **a. True** *(see page 110)*

    b. False

31. For easier identification of dimly lit objects at night, you should look directly at them.

    a. True

    **b. False** *(see page 110)*

32. For easier identification of dimly lit objects at night, use off-centered vision; looking slightly to the side of it (about 20 degrees from center) will project it onto the location of maximum peripheral rod density.

    **a. True** *(see page 110)*

    b. False

33. Your personal weather minimums during NVFR flight should be the same as they are in the day.

    a. True

    **b. False** *(see page 110)*

## Essay

1. Explain what happens in the eye when transitioning from daylight to night vision.

2. What are some problems with using red light as the sole source of cockpit illumination during flight?

3. List and very briefly describe at least three major physiological visual limitations that affect MAC avoidance and at least four strategies necessary to avoid or effectively manage them.

4. List and very briefly describe at least four major physiological visual limitations that affect visual flight at night and at least four strategies necessary to avoid or effectively manage them.

# Chapter 7: Hearing and Noise

## Exam Question Bank

## Multiple Choice

1. **The physical characteristic of sound which gives the physiological and psychological sensation of pitch is called _____.**

   a. intensity

   **b. frequency (Hz)** *(see page 116)*

   c. wavelength (dB)

   d. modulation

2. **The frequency range for normal human hearing is between about _____ and _____ Hz.**

   **a. 20; 20,000** *(see page 116)*

   b. 500; 3,000

   c. 500; 50,000

   d. 5,000; 30,000

3. **Normal human speech ranges from about _____ and _____ Hz.**

   a. 20; 40

   b. 200; 20,000

   **c. 500; 4,000** *(see page 116)*

   d. 5,000; 40,000

4. **The physical characteristic of sound which gives the physiological and psychological sensation of loudness is called _____.**

   a. frequency (Hz)

   **b. intensity (dB)** *(see page 116)*

   c. Hertz (Hz)

   d. modulation

5. **The organ of hearing is the _____.**

   a. auditory canal

   b. semicircular canals

   **c. cochlea** *(see page 117)*

   d. anvil

6. **The organ in which the back-and-forth movement of tiny hair cells hair cells is converted into neural impulses that are sent to the auditory cortex of the brain and interpreted as sound, is the _____.**

   a. hammer

   **b. cochlea** *(see page 117)*

   c. anvil

   d. semicircular canals

7. **The greatest aircraft noise source is _____ noise, which is divided into engine noise and _____ noise.**

   **a. external; airframe** *(see page 118)*

   b. internal; engine

   c. external; engine

   d. internal; environmental control systems (ECS)

8. **Aircraft engine noise is usually _____ during takeoff and _____ during descent.**

   a. higher; higher

   b. lower; higher

   c. lower; lower

   **d. higher; lower** *(see page 118)*

9. **Airframe noise is usually _____ at slower speeds and higher at the _____ speeds involved in cruise and descent.**

   a. higher; lower

   b. higher; higher

   **c. lower; higher** *(see page 118)*

   d. lower; lower

10. **Similar sounding _____ are more easily masked than _____; but both can be masked.**

    **a. consonants; vowels** *(see page 120)*

    b. vowels; consonants

    c. words; call signs

    d. words; consonants

11. **A comparison of speech intensity to noise intensity is called the _____.**

    a. intensity ratio (IR)

    b. pitch ratio (PR)

    c. loudness ratio (LR)

    **d. signal-to-noise ratio (SNR)** *(see page 120)*

12. **Speech intelligibility is _____ when the signal-to-noise ratio (SNR) is the highest.**

a. the least
**b. the greatest** *(see page 120)*
c. the lowest
d. acceptable

13. **_____ can occur after descent to the surface after breathing 100 percent oxygen in flight.**

a. Tinnitus
b. Presbycusis
c. Presbyopia
**d. Oxygen ear** *(see page 121)*

14. **_____, a common type of temporary hearing loss that occurs after exposure to elevated noise levels, such as after a long cross-country flight in a light aircraft, causes a decibel threshold shift, temporarily impairing the ability to hear sounds below that threshold.**

**a. Auditory fatigue** *(see page 121)*
b. Presbycusis
c. Presbyopia
d. Oxygen ear

15. **A ringing or buzzing sound in the ears is called _____.**

a. presbycusis
b. oxygen Ear
**c. tinnitus** *(see page 121)*
d. presbyopia

16. **Hearing loss associated with aging is referred to as _____.**

a. sinusitis
**b. presbycusis** *(see page 122)*
c. presbyopia
d. noise-induced hearing loss (NIHL)

17. **Most protective hearing devices reduce _____-frequency background noises, which enhances speech communication.**

a. low
b. down
**c. medium-to-high** *(see page 122)*
d. only high

## True/False

1. Noise can be defined as any sound that is loud, unpleasant, or unwanted.

   **a. True** *(see page 115)*

   b. False

2. Excessive noise on the flight deck has caused pilots to miss, or misinterpret, ATC clearances that have led to altitude busts, near midair collisions, and runway incursions.

   **a. True** *(see page 115)*

   b. False

3. Noise can contribute to fatigue.

   **a. True** *(see page 115)*

   b. False

4. The measurement of sound intensity is logarithmic and a rule of thumb for perceived loudness is that it doubles for every 10 dB increase in sound intensity.

   **a. True** *(see page 116)*

   b. False

5. Sound wave energy is substantially reduced when passing from a gas (air in outer ear) to a liquid (fluid in inner ear); but the unique mechanical arrangement of the middle ear makes up for this limitation by amplifying the sound energy by as much as 25 dB.

   **a. True** *(see page 117)*

   b. False

6. Airframe noise is partly a function of indicated airspeed (dynamic air pressure) expressed as $1/2\rho V^2$, where $\rho$ (rho) is the density of the air and V is the true airspeed. Therefore, the slower the airspeed and higher the altitude (lower air density), the greater the aerodynamic noise created around the aircraft's fuselage.

   a. True

   **b. False** *(see page 118)*

7. According to the FAA, GA aircraft noise levels are often a hundred times more intense than automobile noise.

   **a. True** *(see page 119)*

   b. False

8. An Australian study found that GA (single and twin piston-engine) airplane noise levels were lower, on average, than passenger transport aircraft (turbojets).

   a. True

   **b. False** *(see page 119)*

9. A recent study comparing the noise levels of a Cessna 172 and a Piper Seminole—two popular GA aircraft used in the United States—found that noise levels exceeded the National Institute for Occupational Safety and Health (NIOSH) standard of 85 dB for eight hours exposure.

   **a. True** *(see page 119)*

   b. False

10. When both speech and noise levels are about the same (SNR = 1), most speech communication is understood because of the context in which the individual words are used.

    **a. True** *(see page 120)*

    b. False

11. Since the 26 letters in English alphabet are not equiprobable, and because of sequential constraints, the English language has a very low redundancy.

    a. True

    **b. False** *(see page 120)*

12. Pilots are exposed to elevated levels of noise and are at higher risk of developing noise-induced hearing loss (NIHL).

    **a. True** *(see page 121)*

    b. False

13. Conductive hearing loss (CHL) arises out of complications in the outer and middle ear that cannot be treated with medication or surgery.

    a. True

    **b. False** *(see page 121)*

14. Sensorineural hearing loss (SNHL), or nerve deafness, that arises from loud noise/sounds that damage the tiny nerve fibers (hairs) in the Cochlea can often be treated with medication or surgery.

    a. True

    **b. False** *(see page 121)*

15. SNHL usually occurs in the lower frequencies making early detection difficult without regular hearing checks.

    **a. True** *(see page 122)*

    b. False

16. Active noise reduction (ANR) systems involves transmitting secondary waves of the same amplitude of the primary noise waves, but 180 degrees out of phase.

    **a. True** *(see page 122)*

    b. False

17. Moldable insert foam earplugs can reduce noise by as much as 60 dB.

    a. True

    **b. False** *(see page 123)*

18. To get the maximum benefit from insert-type foam earplugs, NIOSH recommends the roll, pull, and hold method.

    **a. True** *(see page 123)*

    b. False

19. Most headsets achieve a noise reduction rating (NRR) of no more than about 24 dB.

    **a. True** *(see page 123)*

    b. False

20. ANR headsets may attenuate important environmental sounds and alarm warnings, such as landing gear horns.

    **a. True** *(see page 124)*

    b. False

## Essay

1. List and very briefly describe at least three major effects of noise—both short- and long-term—on pilot performance.

2. List at least three strategies to reduce the effects of noise on communication in the flight environment.

3. List at least three strategies to mitigate hearing loss in the flight environment.

# Chapter 8: Acceleration and Flight

## Exam Question Bank

## Multiple Choice

1. **The study of the body's response to dynamic forces imposed upon it is called _____.**

   a. biostatics
   **b. biodynamics** *(see page 130)*
   c. hallucinogenics
   d. copacetics

2. **_____acceleration is a change in the speed of an object moving in a straight line, such as during a takeoff or landing roll, or when changing airspeed in flight.**

   a. Radial
   b. Angular
   **c. Linear** *(see page 130-131)*
   d. Circular

3. **_____acceleration occurs when there is a change in the direction of an object, such as occurs during a turn, or during a push into, or a pullout from, a dive.**

   **a. Radial** *(see page 131)*
   b. Angular
   c. Linear
   d. Circular

4. **_____ acceleration which involves both a change in speed and direction.**

   a. Radial
   **b. Angular** *(see page 131)*
   c. Linear
   d. Circular

5. **_____ acceleration ($+G_Z$) is headward acceleration (or eyeballs down) that you could experience in a steep turn, an inside loop or a pull-up from a dive.**

   a. Positive transverse
   **b. Positive vertical** *(see page 131)*
   c. Negative lateral
   d. Negative vertical

6. _____ acceleration ($-G_Z$) is footward acceleration (or eyeballs up) that you could experience in an inverted turn, inverted loop or when pushing over into a dive.

   a. Negative transverse
   b. Positive vertical
   c. Negative lateral
   **d. Negative vertical** *(see page 131)*

7. Situations in which significant $+G_Z$ does not occur are during _____.

   a. pull-ups from dives
   **b. rapid downdrafts** *(see page 132)*
   c. rapid updrafts
   d. steeply banked turns

8. Visual hypoxia brought on by $+G_Z$-induced blood stagnation is a form of _____ hypoxia.

   a. hypoxic
   b. hypemic
   c. histotoxic
   **d. stagnant** *(see page 134)*

9. _____ begins with vision dimming, a reduction of visual acuity and a loss of color vision and is usually followed by a reduction of peripheral vision (tunnel vision).

   a. G-induced loss of consciousness (G-LOC)
   b. Blackout
   **c. Grayout** *(see page 134)*
   d. Redout

10. _____ leads to a complete loss of vision from oxygen starvation in the retinal receptors.

    a. G-LOC
    **b. Blackout** *(see page 134)*
    c. Grayout
    d. Redout

11. Grayout and blackout are caused by _____ hypoxia.

    **a. stagnant** *(see page 134)*
    b. hypoxic
    c. histotoxic
    d. hypemic

12. **The most dangerous symptom associated with moderate to high levels of $+G_Z$ is _____.**

    **a. G-LOC** *(see page 135)*
    b. Blackout
    c. Grayout
    d. Redout

13. **G-LOC normally occurs at a sustained G of about _____ $+G_Z$.**

    a. 1
    b. 2
    c. 3
    **d. 5** *(see page 135)*

14. **A normal pilot without using any preventive measures will experience _____ when pulling $+6G_Z$.**

    a. blackout
    **b. G-LOC** *(see page 135)*
    c. grayout
    d. redout

15. **_____ incapacitation (_____ incapacitation) during G-LOC involves total unconsciousness that, depending on the G-onset rate and individual tolerance, lasts for about 12 to 20 seconds.**

    **a. Type I; absolute** *(see page 135)*
    b. Type I; relative
    c. Type II; absolute
    d. Type II; relative

16. **A common symptom after awaking from a G-LOC event is _____.**

    a. hypoxia
    b. hyperventilation
    **c. retrograde amnesia** *(see page 135)*
    d. acclimatization

17. **Redout is caused from blood pooling to head from too much _____.**

    a. $+G_Z$
    b. $+G_Y$
    c. $-G_Y$
    **d. $-G_Z$** *(see page 137)*

18. **What factor increases a pilot's tolerance level for $+G_Z$ acceleration?**

    a. Fatigue
    b. Very low blood pressure
    **c. Being a shorter person** *(see page 138)*
    d. Anemia

19. **What factor increases a pilot's tolerance level for $+G_Z$ acceleration?**

    a. Altitude hypoxia
    b. Hyperventilation
    c. Dehydration
    **d. Anaerobic conditioning** *(see page 138)*

20. **What factor reduces a pilot's tolerance level for $+G_Z$ acceleration?**

    a. Experience with G
    b. Normal temperatures
    c. Sufficient sleep
    **d. Hypoglycemia** *(see page 138)*

21. **Wearing an anti-G suit increases $+G_Z$ tolerance by as much as _____ $G_Z$.**

    **a. +2** *(see page 140)*
    b. +4
    c. +8
    d. +12

## True/False

1. **Acceleration is the rate of change of velocity.**

    **a. True** *(see page 130)*
    b. False

2. **Acceleration is defined as the change in speed and/or direction per unit of time.**

    **a. True** *(see page 130)*
    b. False

3. **The ratio of applied acceleration (a)—or aircraft-maneuver-induced acceleration—over the acceleration of gravity (g), is used to describe the total acceleration (or "G-force") on an aircraft and its pilot (G = a/g).**

    **a. True** *(see page 131)*
    b. False

4. In most normal flight situations, we usually experience $+G_Z$ acceleration in the vertical axis; mostly from the increased load factor involved in turns, but sometimes from rapid updrafts.

   **a. True** *(see page 140)*

   b. False

5. Even though your eyes and brain account for only about two percent of your body weight, they need at least 20 percent of your body's oxygen intake to function effectively.

   **a. True** *(see page 140)*

   b. False

6. At approximately +5 $G_Z$ (depending on individual tolerance) without any natural physiological compensatory mechanisms or human-designed protection measures, you will lose your vision and your consciousness within only a few seconds after the onset of $+G_Z$.

   **a. True** *(see page 140)*

   b. False

7. A pilot experiencing blackout could still be conscious.

   **a. True** *(see page 140)*

   b. False

8. Type I incapacitation during G-LOC is followed by Type II (relative incapacitation) that continues for about another 12 to 16 seconds and renders you unable to function normally because of mental confusion, disorientation and a general lack of understanding of what is going on.

   **a. True** *(see page 140)*

   b. False

9. It takes minimum of about 24 to 36 seconds to regain consciousness and figure what is going on after a G-LOC event. By then, if you were close to the ground when G-LOC occurred, you're probably dead.

   **a. True** *(see page 140)*

   b. False

10. No matter the $+G_Z$ level, you will be spared from symptoms for about 4 to 5 seconds after G-onset because of the residual storage of oxygen dissolved in the brain and eye tissues.

    **a. True** *(see page 140)*

    b. False

11. Thresholds for experiencing visual symptoms (grayout and blackout) increase after about 12 to 15 seconds because of a built-in cardiovascular reflex that compensates for low blood/oxygen pressure by increasing blood/oxygen pressure to the head.

    **a. True** *(see page 140)*

    b. False

12. Redout is caused by burst blood vessels in the eyes.

    a. True

    **b. False** *(see page 140)*

13. Pilots of shorter stature will experience the advesre effects of $+G_Z$ at lower thresholds than taller pilots.

    a. True

    **b. False** *(see page 140)*

14. An anti-G straining maneuver (AGSM) reduces the downward flow of blood during $+G_Z$ acceleration and can raise tolerance levels by as much as $+4G_Z$.

    **a. True** *(see page 140)*

    b. False

15. Your first symptom of excessive $+G_Z$ could easily be G-LOC.

    **a. True** *(see page 140)*

    b. False

16. The use of an anti-G pressure suit to combat $+G_Z$ symptoms is analogous to squeezing a tube of tooth-paste from the bottom.

    **a. True** *(see page 140)*

    b. False

## Essay

1. List and briefly describe the three major physiological effects that excess positive acceleration ($+G_Z$)—about $+3G_Z$ to $+5G_Z$—has on pilot performance while in flight.

2. What maneuvers should you avoid in order to avoid the adverse effects of excessive positive vertical G ($+G_Z$) acceleration?

3. List at least two strategies to reduce the effects of positive accelerations ($+G_Z$) in flight.

4. List and briefly describe at least two physiological effects that excess negative acceleration ($-G_Z$) has on pilot performance while in flight.

5. What maneuvers should you avoid in order to avoid the adverse effects of excessive negative vertical G ($-G_Z$) acceleration?

