PRACTICE EXAM 17

1. A propeller blade is a rotating airfoil. The thrust it produces is analogous to which force on a wing?

A. Drag, opposing the airplane's motion

B. Lift, produced by a pressure difference across the airfoil

C. Weight, acting through the center of gravity

D. Load factor, felt during a turn

2. Carburetor ice causes a gradual RPM loss in a fixed-pitch airplane. The direct aerodynamic consequence if uncorrected is:

A. An increase in the wing's critical angle of attack

B. A reduction in the airplane's stall speed

C. An increase in available excess power

D. Reduced thrust, degrading climb and acceleration

3. Both a wing and a propeller blade lose effectiveness if they exceed their critical angle of attack. For the propeller, increasing blade angle (pitch) without a speed change:

A. Increases the blade's angle of attack toward its critical limit

B. Decreases the blade's angle of attack to zero

C. Has no effect on the blade's angle of attack

D. Reverses the direction of the thrust produced

4. The dual ignition system improves combustion efficiency. The aerodynamic benefit of this is most directly:

A. Slightly more power available for thrust and climb

B. A reduction in the wing's induced drag

C. A lower stall speed at all weights

D. An increase in the airplane's maximum altitude limit

5. A loss of oil pressure threatens the engine. The eventual aerodynamic consequence of a seized engine in flight is that the airplane must:

A. Climb on the remaining excess power

B. Maintain level flight indefinitely

C. Increase thrust to overcome the loss

D. Glide, balancing lift and weight without thrust

6. Flaps increase both lift and drag. A pilot using flaps on approach achieves:

A. A slower, steeper approach without gaining speed

B. A higher cruise speed in level flight

C. A reduction in the airplane's total drag

D. An increase in the never-exceed speed

7. As density altitude increases, both engine power and propeller efficiency decrease. The combined aerodynamic result is:

A. An increase in the airplane's rate of climb

B. A reduced rate of climb due to less excess power

C. A lower stall speed in the thinner air

D. A shorter takeoff distance on the runway

8. The elevator controls pitch, which changes angle of attack. Raising the nose at constant power will, up to a point:

A. Decrease the wing's angle of attack

B. Increase the angle of attack and the lift produced

C. Eliminate induced drag entirely

D. Increase the airplane's true airspeed

9. A controllable-pitch propeller lets the pilot adjust blade angle. Its aerodynamic advantage over a fixed-pitch propeller is:

A. Eliminating the need for an oil system

B. Removing the requirement for ignition timing

C. Lowering the wing's stall speed in cruise

D. Maintaining efficient blade angle of attack across flight conditions

10. An alternator failure does not stop the engine because the magnetos are independent. Aerodynamically, the airplane therefore:

A. Loses all thrust and must glide immediately

B. Continues normal powered flight with thrust intact

C. Stalls due to the loss of electrical power

D. Cannot maintain its angle of attack

11. The wing's induced drag is greatest at low airspeed and high angle of attack. To overcome it during a slow climb, the engine must provide:

A. Less power than in