6. List at least two strategies to reduce the effects of negative accelerations ($-G_Z$) in flight.

# Chapter 9: Spatial Disorientation

## Exam Question Bank

## Multiple Choice

1. **A study conducted by the University of Illinois in the 1950s found that pilots with insufficient instrument flying ability lose control of their airplane in an average of only _____ once they lose outside visual references.**

   **a. 178 seconds** *(see page 147)*

   b. 10 minutes

   c. 7.5 minutes

   d. 10 seconds

2. **Which is *not* one of the three primary sensory systems that provide the information you need to correctly orient yourself in space?**

   a. Visual system

   b. Vestibular system

   c. Somatosensory system

   **d. Circulatory system** *(see page 147 and fig 9-1)*

3. **The _____ bodies, located in the non-auditory portion of inner ear, respond to linear acceleration, while the _____ apparatus, consisting of three semicircular fluid-filled canals, respond to angular acceleration.**

   a. otolith; otolith

   b. vestibular; otolith

   **c. otolith; vestibular** *(see page 148)*

   d. vestibular; vestibular

4. **_____ orientation (sometimes called *postural* or *proprioceptive* or *kinesthetic* orientation) involves sensors in our muscles, tendons, skin, and joints that respond only to acceleration (including gravity) and is often referred to as the "seat of the pants" sensations.**

   **a. Somatosensory** *(see page 150)*

   b. Vestibular

   c. Otolith

   d. Coriolis

5. **Sensory illusions involving primarily the semicircular canals are often referred to as _____ illusions.**

   a. somatogravic

   **b. somatogyral** *(see page 151)*

   c. somatological

   d. G-excess

6. **The _____ is one of the most common vestibular illusions.**

   a. elevator illusion

   b. graveyard spiral

   c. somatogravic illusion

   **d. leans** *(see page 151)*

7. **When a pilot erroneously perceives a bank in the opposite direction to the one she or he just rolled level from, and then attempts to align his or her body with the apparent vertical, this is called _____.**

   a. gyroscopic illusion

   **b. the leans** *(see page 151)*

   c. somatogravic illusion

   d. somatogyral acceleration

8. **The head tilt reflex is the natural tendency for pilots to automatically and unconsciously align their head with the visible (or perceived) horizon, not with the aircraft's vertical (or normal) axis. This is also called the _____.**

   a. somatogravic reflex

   **b. optokinetic cervical reflex** *(see page 152)*

   c. leans reflex

   d. Coriolis reflex

9. **After recovering from a prolonged spin (or spiral dive), you may experience a strong sensation of turning in the _____ direction of the original angular motion. This may cause you to inadvertently enter a spin (or spiral dive) in the _____ direction of the original spin (or spiral dive).**

   a. opposite; opposite

   b. same; same

   **c. opposite; same** *(see page 153)*

   d. same; opposite

10. **While making prolonged constant rate turns in IMC, an abrupt head movement can create a very strong illusion of rotation on an entirely different axis. This is known as _____.**

    a. autokinesis

    **b. the Coriolis illusion** *(see page 154)*

    c. the leans

    d. the somatogravic illusion

11. **Which illusion primarily involves the otolith bodies and somatosensory system?**

    a. the leans

    b. graveyard spin

    c. graveyard spiral

    **d. false climb illusion** *(see page 155)*

12. **The illusion of being in a nose-up attitude, which may occur during a rapid acceleration on takeoff or a go-around, is known as _____.**

    a. the graveyard spiral

    **b. the somatogravic or false-climb illusion** *(see page 155)*

    c. the Coriolis illusion

    d. autokinesis

13. **The _____ illusion involves strong illusory perceptions that occur with rapid head movement a high "+$G_Z$" environment.**

    a. somatogravic

    b. leans

    c. elevator

    **d. G-excess** *(see page 158)*

14. **After an abrupt level-off from a climb, a resultant vector which rotates backward and upward relative to the pilot can create the illusion of flipping backwards to an inverted (upside-down) position. This is called the _____ illusion.**

    a. elevator

    b. graveyard spiral

    c. Coriolis

    **d. inversion** *(see page 158)*

15. **In the absence of outside visual references, a strong updraft increases the strength of gravitational acceleration creating the sensation of a nose-high attitude. This is known as the _____ illusion.**

    **a. elevator** *(see page 158)*

    b. inversion

    c. somatogravic

    d. Coriolis

16. **Involuntary back-and-forth eye movement, called _____, could occur after a prolonged turn.**

**a. nystagmus** *(see page 159)*
b. quick scanning
c. alternobaric illusion
d. somatogravic illusion

17. **_____ is form of disorientation that involves spinning or twirling sensation of one's self or surroundings.**

a. The elevator illusion
b. The somaogyral illusion
c. The graveyard spiral
**d. Vertigo** *(see page 159)*

18. **_____ spatial disorientation (SD) occurs when you are unaware of your disorientation and subsequently base control of your aircraft on a false perception of your attitude.**

**a. Type I (unrecognized)** *(see page 159)*
b. Type I (recognized)
c. Type II (unrecognized)
d. Type II (recognized)

19. **_____ SD occurs when you are aware of your disorientation and are subsequently trying to fight it.**

a. Type I (unrecognized)
b. Type I (recognized)
c. Type II (unrecognized)
**d. Type II (recognized)** *(see page 159)*

20. **A pilot is more subject to spatial disorientation when _____.**

a. ignoring or overcoming the sensations of muscles and inner ear
**b. body sensations are used to interpret flight attitudes** *(see page 160)*
c. the eyes are moved often in the process of cross-checking the flight instruments
d. flying in VMC during the day

21. **Which of the following will not help you counter spatial disorientation?**

a. Obtain training and maintain proficiency in instrument flying
b. Transfer control to autopilot or another pilot
**c. Move you head quickly while in a turn** *(see page 154)*
d. Have confidence in your instruments and ignore all conflicting signals your body gives you

22. **Which procedure is recommended to prevent or overcome spatial disorientation?**

    a. rely on vestibular sense

    b. reduce eye movement to the greatest possible extent

    c. rely on the kinesthetic sense

    **d. rely entirely on the indications of the flight instruments** *(see page 160)*

## True/False

1. **The NTSB determined the deaths of John F. Kennedy Jr., his wife, Carolyn, and her sister, Lauren Bessette, was the result of SD during a descent over water at night.**

    **a. True** *(see page 146)*

    b. False

2. **During the first decade of this century alone, almost 1,000 people lost their lives in airline accidents involving SD.**

    **a. True** *(see page 146)*

    b. False

3. **According to FAA statistics, more than 90 percent of GA spatial disorientation accidents result in fatalities.**

    **a. True** *(see page 146)*

    b. False

4. **The semicircular canals react primarily to steady velocities, not accelerations.**

    a. True

    **b. False** *(see page 148)*

5. **The movement of the sensory hairs in the otolith membrane is the same when the head is tilted downward or when it is upright during forward linear acceleration.**

    a. True

    **b. False** *(see page 150)*

6. **After a prolonged level turn (at least 20 to 30 seconds), the fluid in the semicircular canals equilibrate but the somatosensory system will likely provide the sensation that the aircraft is in a wings-level climb in straight flight.**

    **a. True** *(see page 150)*

    b. False

7. **A USAF survey found that almost a third of the 2,582 pilots surveyed experienced the graveyard spiral while flying their current aircraft.**

   **a. True** *(see page 153)*

   b. False

8. **When you decelerate in poor visibility conditions or IMC, you may have the illusion of pitching up.**

   a. True

   **b. False** *(see page 155 and fig 9-9)*

9. **A common response to Type II SD is to suspect that your flight instruments are not working properly.**

   **a. True** *(see page 159)*

   b. False

10. **Type III (incapacitating) SD occurs when you are aware of your disorientation and can properly take positive control of your aircraft.**

    a. True

    **b. False** *(see page 159)*

11. **The best way to can avoid SD—or successfully defeat it if you experience it—is to learn how to rely on cockpit instrumentation designed to replicate the natural references of the outside world.**

    **a. True** *(see page 160)*

    b. False

12. **Especially helpful in overcoming SD is the use of the attitude indicator, a flight instrument that substitutes the natural horizon with an artificial one, providing you with a direct indication of the aircraft's pitch and bank attitude.**

    **a. True** *(see page 160)*

    b. False

13. **A study by the NTSB in 2010 found that GA aircraft equipped with digital glass cockpits had a lower fatal accident rate than those with conventional electro-mechanical, or so-called steam gauge, flight instrumentation.**

    a. True

    **b. False** *(see page 161)*

14. **Pilots, even those with significant experience in instrument flying, are strongly conditioned to use outside visual references, in what is called an outside spatial strategy, to maintain spatial orientation. This strategy is helpful in avoiding SD.**

    a. True

    **b. False** *(see page 162)*

15. **When flying VFR at night, you should supplement outside references with cockpit flight instruments to avoid vestibular, somatosensory, and visual illusions; and you should continue to rely on the cockpit flight instruments until the outside references are distinguishable enough to maintain accurate orientation.**

    **a. True** *(see page 162)*

    b. False

16. **Recent research indicates that the ability to accurately judge ceiling and visibility values from a moving airplane is a crucial component in avoiding VFR-into-IMC accident and most pilots are very good at it.**

    a. True

    **b. False** *(see page 163)*

## Essay

1. **List and briefly describe at least three different somatogyral (vestibular) illusions that lead to SD.**

2. **List and briefly describe at least three different somatogravic (somatosensory) illusions that lead to SD.**

3. **List and briefly describe at least five strategies to avoid or effectively overcome SD.**

# Chapter 10: Fatigue on the Flight Deck

## Exam Question Bank

## Multiple Choice

1. **The FAA defines _____ as a physiological state of reduced mental or physical performance capability resulting from lack of sleep or increased physical activity that can reduce a flight crewmember's alertness and ability to safely operate an aircraft or perform safety-related duties.**

   a. stress
   **b. fatigue** *(see page 173)*
   c. sleep
   d. circadian dysrhythmia

2. **Fatigue does not usually lead to _____.**

   **a. decreased reaction time** *(see page 174)*
   b. poor communication
   c. reduced vigilance
   d. forgetfulness

3. **Fatigue usually leads to _____.**

   a. decreased reaction time
   b. better communication
   c. increased vigilance
   **d. increased risk-taking** *(see page 175)*

4. **If you need 8 hours of sleep per night, and you only get 6 each night, after three days you will incur a _____-hour sleep debt.**

   a. 8
   **b. 6** *(see page 178)*
   c. 4
   d. 2

5. **Most _____ sleep occurs in the first two to three cycles at the beginning of the sleep period and its duration shortens until there is very little, if any, near the end of the sleep period.**

   **a. deep (stage 3 and 4)** *(see page 179)*
   b. deep (stage 1 and 2)
   c. light (stage 1 and 1)
   d. REM

6. **Most _____ sleep occurs in the latter cycles and its duration lengthens near the end of the sleep period.**

   a. deep (stage 3 and 4)
   b. deep (stage 1 and 2)
   c. light (stage 1 and 1)
   **d. REM** *(see page 179)*

7. **_____ involves waking up and going back to sleep several times during the sleep period, interrupting non-REM and REM sleep and reducing the overall quantity of sleep.**

   **a. Sleep fragmentation** *(see page 180)*
   b. Time awake
   c. Consolidated sleep
   d. Circadian desynchronization

8. **_____ occurs when pilots attempt to make up for sleep debt accrued during their regular sleeping periods by obtaining sleep during multiple short periods.**

   **a. Nonconsolidated sleep** *(see page 180)*
   b. Sleep fragmentation
   c. Insomnia
   d. Circadian resynchronization

9. **_____ occurs when your airway is blocked by relaxed throat muscles causing you to stop or pause your breathing during your sleep.**

   a. Periodic limb movement disorder (PLMD)
   **b. Obstructive sleep apnea (OSA)** *(see page 181)*
   c. Insomnia
   d. Circadian desynchronization

10. **The _____ is when core body temperature reaches its lowest during the day and occurs between about 0200 hours to 0600 hours.**

    a. period of REM sleep
    b. window of consolidated sleep (WOCS)
    c. circadian rhythm
    **d. window of circadian low (WOCL)** *(see page 182)*

11. **The most effective synchronizer, or time cue, to reset the body's internal biological clock to the actual time is _____.**

    a. meals
    b. social activities
    **c. light** *(see page 184)*
    d. sound

12. _____ dysrhythmia is another term for jet lag.

**a. Circadian** *(see page 184-185)*
b. Absolute
c. Relative
d. Music

13. Jet lag is usually worse when flying _____.

a. only westbound
b. north or south
**c. east or west** *(see page 185)*
d. only northbound

14. _____ flights generally produce more jet lag than _____ flights.

a. Westbound; eastbound
**b. Eastbound; westbound** *(see page 185)*
c. Northbound; westbound
d. Southbound; eastbound

15. Transient fatigue is _____ and cumulative fatigue is _____.

**a. short-term; long-term** *(see page 186)*
b. long-term; short-term
c. short-term; short-term
d. long-term; long-term

16. The type of fatigue you may experience after conducting a challenging approach and landing is called _____ fatigue.

a. chronic
b. cumulative
**c. transient** *(see page 186)*
d. physiological

17. Sleep _____ is a period of impaired performance and reduced vigilance after awakening from a regular sleep episode or a nap that lasts for about 15 to 30 minutes.

**a. inertia** *(see page 189)*
b. apnea
c. disorientation
d. consolidation

18. **Which of the following contributes to a good sleep?**

    a. Drink caffeine before bed

    b. Eat high-fat foods before bed

    c. Exercise right before bedtime

    **d. Avoid stressful thoughts and screen time before bed** *(see page 188)*

## True/False

19. **The Guantanamo Bay accident in 1993 was the first time the NTSB cited fatigue as the probable cause of an aircraft accident.**

    **a. True** *(see page 171)*

    b. False

20. **A survey of 1,424 pilots flying for 26 different U.S. regional air carriers found that 89 percent of them rated fatigue as a moderate or serious concern and 80 percent acknowledged having fell asleep during a flight at some time.**

    **a. True** *(see page 172)*

    b. False

21. **Except for only a brief period (2013 to 2015), reducing fatigue–caused transportation accidents has been on the NTSB's *Most Wanted List of Transportation Safety Improvements* list since it was first introduced in 1990.**

    **a. True** *(see page 172)*

    b. False

22. **Excess fatigue levels contribute to cognitive slowing that impairs seeing, hearing, attending, remembering, thinking and deciding.**

    **a. True** *(see page 174-175)*

    b. False

23. **Sustained attention, or vigilance, generally improves with time and is particularly strengthened when we are fatigued.**

    a. True

    **b. False** *(see page 174)*

24. **When we are tired, we have the tendency to focus, or fixate, our attention on just one stimulus at the expense of others that may be more important.**

    **a. True** *(see page 174)*

    b. False

25. An NTSB study of 37 major air carrier accidents found that flight crews who were awake for more than 12 hours made more tactical decision errors—such as making improper decisions and failing to change a course of action or heed warnings that suggest a change in a course of action is warranted—than did crewmembers who had been awake for less time.

    **a. True** *(see page 174)*

    b. False

26. Fatigue affects many higher-level cognitive abilities including one's ability to appreciate a difficult and rapidly changing situation, assess risk, anticipate the range of consequences, control mood and uninhibited behavior, communicate effectively, and avoid irrelevant distractions.

    **a. True** *(see page 175)*

    b. False

27. Moods tend to be more positive and improve with increasing levels of fatigue.

    a. True

    **b. False** *(see page 175)*

28. A fatigued person tends to avoid unnecessary risks.

    a. True

    **b. False** *(see page 175)*

29. Research has shown that most people are not good judges of their own fatigue and tend to overestimate their degree of tiredness.

    a. True

    **b. False** *(see page 175-176, 192)*

30. Reaction time is faster when fatigued.

    a. True

    **b. False** *(see page 176)*

31. Researchers have noticed that the cognitive and emotional deficits measured in fatigued individuals are like those who are intoxicated by alcohol.

    **a. True** *(see page 176)*

    b. False

32. Forty-three percent of U.K. pilots reported involuntarily falling asleep with a third of them waking up only to see their fellow pilot also asleep on the flight deck.

    **a. True** *(see page 177)*

    b. False

33. **A distinction should be made between physiological and subjective sleepiness: the former is how tired you feel, and the latter is how sleepy you really are.**

a. True

**b. False** *(see page 177, 182)*

34. **Pilots whose duty period begins later in the day (and whose duty time therefore ends later in the day) will be more fatigued at the end of their duty period than pilots who started their duty periods earlier in the day.**

**a. True** *(see page 178)*

b. False

35. **Non-REM sleep and REM sleep are both important components of a good night's sleep.**

**a. True** *(see page 179-180)*

b. False

36. **Alcohol and medication impede your ability to get quality sleep.**

**a. True** *(see page 180)*

b. False

37. **Using OTC sleep aids contributes to sleep loss or poor sleep quality.**

**a. True** *(see page 180)*

b. False

38. **The WOCL is the time of maximum physiological sleepiness and lowest cognitive performance and alertness.**

**a. True** *(see page 182-183 and fig 10-2)*

b. False

39. **We are generally the "sleepiest" in the early morning (0200 to 0600 hours) and late afternoon.**

**a. True** *(see page 182-183 and fig 10-2)*

b. False

40. **A secondary WOCL with its sleepiness and an associated drop in alertness and performance occurs about mid-morning between approximately 0900 and 1100 hours.**

a. True

**b. False** *(see page 183)*

41. **Maximum wakefulness generally occurs when body temperature is at its lowest and melatonin levels at their highest, generally mid-morning and early evening.**

a. True

**b. False** *(see page 183)*

42. **Our bodies have a natural cycle (or internal biological clock) of about 25 hours.**

**a. True** *(see page 184)*

b. False

43. **It generally takes about a day per time zone for your body to adjust to the new time zone.**

**a. True** *(see page 184)*

b. False

44. **Jet lag occurs when we travel north or south, not so much east or west.**

a. True

**b. False** *(see page 185)*

45. **Pilots report greater fatigue levels after five short flights that total 5 hours than after two longer ones that total 5 hours.**

**a. True** *(see page 186)*

b. False

46. **Humidity levels on the flight decks of commercial jet airplanes at cruise altitudes are typically high, contributing to dehydration and fatigue.**

a. True

**b. False** *(see page 186)*

47. **If you accumulate a "sleep debt" you must sleep the same number of hours that were originally lost in order to function properly.**

a. True

**b. False** *(see page 188)*

48. **Long commutes from home to base have been implicated in fatigue-related accidents.**

**a. True** *(see page 188)*

b. False

49. **Research has proven that napping is an effective strategy for restoring alertness and improving performance.**

**a. True** *(see page 189)*

b. False

50. It is generally easier to fall asleep during a nap if taken during one of the two daily WOCLs.

    **a. True** *(see page 189)*

    b. False

51. The FAA allows flight crews to use the "NASA nap," or controlled in-seat napping, on civilian flight decks.

    a. True

    **b. False** *(see page 190)*

52. Alcohol consumption reduces your total amount of REM sleep; an important component in healthy restorative sleep.

    **a. True** *(see page 190)*

    b. False

53. Strenuous exercise improves both sleep quality and quantity, especially immediately before going to bed.

    a. True

    **b. False** *(see page 191)*

54. NASA studies indicate that you should try to trick your body into staying in your departure time zone with layovers greater than 24 hours and try to adjust to the new time zone with layovers less than 24 hours.

    a. True

    **b. False** *(see page 191)*

## Essay

1. List at least four serious effects that sleep loss/disruption and fatigue have on pilot performance while in flight.

2. List and briefly explain at least four causes of fatigue in pilots.

3. What causes jet lag and what are some ways to combat it?

4. List and briefly explain at least four strategies to minimize fatigue.

5. Explain how to get a good night's sleep (i.e., what to do and what not to do).

# Chapter 11: Health Maintenance and Lifestyle

## Exam Question Bank

## Multiple Choice

1. **_____ is the term used to refer to any physiological or psychological condition that adversely affects your ability to safely control an aircraft.**

   a. Acclimatization

   **b. Incapacitation** *(see page 200)*

   c. Hyperventilation

   d. Desynchronization

2. **Terms such as sudden, subtle, total, and partial describe _____.**

   a. acclimatization

   **b. incapacitation** *(see page 200)*

   c. hyperventilation

   d. hypoxia

3. **Should you have a disqualifying medical condition that is considered _____ or _____, you may be granted a statement of demonstrated ability (SODA) by the FAA provided you can prove through a special medical flight test or practical test that you are capable of performing pilot duties without endangering public safety.**

   a. static; progressive

   b. dynamic; nonprogressive

   c. dynamic; progressive

   **d. static; nonprogressive** *(see page 203)*

4. **Conditions and situations that you as a pilot can generally control and that arise from choices we make that could lead to physiological incapacitation, are often called _____ stresses.**

   a. social

   b. psychological

   **c. self-imposed** *(see page 203)*

   d. work

5. **The average smoker suffers from _____ hypoxia.**

   a. hypoxic

   **b. hypemic** *(see page 203)*

   c. stagnant

   d. histotoxic

6. **14 CFR §91.17 states that no person may attempt to act as a crewmember of a U.S. civil aircraft while having an alcohol concentration of _____ or greater in a blood or breath specimen.**

   a. .08

   b. .004

   **c. .04** *(see page 205)*

   d. .40

7. **A person may not act as a crewmember of a U.S. civil aircraft if alcoholic beverages have been consumed by that person within the preceding _____ hours.**

   **a. 8** *(see page 205)*

   b. 12

   c. 18

   d. 24

8. **What is the effect of alcohol consumption on functions of the body?**

   a. Small amounts of alcohol in the human system increase judgment and decision-making abilities

   **b. Alcohol has an adverse effect, especially as altitude increases** *(see page 206-208)*

   c. Alcohol has little effect if followed by equal quantities of black coffee

   d. Alcohol is a good treatment for stress and is therefore recommended for stressful situations (like flying)

9. **Alcohol interferes with the body's ability to utilize oxygen, contributing to _____ hypoxia.**

   a. stagnant

   b. hypemic

   **c. histotoxic** *(see page 207)*

   d. hypoxic (altitude)

10. **Involuntary rapid back-and-forth eye movement can occur in straight and level unaccelerated flight if the person has been drinking alcohol. This is known as _____.**

    a. Coriolis effect

    b. nystagmus

    **c. positional alcohol nystagmus (PAN)** *(see page 207)*

    d. oxygen ear

11. **Low blood sugar can seriously impair your performance on the flight deck. This a condition is called _____.**

    **a. hypoglycemia** *(see page 213)*

    b. hypoxia

    c. hyperglycemia

    d. anemia

12. **The humidity in the cabins of commercial jets is low at normal cruise altitudes, which can contribute to pilot _____.**

    a. acclimatization

    b. hyperventilation

    c. desynchronization

    **d. dehydration** *(see page 214)*

13. **Which of the following are good ways to prevent dehydration?**

    a. Drinking caffeine

    b. Drinking soda

    **c. Drinking water** *(see page 214-215)*

    d. Drinking alcohol

14. **Coffee and other caffeinated beverages cause a(n) _____ in urine production and fluid loss, leading to dehydration.**

    **a. increase** *(see page 214)*

    b. decrease

    c. stop

    d. never-ending flow

15. **The acronym "IMSAFE" means: illness, _____, stress, _____, fatigue, and eating (or emotions).**

    **a. medication; alcohol** *(see page 215, fig 11-5)*

    b. monitoring; alcohol

    c. medication; attenuation

    d. monitoring; allocation

## True/False

1. Complete, or total, incapacitation occurs when the phenomenon or event renders a pilot unable to perform any in-flight duties, while the term impairment means he or she can perform some duties, but performance is seriously degraded.

   **a. True** *(see page 200)*

   b. False

2. The probability of a fatal accident due to a medical incapacitation for two-pilot commercial airline operations is approximately one in one billion flight hours.

   **a. True** *(see page 200)*

   b. False

3. Most incapacitation events relate to general health risks and health choices made by pilots.

   **a. True** *(see page 201)*

   b. False

4. The probability of experiencing incapacitation decreases with age.

   a. True

   **b. False** *(see page 202)*

5. U.S. pilot medical certificates expire at midnight on the last day of the month in which they are valid.

   **a. True** *(see page 202)*

   b. False

6. Smoking harms almost every organ in the body and is the number one leading preventable cause of death, claiming 480,000 lives in the U.S. and nearly six million deaths worldwide per year.

   **a. True** *(see page 203)*

   b. False

7. If you are a U.S.-certificated pilot who resides in a state where recreational cannabis use is legal, you won't jeopardize your FAA certificate if you use it.

   a. True

   **b. False** *(see page 204)*

8. U.S. federal drug testing rules require Part 121 and Part 135 air carrier employees who perform a safety-sensitive function—including pilots, flight instructors, mechanics—to submit to drug and alcohol testing.

   **a. True** *(see page 204)*

   b. False

9. Mandatory drug and alcohol testing for pilots occurs prior to employment, during random checks, and when someone has reasonable suspicion you may be using.

   **a. True** *(see page 204)*

   b. False

10. If a Part 121 and Part 135 air carrier pilot refuses to take a drug or alcohol test, the FAA may deny an application for, or suspend or revoke, his or her pilot certificate.

    **a. True** *(see page 204)*

    b. False

11. It will take at about two hours for your blood alcohol concentration (BAC) to drop close to zero after drinking four beers.

    a. True

    **b. False** *(see page 207)*

12. Cold showers, drinking black coffee, and breathing 100 percent oxygen speed up the elimination of alcohol from your bloodstream.

    a. True

    **b. False** *(see page 207)*

13. In some ways, a hangover is more dangerous than small amounts of alcohol because a pilot is usually more willing to fly with a hangover than with any alcohol in their system.

    **a. True** *(see page 208)*

    b. False

14. The negative effects of a hangover can last from two to three days following your last alcoholic drink.

    **a. True** *(see page 208)*

    b. False

15. Pilots cannot consume alcohol within 8 hours prior to flight, but it is better to wait at least 24 hours after drinking before flight.

    **a. True** *(see page 209)*

    b. False

16. **The use of illicit, prescription, and nonprescription drugs (OTC medications) in the pilot population has remained at relatively the same level over the past several decades.**

    a. True

    **b. False** *(see page 209)*

17. **A study conducted by the FAA's Civil Aerospace Medical Institute (CAMI) Toxicology Lab in 2011 found that 42 percent of 1,353 fatally injured pilots examined were tested positive for medications, with 90 percent of those pilots flying under Part 91 regulations.**

    **a. True** *(see page 210 and fig 11-2)*

    b. False

18. **OTC medications treat the symptoms and the cause of the illness.**

    a. True

    **b. False** *(see page 210)*

19. **Most OTC medications—those that don't require a prescription—are safe to use when flying.**

    a. True

    **b. False** *(see page 210)*

20. **If your medical condition is bad enough for you to take prescription or OTC medication for your symptoms, it's very likely the actual condition you are treating will impair your ability to fly safely.**

    **a. True** *(see page 211)*

    b. False

21. **Sweating, dizziness, lightheadedness, weakness, difficult concentrating, anxiety, mental confusion, and even loss of consciousness can occur if you have gone too long without eating a meal.**

    **a. True** *(see page 213)*

    b. False

22. **Alcohol and caffeine are diuretics, which mean they give you diarrhea.**

    a. True

    **b. False** *(see page 214)*

23. **You should consume only moderate amounts (or less) of caffeine: no more than four regular cups of coffee a day.**

    **a. True** *(see page 215)*

    b. False

## Essay

1. List at least five ways in which alcohol affects pilot performance.

2. Is following the pilot alcohol rules enough to keep you safe in flight? Why or why not?

3. What precautions should you take if you are considering flying while taking prescription or OTC medications?

4. List at least three major health choices that can negatively affect your performance on the flight deck and briefly explain how.

5. List and briefly explain four best-practice countermeasures you can use to reduce your odds of losing your medical or experiencing an in-flight incapacitation episode.

# Chapter 12: Visual Perception

## Exam Question Bank

## Multiple Choice

1. **The interpretation of visual sensations (inputs) is known as visual _____.**

   **a. perception** *(see page 223)*
   b. sensation
   c. olfaction
   d. accommodation

2. **Characteristics in the environment that are received by our sensory receptors in our eyes, ears, skin, etc., which aid us in accurately perceiving the outside world, are known as _____.**

   a. sensory overload
   b. monocular cues
   **c. sensory cues** *(see page 224)*
   d. clueless clues

3. **Cues to distance/depth perception that solely depend on stimuli that reside in the outside world, as opposed to physiological mechanisms, are known as _____.**

   a. physiological cues
   **b. monocular cues** *(see page 224)*
   c. binocular cues
   d. shoes for clues

4. **We judge an object to be further away when it is blocked, or occluded, by another object. The object that overlays the other is seen as being closer. This monocular cue to distance/depth perception is known as _____.**

   **a. interposition** *(see page 224 and fig 12-1)*
   b. relative size
   c. height in the visual field
   d. linear perspective

5. **When we are familiar with the actual size of an object, we correctly interpret it as being further away when it casts a smaller image on our retina. This monocular cue to distance/depth perception is known as _____.**

   a. interposition
   b. height in the visual field
   c. linear perspective
   **d. relative size** *(see page 224)*

6. **The monocular cue to distance/depth perception known as _____ makes parallel runway lines appear to converge toward each other with greater distance from you.**

   **a. linear perspective** *(see page 225 and fig 12-4)*
   b. relative size
   c. interposition
   d. height in the visual field

7. **The aerial perspective cue to distance perception can lead pilots to _____ an object's distance on hazy days and _____ it on exceptionally clear days.**

   **a. overestimate; underestimate** *(see page 226)*
   b. overestimate; overestimate
   c. underestimate; overestimate
   d. underestimate; underestimate

8. **The intensity of runway lights is an example of the _____ cue to distance/depth perception.**

   a. linear perspective
   b. relative size
   **c. relative brightness** *(see page 226, 232)*
   d. motion perspective

9. **Cues to distance/depth perception that depend on physiological mechanisms rather than characteristics of stimuli that reside in the outside environment are known as _____ cues.**

   a. monocular
   **b. binocular** *(see page 226 and fig 12-6)*
   c. motion
   d. binocular parallax

10. **In the situation in the above question, the visual system senses these different images as cues to an object's distance and fuses the two disparate images together to form one 3D picture, a process called _____.**

a. retinal disparity

**b. stereopsis** *(see page 227 and fig 12-7)*

c. interposition

d. binocular convergence

11. **The apparent velocity of objects to you as a moving observer is such that objects quickly moving in direction opposite to you are perceived to be closer than objects moving slower or barely at all. This is known as _____.**

a. motion perspective

b. motion disparity

c. motion commotion

**d. motion parallax** *(see page 227 and fig 12-8)*

12. **_____ describes the phenomenon of an outward expanding visual field as you move directly toward an object (e.g., a runway) and a contracting visual field as you move away from it.**

a. Motion parallax

b. Motion disparity

**c. Motion perspective** *(see page 228 and fig 12-9)*

d. Motion commotion

13. **Optic flow depends on altitude and speed. The lower the altitude at any given airspeed, the _____ the optic flow.**

**a. greater** *(see page 229)*

b. lower

c. slower

d. less

14. **Early Boeing 747 pilots, sitting at almost twice the eye-to-wheel height than they were accustomed to in the previous generation of narrow-bodied aircraft, experienced _____ optic flow and had the illusion of taxing at a _____ speed.**

**a. reduced; slower** *(see page 229)*

b. reduced; faster

c. increased; slower

d. increased; faster

15. **Optic flow is _____ when taxiing on the apron at night, causing pilots to taxi too _____.**

a. increased; fast

**b. reduced; fast** *(see page 229)*

c. reduced; slow

d. increased; fast

16. **You are at least _____ times more likely to see another aircraft if air traffic control alerts you to its location (e.g., "traffic, one o'clock, five miles, westbound, six thousand").**

a. 2

**b. 8** *(see page 234)*

c. 20

d. 100

17. **A downsloping runway creates a "too _____" illusion that can result in the pilot flying an approach angle that is too _____.**

a. low; low

b. high; low

**c. low; high** *(see page 235 and fig 12-24)*

d. high; high

18. **An upsloping runway creates a "too _____" illusion which can result in the pilot flying an approach angle that is too _____.**

a. high; high

b. low; high

c. low; low

**d. high; low** *(see page 236 and fig 12-25)*

19. **Terrain below you, that slopes down toward the runway threshold, can create the illusion that you are too _____ while on final approach, leading you to conduct a _____ approach and possible long landing or go-around.**

**a. low; high** *(see page 237 and fig 12-26)*

b. low; low

c. high; low

d. high; high

20. **Terrain below you, that slopes up toward the runway threshold, can create the illusion that you are too _____ while on final approach, leading you to conduct a _____ approach and possible CFIT accident short of the runway.**

a. high; high

b. low; high

**c. high; low** *(see page 237 and fig 12-26)*

d. low; low

21. **You know you are a victim of the _____ when you overestimate the distance of a runway that is smaller than what you're accustomed to and underestimate the distance of a runway that is larger than what you're used to.**

a. height in the visual field cue

b. duck-under phenomenon

**c. home-drome syndrome** *(see page 238 and fig 12-27)*

d. black-hole syndrome

22. **A larger (wider and longer) runway with the same length-to-width (L/W) ratio that you are accustomed to gives the illusion of being _____ the runway.**

a. further away from

b. the same distance from

**c. closer to** *(see page 238 and fig 12-27)*

d. too high above

23. **A smaller (narrower and shorter) runway with the same L/W ratio that you are accustomed to gives the illusion of being _____ the runway.**

**a. further away from** *(see page 238 and fig 12-27)*

b. closer to

c. the same distance from

d. too low below

24. **When conducting an approach to a runway that is smaller than you are used to, the smaller runway will appear to be _____ than it actually is, so you are likely to initiate a _____ landing flare-out, resulting in a possible hard landing.**

a. closer; low

b. closer; high

c. farther away; high

**d. farther away; low** *(see page 238 and fig 12-27)*

25. **When conducting an approach to a runway that is larger than you are used to, the larger runway will appear to be _____ than it actually is, so you are likely to initiate a _____ landing flare-out, resulting in a possible stall over the runway.**

**a. closer; high** *(see page 238 and fig 12-27)*

b. farther away; low

c. closer; low

d. farther away; high

**26. A runway with a small L/W ratio means it is either _____, _____, or both.**

a. long; wide

**b. short; wide** *(see page 238)*

c. long; narrow

d. short; narrow

**27. A runway with a large/high L/W ratio means it is either _____, _____, or both.**

a. short; narrow

b. short; wide

**c. long; narrow** *(see page 238)*

d. long; short

**28. Dimmer-than-normal runway lights look _____ and could give the illusion of being _____.**

**a. further away; further away than actual** *(see page 239)*

b. further away; closer than actual

c. closer than actual; further away

d. closer than actual; closer than actual

**29. If, after conducting an approach to instrument landing minimums, you find yourself descending below the glide path after transitioning to visual references, you may be the victim of the _____.**

a. black hole effect

**b. duck-under phenomenon** *(see page 239-240 and fig 12-29)*

c. Coriolis illusion

d. home-drome syndrome

**30. The presence of significant amounts of water on your aircraft's windscreen can produce a prism effect, causing the outside image to appear _____ than it really is.**

a. higher

b. closer

c. farther away

**d. lower** *(see page 242)*

**31. The _____ phenomenon was a major contributor to the 1979 crash of an Air New Zealand McDonnell Douglas DC-10 into Mount Erebus, in the Antarctic—New Zealand's worst aviation accident to date.**

a. black-hole

b. black-light

**c. flat-light** *(see page 243)*

d. duck-under

32. **Which is *not* an effective strategy for overcoming visual illusions during an approach and landing?**

    a. Use an ILS or GPS glide slope information
    b. Use DME readouts correlated with the altimeter
    c. Use the airport's VASI system
    **d. Fly a long visual straight-in approach** *(see page 245)*

33. **The ideal seat adjustment that provides not only the best access to the flight controls, but also an optimum viewing angle for both cockpit instrumentation and the outside environment is called the design-eye reference point (DERP), or _____.**

    a. design-ear position (DEP)
    **b. design-eye position (DEP)** *(see page 245)*
    c. design-itch position (DIP)
    d. design-aircraft position (DAP)

34. **To fly a 5 degree glide path, maintain _____ feet above the runway threshold for each 1 NM your aircraft is away from it.**

    a. 300
    **b. 500** *(see page 246)*
    c. 600
    d. 1,000

35. **Multiplying your groundspeed by _____ yields the descent rate needed to maintain a 3 degree glide path.**

    a. 3
    **b. 5** *(see page 246)*
    c. 10
    d. 20

## True/False

1. **Limitations in visual perception has contributed to several aircraft accidents.**

    **a. True** *(see page 223-224)*
    b. False

2. **Depth perception is impossible with only one eye.**

    a. True
    **b. False** *(see page 224)*

3. **The monocular cue to distance/depth perception known as height in the visual field makes us perceive objects as closer than they really are when they are seen near the horizon, as opposed to above or below it.**

   a. True

   **b. False** *(see page 225 and fig 12-2)*

4. **The image of the runway on the retina while on normal approach to landing is not a rectangle but a trapezoid.**

   **a. True** *(see page 225)*

   b. False

5. **Bright runway lights make the runway look closer to you than dim ones.**

   **a. True** *(see page 226, 232)*

   b. False

6. **When looking at an object within about 30 feet from you, the image it casts on each retina is different.**

   **a. True** *(see page 226-227)*

   b. False

7. **When conducting a perfect visual approach, the expansion point (or aim point) remains stationary on the windscreen and all movement radiates outward from it.**

   **a. True** *(see page 228 and fig 12-9)*

   b. False

8. **When on final approach to a runway with a large angle of splay, the approach is high; when on an approach to the same runway with a small angle of splay, the approach is low.**

   a. True

   **b. False** *(see page 229 and fig 12-10)*

9. **A car traveling 40 mph at sea level, has a higher optic flow rate than a jet traveling 400 mph at 40,000 feet.**

   **a. True** *(see page 229)*

   b. False

10. **Our "perceptual brain" unconsciously perceives depth in these two-dimensional drawings.**

    **a. True** *(see page 230)*

    b. False

11. **Our past experience and present expectancy strongly influence our perceptions, especially in conditions of visual ambiguity.**

    **a. True** *(see page 233)*

    b. False

12. **Most train engineers who inadvertently traveled through a red-light signal (indicating they should stop) did so because they expected it to be green.**

    **a. True** *(see page 234)*

    b. False

13. **A visual illusion deceives you into seeing the outside world incorrectly.**

    **a. True** *(see page 234)*

    b. False

14. **Visual ambiguity occurs in conditions of sparse visual stimuli (e.g., when flying in poor visibility, at night, or over featureless or snow-covered terrain). These conditions create uncertainty for our perceptual system, increasing our visual brain's susceptibility to visual illusions.**

    **a. True** *(see page 234)*

    b. False

15. **The retinal image when you are on the correct approach angle to a downsloping runway will be a low-approach shape, giving you the illusion that you are too low.**

    **a. True** *(see page 235)*

    b. False

16. **The retinal image when you are on the correct approach angle to an upsloping runway will be a low-approach shape, giving you the illusion that you are too low.**

    a. True

    **b. False** *(see page 236)*

17. **Dark-night conditions are more likely during a full moon and clear sky conditions (no clouds).**

    a. True

    **b. False** *(see page 236)*

18. **On the correct approach angle in daylight conditions to a runway with upsloping or downsloping terrain below you, even though the image on each retina indicates the correct approach angle, the optic flow in your ambient vision is dominant and overrides the normal approach image on your retina causing you to fly too high or low.**

    **a. True** *(see page 237)*

    b. False

19. **A runway with a smaller L/W than you are accustomed to gives the appearance of being too low on the approach.**

    **a. True** *(see page 238 and fig 12-28)*

    b. False

20. **A runway with a larger L/W than you are accustomed to gives the appearance of being too low on the approach.**

    a. True

    **b. False** *(see page 238 and fig 12-28)*

21. **On exceptionally hazy days you might perceive a runway's distance as closer to you than it really is and on unusually clear days you might perceive a runway's distance as farther away than it really is.**

    a. True

    **b. False** *(see page 239)*

22. **When you attempt to maintain a constant visual angle while on an approach in dark-night conditions, the result is not an angle that is straight, but a curved flight path that extends below a safe approach angle.**

    **a. True** *(see page 240 and fig 12-31)*

    b. False

23. **Kraft's early simulator studies found that only one of Boeing's top 12 Instructor pilots crashed short of the runway in black-hole conditions to an upslope runway.**

    a. True

    **b. False** *(see page 241)*

24. **Flat light (also known as sector whiteout or partial whiteout) is a zero-zero condition of snow and/or blowing snow.**

    a. True

    **b. False** *(see page 242-243)*

25. **Reliance on aircraft flight instruments is often the only way to accurately determine your aircraft's altitude and attitude in flat light conditions.**

    **a. True** *(see page 243)*

    b. False

26. **It is difficult for a pilot to inadvertently descend into a large body of calm, glassy smooth, water.**

    a. True

    **b. False** *(see page 243)*

## Essay / Other

1. **List and briefly describe at least four situations when you might be susceptible to a visual illusion when conducting a visual approach to a landing. Describe the illusion each situation creates and the possible incorrect response the pilot might make.**

2. **List and briefly describe at least four effective strategies to avoid or effectively manage visual approach illusions.**

3. **In the table below, circle the correct bold term (two choices in the in the *situation* column and one option in the *possible pilot response & consequences* column):**

| Illusion | Situation | Possible pilot response & consequences |
|---|---|---|
| "Too high" | Black-hole conditions<br>**Upsloping** / **downsloping** runway and/or upsloping terrain on approach<br>Runway with **smaller** / **greater** L/W than pilot accustomed to | Fly **high** / **low** approach<br>Hard landing or CFIT short of runway |
| "Too low" | **Downsloping** / **Upsloping** runway and/or downsloping terrain on approach<br>Runway with **smaller** / **greater** L/W than pilot accustomed to | Fly **high** / **low** approach<br>Long landing, runway overrun, stall above runway |
| "Overestimate distance"<br>(Too high or low*) | **Smaller** / **greater** runway than pilot accustomed to (same L/W)<br>**Poor** / **Good** visibility (haze)<br>**Brighter-** / **Dimmer**-than-normal runway lights | If perceived as increased vertical distance:<br>Fly **high** / **low** approach<br>Hard landing or CFIT short of runway<br>If perceived as increased horizontal distance:<br>Fly **high** / **low** approach<br>Long landing, runway overrun, stall above runway |
| "Underestimate distance"<br>(Too high or low*) | **Smaller** / **Larger** runway than pilot accustomed to (same L/W)<br>**Good** / **Poor** visibility (clear)<br>**Dimmer-** / **Brighter**-than-normal runway lights | If perceived as decreased vertical distance:<br>Fly **low** / **high** approach<br>Long landing, runway overrun, stall above runway<br>If perceived as decreased horizontal distance:<br>Fly **low** / **high** approach<br>Hard landing or CFIT short of runway |

**Depends if distance interpreted vertically or horizontally by subconscious visual perceptual "brain."*

# Chapter 13: Auditory Perception

## Exam Question Bank

## Multiple Choice

1. **A recent International Air Transport Association (IATA) Phraseology Study found the use of _____ by ATC was the biggest communication issue for 2,070 airline pilots surveyed.**

   a. incomplete and inaccurate content
   b. untimely message transmission
   **c. non-standard and/or ambiguous phraseology** *(see page 252)*
   d. garbled phraseology

2. **Words that sound the same as other words, but have different meanings, are called _____.**

   **a. homophones** *(see page 252)*
   b. rhymes
   c. polyfones
   d. synonyms

3. **An analysis of 191 ASRS reports, where crews overshot or undershot their assigned altitude by 1,000 feet, found that that the _____ thousand-foot pairing was by far the most common altitude combination at 38 percent of altitude busts.**

   a. one/two
   b. one/one-one
   c. thirteen/fourteen
   **d. ten/eleven** *(see page 253)*

4. **A pilot incorrectly reads back a clearance to ATC, and the controller fails to catch the error. This is known as _____.**

   a. the party-line effect
   b. code switching
   **c. the readback-hearback problem** *(see page 254)*
   d. the cocktail party effect

5. **_____ occurs when a pilot hears a verbal message that they expect to hear, not what was really said.**

   a. Party-line effect
   b. Cocktail party effect
   c. Code switching
   **d. Expectation bias** *(see page 254-255)*

6. **The phenomenon of multilingual pilots and/or controllers switching back and forth between English and their mother tongue, or unilingual English speakers switching between different English dialects (e.g., aviation English and normal English), is known as _____.**

   a. party-line effect
   **b. code switching** *(see page 255)*
   c. attention switching
   d. cocktail party effect

7. **Party-line information is _____ at joint civil-military airports.**

   **a. reduced** *(see page 256)*
   b. enhanced
   c. the same
   d. absent

8. **According to Chomsky, the _____ structure is the basic idea, or meaning, the speaker wishes to communicate, and the _____ structure is the phonological arrangement of the sounds the speaker uses to communicate. The receiver hears the latter and can only infer the true meaning intended by the sender; but if the sender doesn't effectively use transformation grammar the true meaning of the verbal message may be misinterpreted.**

   a. homophonic; surface
   **b. deep; surface** *(see page 257 and fig 13-3)*
   c. surface; deep
   d. deep; party-line

9. **Which of the following does not contribute to better communication?**

   a. Using standard phraseology
   b. Using full phonetic call sign
   c. Leveraging party line information
   **d. Code switching** *(see page 257-258)*

## True/False

1. Communication breakdown between flight crewmembers and between controllers and pilots has contributed to several fatal aircraft accidents.

   **a. True** *(see page 251)*

   b. False

2. Communication on the flight deck is primarily accomplished through written words and body language.

   a. True

   **b. False** *(see page 251)*

3. The auditory sense is omnidirectional and verbal messages are transient.

   **a. True** *(see page 252)*

   b. False

4. Evaluating 28,000 incident reports submitted by pilots and air traffic controllers during the first five years of the ASRS, researchers found more than 70 percent involved problems with voice communications.

   **a. True** *(see page 252)*

   b. False

5. Ambiguous messages consist of words, phrases, or sentences that have only one meaning.

   a. True

   **b. False** *(see page 252)*

6. Ambiguous usage or interpretation of four words—two, to, four, and for—was cited as the second biggest communication problem identified by pilots in an IATA Phraseology Study and was responsible for a fatal CFIT accident involving a Flying Tiger Line B-747 on final approach to Subang Airport in Kuala Lumpur, Malaysia.

   **a. True** *(see page 252)*

   b. False

7. Pilots have difficulty interpreting ATC messages with several zeros in them, especially with multiple instructions in one transmission.

   **a. True** *(see page 253)*

   b. False

8. Standard radiotelephony (RTF) is most effective if applied globally.

   **a. True** *(see page 254)*

   b. False

9. Clearances meant for one aircraft but accepted by the pilot or crew of another because of call-sign confusion have led to altitude and heading deviations, near midair collisions, and even fatal accidents.

   **a. True** *(see page 254)*

   b. False

10. In just three accidents, more than 800 people lost their lives, in part because of insufficient English language proficiency on the part of the flight crew or a controller.

    **a. True** *(see page 255)*

    b. False

11. Pilots have a natural tendency to revert to previously learned behavior, including communication practices, when under stress.

    **a. True** *(see page 255)*

    b. False

12. The collision between two Boeing B-747s (KLM Royal Dutch Airlines and Pan American) on the runway at Tenerife on March 27, 1977, remains the worst in aviation history, responsible for the deaths of 583 people aboard both airplanes.

    **a. True** *(see page 255)*

    b. False

13. Party-line information (PLI) is the distorted information you receive after it has gone through several different people's interpretations.

    a. True

    **b. False** *(see page 256)*

14. PLI refers to the information provided by multiple parties communicating on a single radio frequency in the same language that enhances distortion of information after it has passed through several hands—like a game you might play at a party.

    a. True

    **b. False** *(see page 256)*

15. Generally, the higher the signal-to-noise ratio (SNR), the harder it is to detect and perceive a verbal message.

    a. True

    **b. False** *(see page 257)*

## Essay

1. Describe the readback-hearback problem.

2. Give an example of ambiguous communication used in the flight environment.

3. List three examples of non-standard phraseology.

4. Why do pilots sometimes acknowledge an ATC clearance that was intended for another aircraft?

5. List and briefly describe at least three causes of miscommunication in the flight environment.

6. List and briefly describe at least three strategies to avoid or effectively manage auditory perception problems in the flight environment.

# Chapter 14: Attention, Vigilance, and Monitoring

## Exam Question Bank

## Multiple Choice

1. **Between 1972 and 2013 in the United States, the leading item not monitored in 25 major U.S. air carrier accidents that killed 894 people was the aircraft's _____.**

   a. altitude
   b. fuel consumption
   c. rate of descent
   **d. airspeed** *(see page 264)*

2. **Between 2000 and 2014 in the United States, the leading item not monitored in 110 ASRS incident reports submitted by flight crews was the aircraft's _____.**

   **a. altimeter** *(see page 264)*
   b. airspeed
   c. heading
   d. rate of descent

3. **The process of detecting and orienting toward sensory inputs is known as _____.**

   a. sensation
   b. decision making
   **c. attention** *(see page 264)*
   d. problem solving

4. **_____, or monitoring, involves maintaining attention over time.**

   **a. Vigilance** *(see page 264)*
   b. Attention
   c. Perception
   d. Focusing

5. **Using the light beam of a flashlight as a metaphor, _____ attention is the area we attend to, or where we point the flashlight.**

   **a. selective** *(see page 265)*
   b. focused
   c. divided
   d. series

6. **Using the light beam of a flashlight as a metaphor, _____ attention involves concentrating on a single stimulus in the environment to the exclusion of others, or using a narrow beam with the flashlight.**

   a. selective

   **b. focused** *(see page 265)*

   c. divided

   d. series

7. **Using the light beam of a flashlight as a metaphor, _____ attention involves attending to two or more stimuli or tasks at once, or using a wide beam with the flashlight.**

   a. selective

   b. focused

   **c. divided** *(see page 265)*

   d. parallel

8. **Multiple tasks are usually not accomplished simultaneously (in parallel), but sequentially (in series), with an individual's attention switching rapidly back and forth between them. This is known as _____.**

   **a. attention switching** *(see page 266)*

   b. code switching

   c. selective attention

   d. vigilance

9. **Drawing attention away from one task to attend to another often leads to _____.**

   a. unfocused attention

   b. multitasking

   c. divided attention

   **d. inattentional blindness** *(see page 266)*

10. **Studies have shown that automobile drivers using cell phones while driving fail to see up to _____ percent of the information in their environment, even when they are looking straight ahead out the window!**

    a. 5

    b. 10

    **c. 50** *(see page 266)*

    d. 100

11. **The "margin of safety" is the least during the _____ phase of flight.**

a. taxi
b. takeoff
c. cruise
**d. approach and landing** *(see page 266-267 and fig 14-3)*

12. **The Yerkes-Dodson curve demonstrates that the optimal level of human performance is accomplished at _____ levels of workload.**

a. low
**b. moderate** *(see page 268 and fig 14-4)*
c. high
d. very high

13. **The perception of elements in the environment within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future, is known as _____.**

**a. situational awareness** *(see page 268)*
b. attentional blindness
c. code switching
d. vigilance

14. **_____ was the number one cause of monitoring failures and subsequent flight path deviations in 110 ASRS incident reports studied.**

a. Daydreaming
b. Sleeping
c. Fatigue
**d. Distraction** *(see page 270)*

15. **Most distractions in flight involve _____.**

**a. communication** *(see page 270 and fig 14-5)*
b. runway/arrival change
c. searching for VFR traffic
d. abnormal situations

16. **_____ is the frequency with which a pilot directs his or her gaze and attention to the flight instruments and associated flight guidance automation indicators and, if operating in VMC, the external environment.**

a. Mental workload
b. Geographical situational awareness (GSA)
**c. The sampling rate** *(see page 274)*
d. Situational awareness (SA)

17. **Probably the highest areas of vulnerability, and the most critical phase of flight, is the _____ phase of flight.**

    **a. approach and landing** *(see page 275)*

    b. taxiing

    c. cruise descent

    d. cruise

18. **The so-called U.S. sterile cockpit rule was prompted in part by _____.**

    a. an Air New Zealand DC-10 CFIT accident into Mount Erebus in 1979

    b. a Boeing B-777 crash into a seawall at San Francisco Airport in 2013

    **c. a DC-9 collision with terrain in fog three miles short of the runway at Charlotte Douglas International Airport in 1981** *(see page 276)*

    d. an American Airlines B-757 CFIT accident near Cali, Colombia in 1995

19. **The sterile cockpit rule prohibits crew members from engaging in nonessential activities (including extraneous conversations) that could distract them from completing the essential duties required for the safe operation of their aircraft during the critical phases of flight. Which of the following is *not* considered critical phase of flight?**

    a. Taxi and takeoff

    **b. Cruise flight below 10,000 feet MSL** *(see page 276)*

    c. Climbs, descents, and approaches below 10,000 feet

    d. Landings

## True/False

1. **An NTSB study of 37 U.S. air carrier accidents, in which the actions of the flight crew were cited as a causal or contributing factor, found that monitoring/challenging failures occurred in 84 percent of them.**

    **a. True** *(see page 263)*

    b. False

2. **Research indicates that humans are good at paying attention and maintaining sustained attention.**

    a. True

    **b. False** *(see page 264)*

3. **The vigilance level decreases, and the vigilance decrement increases, with time.**

    **a. True** *(see page 264)*

    b. False

4. **Sustained attention needed for good vigilance/monitoring performance is very demanding of mental resources.**

   **a. True** *(see page 264)*

   b. False

5. **A common view of attention is that humans can attend to several things at a time and are multi-channel processors.**

   a. True

   **b. False** *(see page 264)*

6. **One view of attention is that unattended information is attenuated (or weakened) and makes it through to our conscious perception only if the stimulus is relevant or salient (features that make it stand out from the attended information; e.g., larger, louder, brighter, etc.).**

   **a. True** *(see page 265)*

   b. False

7. **Accomplishing two different tasks simultaneously is as effective as doing them separately.**

   a. True

   **b. False** *(see page 266)*

8. **True multitasking is essentially a myth.**

   **a. True** *(see page 266)*

   b. False

9. **Research indicates that performance decrements occur when performing two different tasks that draw upon the same regions of the brain using the same modality (e.g., attempting two visual tasks simultaneously or two perform auditory tasks simultaneously).**

   **a. True** *(see page 266)*

   b. False

10. **Most monitoring errors occur during the vertical phases of flight (climb, descent, approach, and landing).**

    **a. True** *(see page 266)*

    b. False

11. **Distractions on the flight deck have contributed to aircraft accidents.**

    **a. True** *(see page 269)*

    b. False

12. Based on a review of NTSB accident reports and ASRS incident reports, flight crews are most vulnerable interruptions and distractions from the "BEFORE START" phase through "PUSH BACK," "START," "TAXI," and "BEFORE TAKEOFF" phases of operation.

    **a. True** *(see page 270)*

    b. False

13. Overlearning the psychomotor skills involved in hand-flying an aircraft allows for automatic processing that, in turn, provides more attentional resources to devote to other tasks.

    **a. True** *(see page 273)*

    b. False

14. Using only one sensory modality during times of high mental workload provides a "redundancy gain" that minimizes inattentional blindness, improving attentional performance.

    a. True

    **b. False** *(see page 273)*

15. Research indicates that captains are less likely to challenge deviations committed by FOs than the other way around.

    a. True

    **b. False** *(see page 273)*

16. In general, the pilot flying (PF) is responsible for monitoring and the pilot monitoring (PM) is responsible for managing.

    a. True

    **b. False** *(see page 274)*

17. Noncompliance with the sterile cockpit rule has contributed to several accidents.

    **a. True** *(see page 276)*

    b. False

## Essay

1. Summarize a specific example of a major airline accident or incident that was caused, or partially caused, by distraction.

2. In your own words, define the sterile cockpit rule.

3. List and briefly explain five best practices for improving attention.

# Chapter 15: Flight Deck Design and Automation

## Exam Question Bank

## Multiple Choice

1. **The flight deck should be designed to accommodate the limitations and capabilities of the human operator, not the other way around. This is known as _____.**
   a. industrial/organizational psychology
   b. human-machine interface
   c. closed-loop feedback system
   **d. human-centered design** *(see page 282)*

2. **A basic _____ involves continuous feedback enabling continuous control to maintain a given set point.**
   a. open-loop feedback system
   b. human-machine interface
   **c. closed-loop feedback system** *(see page 282-283)*
   d. integrated display

3. **Information on displays and the design of controls is often called _____.**
   a. the closed-loop interface
   b. a population stereotype
   c. proximity compatibility principle
   **d. the human-machine interface** *(see page 283)*

4. **_____ involves designing displays and controls according to their function and how they are best understood by humans.**
   a. The integrated display
   b. A digital display
   **c. Interface coding** *(see page 283)*
   d. Proximity compatibility

5. **Designing controls to look like the device they control is known as _____.**
   **a. shape coding** *(see page 283)*
   b. color coding
   c. location coding
   d. proximity compatibility

6. **A culturally agreed-upon understanding of what certain locations of switches, direction of switch movement, symbols, shapes, or colors mean is known as _____.**

   **a. a population stereotype** *(see page 284)*
   b. the proximity compatibility principle
   c. location coding
   d. the human-machine interface

7. **Turning a knob clockwise almost always increases the intensity of sound, light, or whatever. This clockwise rotation of the knob conforms to _____.**

   a. the proximity compatibility principle
   b. shape coding
   c. interface coding
   **d. a population stereotype** *(see page 284)*

8. **The placing and arranging of displays and controls to best meet the processing needs of the human operator is known as _____.**

   **a. location coding** *(see page 284)*
   b. shape coding
   c. color coding
   d. a population stereotype

9. **By design (and regulation), the primary flight instruments (sometimes called the "six pack" for traditional round-dial instruments) are located so they fall within the _____ of view of the pilot.**

   **a. primary optimum field** *(see page 284 and fig 15-3)*
   b. secondary optimum field
   c. neutral field
   d. closed-loop interface system

10. **The attitude indicator is an example of a _____.**

    a. digital display
    b. digital control
    c. population stereotype
    **d. pictorial display** *(see page 284-285)*

11. **When information from different displays need to be frequently compared to each other to gain a complete understanding of the aircraft's state (e.g., VSI and altimeter), those displays should be located close together. This is known as _____.**

    a. pictorial realism
    b. shape coding
    c. human-machine interface coding
    **d. the proximity compatibility principle** *(see page 285)*

12. **The newer rectangular electronic flat-panel primary displays—primary flight displays (PFDs) and multifunction displays (MFDs)—where related information is presented together for easy comparison, are examples of _____.**

a. analog displays
b. a population stereotype
**c. integrated displays** *(see page 287)*
d. digital displays

13. **_____ displays present qualitative, continuous information that represents the state of an aircraft attribute in symbolic or pictorial format, often with a moving indicator.**

a. Digital
**b. Analog** *(see page 288 and fig 15-9)*
c. Shape-coded
d. Integrated displays

14. **_____ displays present quantitative, discrete numeric information that is helpful in determining precise values, and usually involves less mental effort and fewer mental computations to interpret exact values.**

**a. Digital** *(see page 288 and fig 15-10)*
b. Analog
c. Shape-coded
d. Integrated

15. **When numerical values are rapidly changing (e.g., airspeed, altitude) both the direction and rate of change is more difficult for pilots to interpret on a(n) _____ display compared to a(n) _____ display.**

a. analog; digital
**b. digital; analog** *(see page 288-289)*
c. analog; integrated
d. digital; integrated

16. **The traditional three-pointer altimeter (round dial) is an example of a(n) _____ display.**

a. integrated
b. pictorial
**c. analog** *(see page 289 and fig 15-9)*
d. digital

17. **The most common altimeter misreading error is misreading the altitude by 1,000 feet, usually _____ it by _____ feet, leaving the false impression that the aircraft is higher than it really is.**

a. under-reading; 1,000

**b. over-reading; 1,000** *(see page 289)*

c. under-reading; 10,000

d. over-reading; 10,000

18. **_____ in flight deck design involves making and arranging displays and controls that conform to agreed-upon standards of aircraft design according to good human factors engineering principles. This involves similarity of coding, layout, and operating principles.**

a. Proximity compatibility

b. Integration

**c. Standardization** *(see page 290-291)*

d. Interpretation

19. **_____ occurs when a pilot's prior experience and learning interfere with his or her performance when checking out in another aircraft that has different controls and location of controls (e.g., flaps handles, gear handles, etc.).**

a. Positive transfer of learning

b. Negative control-display compatibility

**c. Negative transfer of training** *(see page 291)*

d. Proximity incompatibility

20. **A concept that states symbols on displays should move in the same direction as the part that they represent is known as the _____.**

**a. principle of the moving part** *(see page 291)*

b. proximity compatibility principle

c. positive transfer of learning

d. negative control-display compatibility

21. **The Western-designed attitude indicator is also known as an _____ attitude indicator.**

a. upside-down

**b. inside-out** *(see page 292)*

c. outside-in

d. over-and-out

22. **The _____ principle states that control devices (knobs, handles, switches) and symbols on displays should move in the same direction as the part they are supposed to represent.**

a. control-display compatibility
b. control-display incompatibility
c. proximity incompatibility principle
**d. proximity compatibility principle** *(see page 293)*

23. **Which of the following indicates control-display incompatibility?**

a. Raising flaps by raising a handle or switch
b. The attitude indicator
c. The heading indicator
**d. Raising landing gear by lowering a handle** *(see page 293)*

24. **_____ is the accomplishment of a task by a machine instead of a human.**

a. Standardization
b. Artificial intelligence
**c. Automation** *(see page 293)*
d. Closed-loop design

25. **_____ technology makes this possible: control surfaces (elevator, aileron, rudder, etc.) move in response to electronic signals through wires to electronic devices and control actuators at each control surface, not by direct mechanical connection to the pilot's flight controls.**

a. Human-machine interface
b. Closed-loop feedback system
c. Integrated display
**d. Fly-by-wire** *(see page 293)*

26. **A lack of understanding or awareness by flight crews of what mode the autoflight system is operating in, or in how such systems operate, is known as _____.**

**a. mode confusion** *(see page 297)*
b. mode reversion
c. automation complacency
d. automation paradox

27. **_____, the reaction a flight crew member experiences when the automation does something different than what he or she expects it to do, results from automation complexity, ignorance, and/or confusion.**

a. Automation complacency

**b. Automation surprise** *(see page 299)*

c. Automation paradox

d. Automation addiction

28. **_____ occurs when the autoflight system changes modes without any direct input from the flight crew.**

a. Mode paradox

b. Pilot-initiated mode change

c. Automation paradox

**d. Mode reversion** *(see page 300)*

29. **The phenomenon of trusting the automation too much is known as _____.**

**a. automation complacency** *(see page 301)*

b. mode confusion

c. mode reversion

d. automation paradox

30. **_____ occurs when the use of automated systems during high workload phases of flight doesn't decrease, but increases overall pilot workload compared to flying a non-automated aircraft.**

**a. Automation paradox** *(see page 301)*

b. Automation surprise

c. Automation complacency

d. Automation reversion

31. **Automation _____ occurs when pilots become dependent on the use of automation, hampering their ability to fly safely without it.**

a. surprise

b. paradox

**c. addiction** *(see page 302-303)*

d. confusion

32. **Which of the following, if actively in use on the flight deck, is the lowest level of automation?**

    a. Autopilot, FD, and preprogrammed FMS
    b. Autopilot and FD
    c. Manually flying using FD
    **d. Manually flying using raw data** *(see page 284)*

33. **Which strategy below is not recommended to help manage automation?**

    a. Double-check FMS entries before engaging
    b. Be prepared in areas of high vulnerability
    **c. Leave the autopilot on when flying in icing conditions** *(see page 301, 304-306)*
    d. Use the proper level of automation

34. **Which strategy below is not recommended to help manage automation?**

    a. Practice manual flying
    b. Aviate (fly), navigate, communicate—in that order
    **c. Use the vertical speed mode when climbing using the autopilot** *(see page 281, 305-307)*
    d. Double-check FMS entries before engaging

## True/False

1. **Aircraft control and display design has led to aircraft accidents.**

    **a. True** *(see page 282-283)*
    b. False

2. **Controlling an aircraft in flight is an example of an open-loop feedback system.**

    a. True
    **b. False** *(see page 282-283, fig 15-1)*

3. **Most side-stick-equipped aircraft provide little or no tactile feedback to the pilot flying (PF) from movements resulting from turbulence or control inputs from the other pilot.**

    **a. True** *(see page 283)*
    b. False

4. **Proper interpretation of information needed from a variety of cockpit displays to perform a task takes less time and mental effort when they are located farther away from each other.**

    a. True
    **b. False** *(see page 284)*

5. **The attitude indicator, sometimes called the artificial horizon, is the only primary flight instrument that provides a direct indication of the aircraft's pitch and bank attitude.**

   **a. True** *(see page 284)*

   b. False

6. **Pictorial displays involve more mental operations causing slower and less accurate interpretation of the information presented.**

   a. True

   **b. False** *(see page 285)*

7. **The information found in the newer rectangular electronic flat-panel primary flight displays (PFD) is similarly arranged to the traditional "six-pack" round dial displays, but in slightly different formats.**

   **a. True** *(see page 287 and fig 15-6)*

   b. False

8. **A major advantage of an integrated display is that it reduces attentional demands on the pilot, enabling his or her limited attentional resources to be used for other tasks.**

   **a. True** *(see page 287)*

   b. False

9. **Research has concluded that the three-pointer altimeter is more susceptible to misinterpretation than a digital one.**

   **a. True** *(see page 289)*

   b. False

10. **Altimeter reading errors seem to be less common at night and/or in IMC.**

    a. True

    **b. False** *(see page 290)*

11. **When you roll into a bank, or pitch the nose up or down, the miniature airplane on a Western-designed attitude indicator does not move—the horizon bar does.**

    **a. True** *(see page 291-292)*

    b. False

12. **Research clearly indicates that, with flight-naïve participants (i.e., non-pilots), better performance and less confusion occurs when using an attitude indicator that displays a stationary horizon with a moving miniature airplane (as it is in the real world).**

    **a. True** *(see page 292)*

    b. False

13. **The inside-out attitude indicator violates the principle of the moving part, but it conforms to the principle of pictorial realism.**

    **a. True** *(see page 292)*

    b. False

14. **Manually inputting incorrect values into radios or other electronics is sometimes called finger trouble.**

    **a. True** *(see page 296)*

    b. False

15. **An international survey of 1,268 airline pilots found that about three-quarters of them had, on occasion, inadvertently selected the wrong mode on their aircraft's autoflight system.**

    **a. True** *(see page 297)*

    b. False

16. **Mode confusion has been a factor in several major airline incidents and accidents.**

    **a. True** *(see page 298)*

    b. False

17. **Automation paradox is more likely during low workload phases of flight.**

    a. True

    **b. False** *(see page 301)*

18. **Airline policies and operational requirements have historically discouraged pilots from practicing their hand-flying skills; the FAA estimates that automation is used 90 percent of the time in airline flight operations.**

    **a. True** *(see page 302-303)*

    b. False

19. **Loss of proficiency in manual flying skills, and diminished ability of U.S. airline flight crews to fly without advanced avionics and automated systems, was documented in a recent study conducted by the Flight Safety Foundation.**

    **a. True** *(see page 302-303)*

    b. False

20. Studies have confirmed that basic psychomotor (hand-eye) skills needed to manually fly an aircraft significantly declined with time, but the cognitive skills needed to successfully hand-fly an aircraft—such as recalling procedural steps, keeping track of which steps have been completed and which one's remain, visualizing the geographical position of the aircraft, performing mental calculations, and recognizing abnormal situations—were resistant to significant decline over time.

    **a. True** *(see page 303)*

    b. False

21. A recent Boeing survey of 966 airline pilots found that only 23 percent felt comfortable operating the FMS on their first flight after training, only 15 percent felt comfortable after their initial operating experience, and the rest (62 percent) felt comfortable only after gaining line experience.

    **a. True** *(see page 304)*

    b. False

22. A recently published FAA *Safety Alert for Operators: Manual Flight Operations* (SAFO 13002) recommends airlines and other operators to promote manual flight operations during training (initial, upgrade, and recurrent) and when flying on the line, as appropriate.

    **a. True** *(see page 306)*

    b. False

## Essay

1. What is the "human-machine interface" as it relates to the flight deck? Why is its design important?

2. Explain why the primary flight instruments (sometimes called the "six pack" for traditional round-dial instruments) are arranged the way they are.

3. List and briefly describe the benefits of flight deck automation.

4. List and briefly describe the problems with flight deck automation.

5. Briefly explain the "CAMI" or "VVM" procedure when engaging the autopilot.

6. List and briefly describe at least four strategies you can use to manage the problems sometimes encountered when using automation.

# Chapter 16: Memory

## Exam Question Bank

## Multiple Choice

1. **_____ is the process by which information is stored in our brain.**

   **a. Memory** *(see page 316)*
   b. Perception
   c. Sensation
   d. Attention

2. **_____ memory is like the RAM and _____ memory is like the hard disc drive of a computer.**

   a. Long-term; short-term
   b. Sensory; long-term
   c. Short-term; sensory
   **d. Working; long-term** *(see page 316)*

3. **_____ involves well-learned information that is stored for an indefinite period.**

   **a. Long-term memory** *(see page 316)*
   b. Short-term memory
   c. Sensory information storage
   d. Working memory

4. **Attended information that is temporarily stored and consciously elaborated upon is manipulated in _____.**

   a. long-term memory
   **b. working memory** *(see page 317)*
   c. sensory information storage
   d. perception

5. **When you make calculations on the fly, such as estimating the rate of descent needed to reach a desired altitude by a certain time or fix, or calculating your ETA at your destination, you are using _____.**

   a. sensory information storage
   **b. working memory** *(see page 317)*
   c. long-term memory
   d. procedural memory

6. **_____ involves vocal or mental repetition of an auditory input or mentally attending to or manipulating a visual image.**

   **a. Rehearsal** *(see page 318)*

   b. Perception

   c. Chunking

   d. Encoding

7. **Repeating (out loud or in thought) a decision altitude (DA) several times while conducting an ILS approach, or repeating a transponder code or ILS frequency while dialing it into the appropriate avionics, is an example of _____.**

   a. elaborative rehearsal

   b. chunking

   c. maintenance encoding

   **d. maintenance rehearsal** *(see page 318)*

8. **_____ rehearsal involves inserting new information back into working memory using simple rote techniques, while _____ rehearsal involves relating the new information to previously learned material stored in long-term memory (LTM).**

   a. Elaborative; maintenance

   b. Maintenance; chunking

   **c. Maintenance; elaborative** *(see page 318)*

   d. Elaborative; encoding

9. **_____ occurs when new information/activity interferes with the recall of previously stored information in long-term memory or material to be remembered (MTBR), in working memory.**

   a. Proactive interference

   **b. Retroactive interference** *(see page 318)*

   c. Maintenance interference

   d. Elaborative interference

10. **You forget a heading and altitude clearance by a controller because immediately after receiving the clearance you are questioned by the captain about some other aspect of the flight status. This is known as _____ interference.**

    **a. retroactive** *(see page 318)*

    b. proactive

    c. chunking

    d. elaborative

11. **You receive a clearance (e.g., a speed to climb at and an altitude to climb to) and a couple of seconds later receive another clearance (e.g., a heading to fly). If you forget the second clearance because of interference from the first, you have experienced _____.**

    **a. proactive interference**
    b. retroactive interference
    c. chunking interference
    d. prospective memory

12. **You are a new student pilot trying to learn how to taxi an airplane using rudder inputs. If you taxi trying using aileron inputs instead of rudder inputs, you are likely experiencing _____.**

    a. elaborative rehearsal
    b. retroactive interference
    **c. proactive interference** *(see page 318)*
    d. positive transfer of learning

13. **Controllers experience _____ when managing two or more aircraft from different airlines with the same call number (e.g., UAL 123, DAL 123) or from the same airline with similar call signs (e.g., UAL 123, UAL 213).**

    a. chunking
    **b. confusion** *(see page 319)*
    c. proactive rehearsal
    d. procedural interference

14. **_____ involves grouping bits of information into larger meaningful wholes and enhances learning and memory.**

    **a. Chunking** *(see page 319)*
    b. Using checklists
    c. Proactively interfering
    d. Deferring tasks

15. **_____ memory is mostly about "knowing what" while implicit memory is about "knowing how."**

    **a. Explicit; implicit** *(see page 320 and fig 16-2)*
    b. Implicit; explicit
    c. Muscle; implicit
    d. Semantic; episodic

16. **Using previously learned psychomotor skills to do things such a hand-fly an aircraft is called _____ memory.**

a. explicit
b. semantic
c. episodic
**d. procedural** *(see page 318)*

17. **External (environmental) and internal (physiological or psychological) contextual features that are unconsciously stored in LTM at the same time MTBR is encoded and stored in LTM are known as _____.**

**a. memory retrieval cues** *(see page 321)*
b. episodic memories
c. prospective memories
d. retrospective memories

18. **You intended to set the flaps for takeoff, but forgot to. This type of memory failure is known as a(n) _____ memory failure.**

a. retrospective
b. episodic
**c. prospective** *(see page 321)*
d. procedural

19. **_____ redirect our attention away from what we were doing, preventing us from rehearsing MTBR in working memory and causing us to completely forget what we were originally planning to do.**

a. Deferred tasks
**b. Distractions** *(see page 321)*
c. Checklist items
d. Episodic memories

20. **Which of the following is *not* an example of a mnemonic?**

a. Acronym
b. Rhyme
c. Arranging it into high-information chunks
**d. Written checklist** *(see page 325)*

21. **What is *not* a good strategy to assist your memory on the flight deck?**

a. Utilizing chunking
b. Using mnemonics
c. Using checklists
**d. Defering checklist items if possible** *(see page 322, 324-326)*

22. **What is *not* a good strategy to assist your memory on the flight deck?**

    a. Using more than just one sensory modality

    b. Avoiding rushing by buying time if necessary

    c. Using reminder cues

    **d. Focusing on the consequences of failing when faced with an emergency** *(see page 326-328)*

## True/False

1. **Hundreds of people have died because pilots have forgotten to set the flaps to the proper takeoff setting.**

    **a. True** *(see page 314 and table 16-1)*

    b. False

2. **The worst runway incursion (RI) accident on U.S. soil occurred because a controller forgot another airplane was on the runway.**

    **a. True** *(see page 316)*

    b. False

3. **A study of controller errors and deviations at the busiest control towers in the U.S. found that the number one cause of operational errors in 251 reports analyzed was that the controller forgot something.**

    **a. True** *(see page 316)*

    b. False

4. **Virtually all mental operations—such as perception, attention, problem solving, and decision making—are dependent upon working memory.**

    **a. True** *(see page 3165-318)*

    b. False

5. **Results of experiments indicate that visual sensory information in visual short-term sensory memory lasts for only about ½ to 1 second, whereas auditory sensory information in acoustic short-term sensory memory lasts up to maybe 1 to 2 seconds.**

    **a. True** *(see page 317)*

    b. False

6. **Pilot performance is significantly degraded when you try to perform two concurrent tasks using the same sensory modality (e.g., two auditory tasks or two visual tasks) compared to doing the tasks alone or with another task that uses a different modality (e.g., an auditory task and a visual task).**

   **c. True** *(see page 317)*

   d. False

7. **In a study of controller-pilot communications, researchers found that proactive interference is reduced if the time between two distinct ATC clearances is at least 10 seconds.**

   **a. True** *(see page 318)*

   b. False

8. **Spatial and visual information/activity interferes with verbal recall more than with spatial/visual recall.**

   a. True

   **b. False** *(see page 318)*

9. **A study of 386 NASA ASRS reports during a five-year period found that aircraft with similar call signs were the biggest factor in miscommunications between pilots and ATC contributing to 54 percent of incidents involving pilots accepting clearances intended for other aircraft.**

   **a. True** *(see page 319)*

   b. False

10. **According to George Miller's research, the limit to how much information can be held in working memory at one time is about five to nine items, but many agree that his numbers are somewhat optimistic for most people and that it may be closer to only about four or five items.**

    **a. True** *(see page 319)*

    b. False

11. **When you memorize something, it stays in working memory.**

    a. True

    **b. False** *(see page 320)*

12. **Memory is significantly improved when the context at the time of retrieval is different than it was when you encoded and stored the information into long-term memory.**

    a. True

    **b. False** *(see page 321)*

13. **Most memory failures on the flight deck are retrospective, not prospective, memory failures.**

    a. True

    **b. False** *(see page 321)*

14. **It is relatively easy to remember to perform a deferred task.**

    a. True

    **b. False** *(see page 322)*

15. **Time pressures have contributed to accidents and incidents.**

    **a. True** *(see page 323)*

    b. False

16. **NASA researchers studied 12 major airline accidents that involved hull loss or loss of life and that were deemed to involve significant levels of acute situational stress on the part of the flight crew after the onset of non-normal/emergency events that preceded the accident. They found that most of the 212 flight crew errors identified did not involve the pilots forgot something.**

    a. True

    **b. False** *(see page 324)*

17. **The four-digit transponder code "4173" is easier to recall when presented by ATC or repeated by the pilot as "four one seven three" than stated "forty-one seventy-three".**

    a. True

    **b. False** *(see page 325)*

18. **Associating new material with novel, unusual, or bizarre images enhances memory.**

    **a. True** *(see page 325)*

    b. False

19. **Cognitive scientist Donald Norman observes that humans rely on knowledge "in the world" in addition to knowledge "in the head" to aid in memory. Using his language, the use of a checklist would be an example of using knowledge "in the head."**

    a. True

    **b. False** *(see page 325)*

20. **Less cognitive effort is required using recall memory compared to recognition memory.**

    a. True

    **b. False** *(see page 326)*

21. **Checklists help support prospective memory by helping you to "remember to remember" to perform the required actions needed to achieve safe flight operations.**

    **a. True** *(see page 326)*

    b. False

22. **During periods of high mental workload attention and memory can be improved if you use more than one sensory modality (e.g., sight, hearing and touch vs. just sight).**

    **a. True** *(see page 326-327)*

    b. False

23. **Complying with the sterile cockpit rule does not really aid memory performance of flight crews.**

    a. True

    **b. False** *(see page 327)*

## Essay

1. **Why is it especially difficult to remember to perform a deferred task on the flight deck?**

2. **List some strategies to use to manage deferred tasks.**

3. **What are some good strategies to manage interruptions and distractions on the flight deck?**

4. **List and briefly describe at least four strategies you can use to reduce memory failures on the flight deck.**

# Chapter 17: Decision Making

## Exam Question Bank

## Multiple Choice

1. **After reading an accident report, what appears patently obvious to us after the fact did not appear obvious to the pilot before the fact. This is known as the _____.**

   a. fundamental attribution error

   **b. hindsight bias** *(see page 334)*

   c. framing

   d. expectation

2. **The I-knew-it-all-along effect, also known as the _____ bias, occurs when we read the conclusions of an aircraft accident report and believe that the cause is so blatantly obvious that we would never make the same mistake as the accident pilot did.**

   a. heuristic

   b. framing

   c. expectation

   **d. hindsight** *(see page 334)*

3. **The _____ is the tendency to blame internal characteristics in others for their attitudes, behavior or failures while blaming situational circumstances to excuse our own.**

   a. escalation bias

   **b. fundamental attribution error** *(see page 334)*

   c. confirmation bias

   d. optimistic bias

4. **The hindsight bias leads to a kind of _____, thereby preventing us from truly learning from the mistakes of others when we read aircraft accident reports.**

   **a. cognitive conceit** *(see page 334)*

   b. optimistic bias

   c. framing bias

   d. hindsight bias

5. **About a third of all worldwide major and substantial-damage transport-category turbojet and turboprop aircraft accidents are runway-related accidents, with 97 percent of those classified as runway _____.**

   **a. excursions** *(see page 337)*

   b. incursions

   c. takeoff accidents

   d. events

6. **_____ decision-making models describe how decisions should be made to arrive at the best possible choice, while _____ models attempt to explain how humans actually do make decisions.**

   **a. Normative; descriptive** *(see page 338)*

   b. Descriptive; normative

   c. Normative; compensatory

   d. Heuristic; compensatory

7. **A person who chooses an option with a less desirable trait because another desirable trait compensates for it, is adopting a _____ approach to decision making.**

   **a. compensatory** *(see page 339)*

   b. non-compensatory

   c. normative

   d. descriptive

8. **Decision making in its most basic form involves _____.**

   a. choosing a course of action, then assessing a situation

   b. only choosing a course of action

   **c. assessing a situation, then choosing a course of action** *(see page 339)*

   d. only assessing a situation

9. **_____ behaviors involve highly practiced manual/physical motor skills that occur almost automatically and usually at an unconscious level.**

   a. Rule-based

   b. Knowledge-based

   **c. Skill-based** *(see page 341)*

   d. Normative

10. **A pilot makes minor stick-and-rudder control inputs to remain within altitude and heading parameters when flying manually. This is an example of _____ behavior.**

    **a. skill-based** *(see page 341)*
    b. rule-based
    c. knowledge-based
    d. compensatory

11. **_____ behaviors involve predetermined actions that apply to specific situations, often using an "if x, then y" formula.**

    a. Skill-based
    **b. Rule-based** *(see page 341)*
    c. Knowledge-based
    d. Compensatory

12. **The left alternator light illuminates, and the crew carries out the steps prescribed in the illumination of alternator light checklist. This is an example of _____ behavior.**

    a. skill-based
    b. knowledge-based
    **c. rule-based** *(see page 341)*
    d. compensatory

13. **_____ behaviors involve reliance on a pilot's own experience and previously learned knowledge to solve a novel problem.**

    a. Rule-based
    b. Skill-based
    **c. Knowledge-based** *(see page 341)*
    d. Descriptive

14. **When you use rules of thumb to make decisions, you are said to be using _____.**

    a. framing
    b. compensatory strategies
    c. a normative approach
    **d. heuristics** *(see page 343)*

15. **The _____ is used when we estimate the frequency or probability of something by the ease with which instances or associations can be recalled.**

    a. hindsight bias
    b. framing heuristic
    c. expectation bias
    **d. availability heuristic** *(see page 343)*

16. **When obtaining updated weather information that describes more serious conditions than originally forecast, pilots may make insufficient adjustments to their judgment of weather severity and elect to continue to their destination in the face of deteriorating weather. The pilot may be using the _____.**

a. confirmation bias

**b. anchoring and adjustment heuristic** *(see page 345)*

c. hindsight bias

d. compensatory heuristic

17. **You must decide whether you should continue VFR flight into gradually deteriorating weather or divert. If you think about your decision in terms of choices between two gains (e.g., certain preservation of life if you turn back/divert vs. the possibility of making it through the poor weather if you continue), you will tend to be risk averse. If you think about your decision in terms of choices between two losses (e.g., passenger displeasure, missed meetings/connections, etc., if you turn back/divert vs. the possibility of an accident should you continue), you will tend to be risk-seeking and continue. This type of thinking may be caused by the _____ bias.**

**a. framing bias** *(see page 345-346)*

b. availability heuristic

c. hindsight bias

d. expectation bias

18. **You are reluctant to abandon a given course of action even when it is a failing one because you have too much invested to quit in terms of time, energy, and other resources. This is an example of the _____.**

**a. escalation bias** *(see page 346)*

b. framing bias

c. hindsight bias

d. optimistic bias

19. **When a pilot has a VFR-into-IMC accident on the return trip to home we sometimes call it the _____ syndrome.**

a. palindrome

b. lost-leg

**c. last-leg** *(see page 346)*

d. home-drone

20. **The tendency to look for evidence which supports our hunches, rather than evidence that discredits them, is known as the _____ bias.**

a. framing

b. escalation

**c. confirmation** *(see page 347)*

d. optimistic

21. **During a night visual approach in VMC, Southwest Airlines Flight 4013, a Boeing B-737, was cleared to land on Runway 14 at Branson Airport in Missouri, but the crew mistakenly landed 6 miles north on Runway 12 at M. Graham Clark Downtown Airport. The flight crew may have fallen victim to the _____.**

**a. confirmation bias** *(see page 347)*

b. framing bias

c. availability heuristic

d. expectation bias

22. **After you've made the decision to continue to your destination in poor weather (rather than divert to a more suitable airport), you increase your belief that it was a much better choice than the other option. You are likely affected by the _____ bias.**

a. framing

b. confirmation

**c. choice-supportive** *(see page 348)*

d. escalation

23. **_____ occurs when you think what you believe is true even in the face of evidence that discredits such a belief.**

a. Persistence bias

b. Expectation bias

c. Optimistic bias

**d. Belief perseverance** *(see page 348)*

24. **If you believe that an accident might happen to the other person, but never to you, you might be exhibiting _____.**

a. the ability bias

**b. invulnerability (or optimistic) bias** *(see page 349)*

c. the macho attitude

d. belief perseverance

25. **If you believe that you possess greater flying skill than your peers and are better at avoiding or extricating yourself from an unsafe flight situation, you might be exhibiting _____.**

**a. macho (or ability) bias** *(see page 349)*

b. the attitude of invulnerability

c. choice-supportive bias

d. belief perseverance

**26. When people asked to indicate their confidence levels to answers they give to various questions they are almost always more confident of the correctness of their answers than they are actually correct. This is evidence of _____.**

a. confirmation bias

**b. overconfidence** *(see page 350)*

c. optimistic bias

d. under confidence

**27. Experienced pilots are more likely to make _____ decisions.**

a. normative

b. noncompensatory

**c. recognition-primed** *(see page 353)*

d. optimistic

**28. _____ is the effective use of all available resources—people, information, and equipment—to achieve safe and efficient flight operations.**

**a. CRM** *(see page 354)*

b. MRC

c. RCM

d. SRM

**29. _____ is the art of managing all onboard and outside resources available to a pilot before and during a flight to help ensure a safe and successful outcome.**

a. CRM

b. MRC

c. RCM

**d. SRM** *(see page 354)*

**30. The decision to stick to your plan to continue a course of action even though the evidence suggests you shouldn't, is called a _____ error.**

a. confirmation

**b. plan continuation** *(see page 356)*

c. belief perseverance

d. recognition-primed

**31. What is *not* a good suggestion to help you make better decisions on the flight deck?**

a. Do your homework by being prepared for every flight

b. Maintain your proficiency

c. Comply with SOPs

**d. Employ the optimistic and ability heuristics** *(see page 353-354, 356)*

32. **What is *not* a good suggestion to follow to make better decisions on the flight deck?**

    a. Use checklists

    b. Practice CRM (or SRM)

    c. Manage stress

    **d. Use the confirmation bias** *(see page 354-356)*

## True/False

1. **A study of 37 major U.S. airline accidents that occurred between 1978 and 1990, where the actions of flight crews were a causal or contributing factor to the accident, found that tactical decision errors were the third leading type of flight crew error.**

    **a. True** *(see page 336)*

    b. False

2. **A study of 2,801 U.S. GA accidents that occurred between 2008 and 2010 found the pilot's actions, decision making, or cockpit management was the cause of 70 percent of fatal airplane accidents.**

    **a. True** *(see page 336)*

    b. False

3. **Faulty pilot decision making contributes to a significant proportion of fatal and non-fatal aviation accidents.**

    **a. True** *(see page 336)*

    b. False

4. **Compared to the 1980s when they averaged more than twice a week, VFR-into-IMC accidents occur less than twice a month within the United States and Canada.**

    **a. True** *(see page 337)*

    b. False

5. **Attempted VFR-into-IMC flight remains the number one cause of fatal GA weather-related accidents in the United States and Canada.**

    **a. True** *(see page 337)*

    b. False

6. **Compared to a fatality rate of about only 19 percent for GA accidents, almost 90 percent of VFR-into-IMC accidents result in fatalities.**

    **a. True** *(see page 337)*

    b. False

7. **Violations are unintentional mistakes (the pilot may not know better) while decision errors involve intentional noncompliance with regulations, rules, and procedures that are designed to ensure safe flight operations (the pilot knows better but makes the decision anyway).**

   a. True

   **b. False** *(see page 337-338)*

8. **A United Airlines DC-10 in Sioux City, Iowa, experienced a catastrophic separation and forceful discharge of uncontained stage 1 fan rotor assembly parts from the number 2 engine that severed all three hydraulic systems that powered the airplane's flight controls, rendering them useless. This was a well-structured, rule-based, problem for the crew to manage.**

   a. True

   **b. False** *(see page 341-342)*

9. **A US Airways Airbus lost thrust in both engines two minutes after departing Runway 04 at LaGuardia Airport after encountering a flock of Canada geese at only 2,800 feet AGL. This was an ill-structured, knowledge-based problem for the crew to manage.**

   **a. True** *(see page 342-343)*

   b. False

10. **Researchers have discovered that unlike other types of accidents, those involving VFR flight into IMC tend to occur closer to the intended destination.**

    **a. True** *(see page 346)*

    b. False

11. **Most VFR-into-IMC accidents occur on the last leg of a return trip to home.**

    **a. True** *(see page 346)*

    b. False

12. **The confirmation bias has been implicated in very few aircraft accidents and incidents.**

    a. True

    **b. False** *(see page 347)*

13. **Most GA pilots tend to believe they have a lower-than-average chance of experiencing an aircraft accident and believe they possess greater-than-average piloting ability that will help them to avoid, or extricate themselves from a situation that could lead to, an accident.**

    **a. True** *(see page 349)*

    b. False

14. **Most Americans believe they are more intelligent than their fellow citizens.**

    **a. True** *(see page 349)*

    b. False

15. **Most GA pilots believe they are safer, are much less likely to take risks in flying, and possess greater flying skill than their peers.**

    **a. True** *(see page 349)*

    b. False

16. **The overconfidence bias has been implicated in only a few GA aircraft accidents and incidents.**

    a. True

    **b. False** *(see page 350)*

17. **Several studies indicate that compared to mildly/moderately depressed people, so-called "normal" people are more optimistic yet less realistic about life.**

    **a. True** *(see page 351)*

    b. False

18. **Even though optimistic and ability-type biases may be unrealistic and often unjustified, they appear to be very good for both our mental and physical well-being.**

    **a. True** *(see page 351)*

    b. False

19. **Poor CRM skills have been implicated in numerous airline incidents and accidents, including more than 70 percent of approach-and-landing incidents or accidents.**

    **a. True** *(see page 354)*

    b. False

## Essay

1. Decision making boils down to two basic elements. What are they?

2. Explain the difference between compensatory and non-compensatory decision making models. Use an aviation example to illustrate the difference.

3. Explain the difference between normative and descriptive decision making models. Use an aviation example to illustrate the difference.

4. List at least three decision-making biases and briefly explain how they could affect pilot decision making. Provide an example from the flight environment for each bias.

5. List and briefly explain at least three ways in which excess stress can affect decision-making performance.

6. List and briefly describe at least four strategies you can use to improve decision making on the flight deck.

# Chapter 18: Social Influence

## Exam Question Bank

## Multiple Choice

1. **_____ is the actual or perceived influence exerted by other people to feel, think, or behave in a certain manner.**

   **a. Social influence** *(see page 366)*
   b. Social loafing
   c. Social butterflies
   d. Cognitive psychology

2. **_____ is usually defined as the scientific study of how people's thoughts and behaviors are influenced by others.**

   a. Cognitive psychology
   b. Behavioral psychology
   c. Social loafing
   **d. Social psychology** *(see page 369)*

3. **People usually find _____ satisfaction and participate _____ the larger the size of the group they are in.**

   a. less; more
   **b. less; less** *(see page 369)*
   c. more; less
   d. more; more

4. **_____ are unwritten rules of expected behavior dictated by the majority of the group.**

   a. Roles
   b. Status
   **c. Norms** *(see page 369)*
   d. SOPs

5. **_____ is/are a set of socially defined norms that define how people in a given social situation should behave.**

   a. Norms
   **b. Roles** *(see page 369)*
   c. Status
   d. Groupthink

6. _____ is the prestige bestowed by the group on its members.

   a. Roles
   b. Norms
   c. Cohesiveness
   **d. Status** *(see page 369)*

7. Group _____ is the extent to which individual members are bonded together with each other.

   **a. cohesiveness** *(see page 369)*
   b. status
   c. think
   d. norms

8. Group _____ can occur when, after a group discusses an issue, individual group members tend to shift their position to a more extreme version of the position they initially held.

   a. think
   b. shift
   c. diffusion
   **d. polarization** *(see page 370)*

9. _____ is a phenomenon that occurs in situations where a crowd is present and a stranger needs some sort of assistance (e.g., due to a crime or medical emergency) but doesn't receive any.

   a. Groupthink
   b. Social loafing
   c. Conservative shift
   **d. Bystander effect** *(see page 370-371)*

10. _____ is the phenomenon of dividing responsibility for decisions, actions and consequences amongst the group, minimizing one's own individual share of responsibility.

    **a. Diffusion of responsibility** *(see page 371)*
    b. Bystander effect
    c. Groupthink
    d. Risky shift

11. If an individual group member expends less individual effort to accomplish a group goal than they would if they were acting alone they are exhibiting _____.

    **a. social loafing** *(see page 371)*
    b. bystander effect
    c. groupthink
    d. conservative shift

12. **The tendency of individuals in the group to agree with the group consensus—or their perception of the consensus—despite their own personal reservations about the group's decision is known as _____.**

a. social loafing
b. diffusion of responsibility
**c. groupthink** *(see page 371)*
d. groupshift

13. **_____ is cited as responsible for flawed decisions that contributed to two NASA space-mission disasters: the breakup of Space Shuttle Challenger after liftoff in 1986 and the disintegration of Space Shuttle Columbia during re-entry in 2003.**

a. Social loafing
**b. Groupthink** *(see page 371-372)*
c. Bystander effect
d. Risky shift

14. **_____ is a change in behavior or beliefs as a result of real or imagined group pressure.**

a. Groupthink
b. Social loafing
**c. Conformity** *(see page 373)*
d. Risky shift

15. **Psychologists generally distinguish between two types of conformity: _____ involves outwardly conforming to the values, beliefs or norms of the group, while privately disagreeing with them. _____ involves conforming to them and inwardly agreeing to them and internalizing them as one's own.**

**a. Compliance; Acceptance** *(see page 373)*
b. Acceptance; Compliance
c. Compliance; Compliance
d. Acceptance; Acceptance

16. **You privately disagree with the group but conform anyway because of your desire to be accepted by the other group members. This is known as _____ conformity.**

a. descriptive
b. informational
**c. normative** *(see page 375)*
d. relative

17. **What is *not* a recommended practice to reduce conformity in flight operations?**

    a. Be aware of social influence on your behavior

    b. Increase your confidence by maintaining expert knowledge of proper flight operations

    c. Be assertive by making your concerns known in a straightforward, yet respectful, manner

    **d. Go along, to get along** *(see page 378)*

## True/False

1. **A comprehensive review of 409 U.S. GA airplane VFR-into-IMC accidents during an eight-year period found that a significantly higher proportion of these types of accidents carry passengers on board (as opposed to the pilot being the sole occupant).**

    **a. True** *(see page 367)*

    b. False

2. **Eighty-four percent of Alaska commuter and air taxi pilots surveyed by the NTSB reported they had inadvertently entered IMC on a VFR flight in response to operational pressures from themselves and others (e.g., managers, passengers, other pilots, U.S. Postal Service).**

    **a. True** *(see page 367)*

    b. False

3. **Emergency medical services (EMS) pilots often continue VFR flight into reduced visibility and/or IMC because their judgment and decision-making ability is impaired by externally imposed pressures to complete an EMS flight (e.g., customers, supervisors, competitors).**

    **a. True** *(see page 368)*

    b. False

4. **An individual's feelings, beliefs, and behavior are not influenced by simply being in the presence of other people.**

    a. True

    **b. False** *(see page 369)*

5. **People tend to conform to group expectations the smaller a group's size.**

    a. True

    **b. False** *(see page 369)*

6. Highly cohesive groups tend to perform better as a team, but individual members also tend to experience greater pressure to conform to the wishes of the group.

   **a. True** *(see page 369)*

   b. False

7. Group polarization tends to increase if information is clear and unambiguous.

   a. True

   **b. False** *(see page 370)*

8. Studies have found that the higher the number of people observing a situation involving a stranger that needs assistance, the less likely anyone will offer it.

   **a. True** *(see page 370)*

   b. False

9. Groupthink is strongest within non-cohesive groups.

   a. True

   **b. False** *(see page 371)*

10. Stanley Milgram measured the degree to which people would obey an authority figure by having participants administer what they thought were electric shocks to participants who provided incorrect answers to questions in a memory test. What he found was 63 percent of participants, despite their protests, obeyed to the end administering what they thought was the full 450 volts to their victims.

    **a. True** *(see page 375)*

    b. False

11. Thirty-one of the first 40 U.S. Air Mail Service pilots were killed in action trying to meet and conform to the expectations imposed on them from the authority figures in government and industry.

    **a. True** *(see page 378)*

    b. False

## Essay

1. List and briefly describe three situations or conditions that are conducive to increased levels of conformity.

2. List and briefly explain four strategies you can use to minimize any undue pressure from others to take uncomfortable risks in flight?

# Chapter 19: Crew Resource Management

## Exam Question Bank

## Multiple Choice

1. _____ is the effective use of all available resources—people, information, and equipment—to achieve safe and efficient flight operations.

   **a. CRM** *(see page 386)*

   b. MRC

   c. RCM

   d. SRM

2. Specifically tailored to single-pilot operations, _____ is the art of managing all onboard and outside resources available to a pilot before and during a flight to help ensure a safe and successful outcome.

   a. CRM

   b. MRC

   c. RCM

   **d. SRM** *(see page 387)*

3. _____ involves stating what you know or believe in a direct and forthright manner.

   **a. Advocacy** *(see page 388)*

   b. Inquiry

   c. Listening

   d. Conflict resolution

4. If you have a high concern for attaining and maintaining good relationships and a friendly atmosphere on the flight deck, your communication style falls into the _____ quadrant on the relationship-task grid.

   a. aggressive

   b. assertive

   c. autonomous

   **d. nurturing** *(see page 388)*

5. **If you have a high concern for accomplishing the task with minimal concern for the thoughts and feelings of others on the flight deck, your communication style falls into the _____ quadrant on the relationship-task grid.**

   **a. aggressive** *(see page 388)*

   b. assertive

   c. autonomous

   d. nurturing

6. **The _____ style of communication describes the stereotypical autocratic captain who says to his or her FO, "Gear up. Flaps up. Shut up."**

   **a. aggressive** *(see page 389)*

   b. assertive

   c. autonomous

   d. nurturing

7. **If you have a high concern for both task accomplishment and maintaining good relationships and a friendly atmosphere on the flight deck, your communication style falls into the _____ quadrant on the relationship-task grid.**

   a. aggressive

   **b. assertive** *(see page 389)*

   c. autonomous

   d. nurturing

8. **In an emergency, a(n) _____ style of communication is recommended.**

   a. indirect

   **b. direct** *(see page 390)*

   c. subtle

   d. nurturing

9. **The flight deck authority gradient describes the _____.**

   a. the difference in temperature between the captain and FO in the cockpit

   b. the relationship-task gradient

   **c. actual and/or perceived difference in authority between the captain and his or her subordinates** *(see page 391)*

   d. the difference in pressure between the captain and FO

10. **The most desirable authority gradient on the flight deck is _____.**

    a. very steep

    **b. tilted down slightly toward the FO** *(see page 391 and fig 19-2)*

    c. flat

    d. negative

**11. An outcome that produces a higher level of group performance than the sum of the individual performance of its members is known as _____.**

a. energy
b. addition
c. subtraction
**d. synergy** *(see page 395)*

**12. The body's response to any demand (stressor) placed upon it is called _____.**

**a. stress** *(see page 396)*
b. a stressor
c. a psychological defense mechanism
d. eustress

**13. Any environmental, physiological, psychological, or social demand placed upon your body and/or mind (pleasant or unpleasant) is called _____.**

a. stress
b. eustress
c. distress
**d. a stressor** *(see page 396)*

**14. Pulling excessive positive G would be an example of a(n) _____ stressor.**

a. cognitive
**b. environmental/physical** *(see page 396 and table 19-3)*
c. psychological
d. social

**15. Spatial disorientation would be an example of a(n) _____ stressor.**

a. environmental/physical
b. psychological/cognitive
**c. physiological** *(see page 396 and table 19-3)*
d. social

**16. Trying to diagnose and solve an in-flight emergency would be an example of a(n) _____ stressor.**

**a. psychological/cognitive** *(see page 396 and table 19-3)*
b. physiological
c. environmental/physical
d. social

17. **Working with difficult captain would be an example of a _____ stressor.**

**a. social** *(see page 396 and table 19-3)*
b. psychological/cognitive
c. physiological
d. environmental/physical

18. **The natural and normal mechanism used by almost everyone to cope with excess stress is the _____ response.**

a. regression
**b. fight or flight** *(see page 396)*
c. projection
d. sublimation

19. **Pupil dilation, increase in heart and breathing rate, greater perspiration, and more acute vision and hearing are physiological responses that occur during the _____ stage of Hans Selye's General Adaptation Syndrome.**

a. resistance
**b. alarm reaction** *(see page 396)*
c. exhaustion
d. recovery

20. **Fatigue, irritability, depression, illness, and even disease are physiological responses that can occur during the _____ stage of Hans Selye's General Adaptation Syndrome.**

a. alarm reaction
b. resistance
**c. exhaustion** *(see page 396)*
d. recovery

21. **_____ demonstrate(s) that too little or too much stress often leads to diminished performance, with the optimal level of performance accomplished at moderate levels of stress.**

**a. The Yerkes-Dodson curve** *(see page 397 and fig 19-3)*
b. The General Adaptation Syndrome
c. Psychological defense mechanisms
d. The relationship-task grid

22. **_____ stress results from short-term demands placed on the body by the immediate task at hand.**

a. Chronic
b. Long-term
c. Functional
**d. Situational** *(see page 397)*

23. **An otherwise competent pilot fails a checkride because she or he is too stressed-out about it (checkride-itis). This is an example of _____.**

a. chronic stress
b. long-term stress
**c. situational stress** *(see page 397)*
d. alarm reaction

24. **_____ results from long-term demands/stressors placed on the body.**

**a. Life stress** *(see page 397)*
b. Situational stress
c. Acute stress
d. Checkride-it is

25. **An otherwise competent pilot fails a checkride because they have been, for several weeks, too stressed-out at work. This is an example of _____.**

a. Situational stress
b. Acute stress
c. Alarm reaction
**d. Chronic stress** *(see page 397)*

26. **A NASA study on acute stress and threat-induced anxiety on the flight deck examined 12 major airline hull-loss/loss-of-life accidents where errors of highly experienced flight crews made on the flight deck were related to the highly stressful situation they faced. More than two-thirds of 212 errors were errors of _____, many of which were _____ memory failures.**

**a. omission; prospective** *(see page 398)*
b. omission; retrospective
c. commission; prospective
d. commission; retrospective

27. **The FAA suggests seven ways to effectively manage chronic life-stress. Which of the following is not one of them?**

a. Use humor
b. Practice moderation
c. Exercise
**d. Keep your thoughts to yourself** *(see page 402-403)*

## True/False

1. United Airlines was the first in the United States to implement an extensive CRM training program for its pilots; it was called command leadership resource management.

   **a. True** *(see page 386)*

   b. False

2. An advanced qualification program (AQP) is alternate method of qualifying, training, certifying, and ensuring competency of flight crew members by providing ground instruction in CRM that is reinforced and practiced through in-flight training scenarios in a simulator or flight training device (FTD) during line-oriented simulations (LOS) or line-oriented flight training (LOFT).

   **a. True** *(see page 386)*

   b. False

3. The FO was the PF in more than 80 percent of 37 major U.S. airline accidents where the actions of the flight crew were a causal or contributing factor to the accident.

   a. True

   **b. False** *(see page 388)*

4. If you are overly assertive you are in danger of violating your own rights by letting others get their way, which could lead to less safe outcomes on the flight deck.

   a. True

   **b. False** *(see page 388-389)*

5. If you are overly nurturing you are in danger of violating the rights of others, which could lead to less safe outcomes on the flight deck.

   a. True

   **b. False** *(see page 388-389)*

6. As a pilot, you should aim to change your behaviors in the assertive direction.

   **a. True** *(see page 390)*

   b. False

7. A simulator study conducted by United Airlines had captains, who were designated the PF, feign subtle incapacitation while conducting an approach. In approximately 25 percent of the trials the aircraft hit the ground because the FO did not intervene.

   **a. True** *(see page 390)*

   b. False

8. **Major aircraft accidents have occurred because subordinate crew members were too intimidated to assertively communicate their concerns to the captain in a forthright manner.**

   **a. True** *(see page 390)*

   b. False

9. **One principle of effective conflict resolution is to focus the discussion on *who* is right, not *what* is right.**

   a. True

   **b. False** *(see page 392)*

10. **Flight crews who communicate more—make more statements, inquiries, commands, and acknowledgements—perform better and the outcomes are more positive than those who don't.**

    **a. True** *(see page 392)*

    b. False

11. **In the NTSB study of 37 major U.S. airline accidents where the actions of the flight crew were a causal or contributing factor to the accident, it was found that even though tactical decision errors were the third leading type of flight crew error overall, they were the number one error-type committed by captains.**

    **a. True** *(see page 395)*

    b. False

12. **Excess stress levels can impair seeing, hearing, attending, remembering, thinking, and deciding.**

    **a. True** *(see page 395 and table 19-2)*

    b. False

13. **A stressed-out person tends to communicate more.**

    a. True

    **b. False** *(see page 395 and table 19-2)*

14. **As the degree of uncertainty regarding the outcome of a threatening situation increases, and as a your perceived ability to successfully manage it decreases, you will tend to view the situation as a threat rather than a challenge; this leads to greater levels of anxiety that can in turn impair your performance.**

    **a. True** *(see page 397)*

    b. False

15. **Acute situational stress has been implicated in several major aircraft accidents.**

    **a. True** *(see page 398)*

    b. False

16. **Preoccupation with marital separation was one of the most common stress-related factors that was correlated with accidents amongst Canadian fixed- and rotary-wing pilots, was.**

    **a. True** *(see page 399)*

    b. False

17. **Those who experience significant life stress events experience more intrusive thoughts, which in turn reduces their performance on working-memory tasks.**

    **a. True** *(see page 399)*

    b. False

18. **Life-stress has not been implicated in aircraft accidents.**

    a. True

    **b. False** *(see page 400)*

19. **Chronic life-stress can lead to fatigue which can in turn can increase the probability of performance impairment and an aircraft accident.**

    **a. True** *(see page 400)*

    b. False

20. **When faced with a stressor, our stress level depends on our cognitive appraisal of the demand and our ability to meet it. If this appraisal is based on an overly negative perception of the actual demand and our actual ability to handle it, we will experience more stress than we need to.**

    **a. True** *(see page 401 and fig 19-4)*

    b. False

21. **Excess stress on the flight deck (e.g., an emergency) can interfere with your ability to successfully manage the situation, thereby contributing to a self-fulfilling prophecy should you fail to manage stress.**

    **a. True** *(see page 401)*

    b. False

22. There are relatively few circumstances involving a diagnosis of depression that would result in permanent denial of medical certification for U.S. pilots.

    **a. True** *(see page 402)*

    b. False

23. The FAA is willing to return virtually all clinically depressed pilots back to flying after successful treatment.

    **a. True** *(see page 402)*

    b. False

## Essay

1. List and briefly describe five important aspects of effective communication.

2. The text discusses five components of effective teamwork. List and briefly describe at least three of them.

3. The text suggests seven ways to effectively manage chronic life-stress. List and share your opinions on at least four of them.

4. What can you do to effectively manage stress—and therefore avoid its negative effects on your performance—when faced with an emergency such as fire or engine failure?

# Chapter 20: Threat and Error Management

## Exam Question Bank

## Multiple Choice

1. A(n) _____ is any condition, event, or error outside of the influence of the flight crew that increases the operational complexity of a flight, often leads to pilot error, and requires attention and management if safety margins are to be maintained.

   a. error

   **b. threat** *(see page 410)*

   c. mistake

   d. undesired aircraft state

2. Threats originate from four sources that generally align with the FAA's familiar PAVE model: the physiological or psychological condition of the pilot (not their actions), the _____, the environment, and other people's actions/expectations (external pressures).

   **a. aircraft** *(see page 410)*

   b. airworthiness

   c. ACAS

   d. areas of vulnerability

3. A(n) _____ is any action or inaction on the part of the flight crew that leads to a deviation from crew or organizational intentions and that can lead to an undesired aircraft state increasing the probability of an accident or incident.

   **a. error** *(see page 411)*

   b. threat

   c. mistake

   d. undesired aircraft state

4. _____ include manual (hand-flying) skill errors, poor technique, and improper systems or radio operation (finger trouble).

   **a. Handling and proficiency errors** *(see page 411)*

   b. Ineffective resource management errors

   c. Procedural errors

   d. Violations

5. **_____ occur when you unintentionally fail to operate the aircraft according to the manufacturer's instructions found in the aircraft flight manual or the company SOPs or fail to use the checklist properly.**

a. Handling and proficiency errors
b. Ineffective resource management errors
**c. Procedural errors** *(see page 412)*
d. Violations

6. **_____ occur when you fail to communicate effectively or fail to manage distractions or stress.**

a. Handling and proficiency errors
**b. Ineffective resource management errors** *(see page 412)*
c. Procedural errors
d. Violations

7. **_____ are unintended mistakes, while _____ are intentional (willful) noncompliance with regulations and procedures that are designed to ensure safe flight operations.**

a. Violations; errors
b. Errors; errors
**c. Errors; violations** *(see page 412)*
d. Violations; violations

8. **_____ violations involve somewhat habitual noncompliance with rules and regulations, while _____ violations are rare.**

a. Exceptional; routine
b. Persistent; routine
c. Rare; continual
**d. Routine; exceptional** *(see page 412)*

9. **A(n) _____ is an undesired aircraft position, condition, or attitude that compromises safety and, if not corrected, could lead to an incident or an accident.**

a. error
b. threat
c. mistake
**d. undesired aircraft state** *(see page 412-413)*

10. **A(n) _____ is a condition whereby an airplane unintentionally exceeds parameters normally considered safe.**

    a. attitude
    b. event cascade
    **c. airplane upset** *(see page 413)*
    d. threat

11. **Which of the following is *not* indicative of an airplane upset?**

    a. Pitch attitude greater than 25 degrees nose-up
    b. Bank angle greater than 45 degrees
    c. Inappropriate airspeeds (too fast or slow) for the conditions
    **d. Pitch attitude less than 10 degrees nose-down** *(see page 413)*

12. **An unstable approach is an example of _____.**

    a. a slip
    b. a lapse
    **c. an undesired aircraft state** *(see page 413)*
    d. an event cascade

13. **Unexpected threats often lead to an errors, creating a domino effect, or _____, that subsequently leads to an undesired aircraft state.**

    **a. an event cascade** *(see page 415)*
    b. lapse
    c. an event horizon
    d. point of no return

14. **Any measure or action taken to counter a threat or error is called a _____.**

    **a. countermeasure** *(see page 415)*
    b. hazard
    c. best practice
    d. event cascade

15. **Terrain awareness warning systems (TAWS or enhanced GPWS) and airborne collision avoidance systems (ACAS or TCAS) are examples of _____.**

    a. active countermeasures
    b. passive best practices
    **c. passive countermeasures** *(see page 415)*
    d. active best practices

16. **_____ one-size-fits-all countermeasures are good for covering a multitude of problems and are applicable to almost every aspect of flight.**

    a. Threat- and error-specific
    b. Passive
    **c. Generic** *(see page 416)*
    d. Domain-specific

17. **A(n) _____ is an industry-recognized procedure or set of behaviors that operational experience and research have proven to result in the best possible outcome for a given task.**

    a. passive countermeasure
    b. active countermeasure
    c. worst practice
    **d. best practice** *(see page 416)*

18. **_____ are written procedures that are applied uniformly and consistently for every aspect and phase of flight, including normal, non-normal, and emergency operations.**

    a. Flows
    **b. SOPs** *(see page 417)*
    c. LOSAs
    d. Immediate action items

19. **Which of the following is permitted when the sterile cockpit rule is in effect?**

    a. Passenger announcements pointing out sights of interest
    b. Eating meals
    c. Nonessential conversations within and between the cabin and flight deck
    **d. Use of personal wireless communication device if needed for safe operation of the aircraft** *(see page 418)*

## True/False

1. **A threat and error management (TEM) approach to managing risk assumes that threats to safe flight are ever-present and errors made by pilots are inescapable.**

    **a. True** *(see page 409)*
    b. False

2. **TEM is a broad model that was initially developed as a systematic observation tool in line operations safety audits (LOSA).**

    **a. True** *(see page 409)*
    b. False

3. Line operations safety audits (LOSA) involve highly trained expert observers who, while riding in the aircraft jump seat during regularly scheduled airline flights, record and code threats to safety that flight crews may face and the errors that they may make, and more importantly, how they manage them.

   **a. True** *(see page 409)*

   b. False

4. An error occurs when a person fails to perform the correct action or performs the wrong action for a given circumstance.

   **a. True** *(see page 409)*

   b. False

5. Exceptional violations involve somewhat habitual noncompliance with rules and regulations.

   a. True

   **b. False** *(see page 412)*

6. Exceptional violations almost always involve *extreme* noncompliance with rules and regulations, while routine violations almost always involve *mild* noncompliance.

   a. True

   **b. False** *(see page 412)*

7. Most runway excursions (REs) occur during takeoff.

   a. True

   **b. False** *(see page 413)*

8. In a controlled flight into terrain (CFIT) accident the aircraft is under positive control, but the pilot is unaware of its impending collision with nearby terrain (or becomes aware too late).

   **a. True** *(see page 414)*

   b. False

9. It is not considered an error if you fail to manage a threat.

   a. True

   **b. False** *(see page 415)*

10. Using countermeasures in flight is like defensive driving for pilots.

    **a. True** *(see page 416)*

    b. False

11. There doesn't always have be one pilot designated as the pilot monitoring (PM).

    a. True

    **b. False** *(see page 417)*

12. Verbalizing procedures provides a redundancy gain by using an additional sensory modality besides vision.

    **a. True** *(see page 418)*

    b. False

13. Noncompliance with the sterile cockpit rule has been implicated in only a few aircraft incidents and fatal accidents.

    a. True

    **b. False** *(see page 418)*

14. A stabilized approach involves flying a relatively constant approach angle and rate of descent (normally no greater than 1,000 feet per minute) down to the flare-out point within the touchdown zone of the runway.

    **a. True** *(see page 419)*

    b. False

15. A stabilized approach for a commercial flight should be stabilized by no lower than 1,000 feet height above touchdown (HAT) in IMC or 500 feet HAT in VMC, and the airplane should be in the landing configuration and all checklist should be complete.

    **a. True** *(see page 419)*

    b. False

## Essay

1. Distinguish between errors and violations in the TEM approach.

2. The text discusses four categories of errors that pilots commit on the flight deck. List three and provide an example of each from flight operations.

3. The text discusses four type of undesired aircraft states. List three and provide an example of each.

4. The text lists about a dozen generic best practice countermeasures that airline and other professional crews use to help them effectively manage threats and errors on the flight deck. List and briefly explain four of them.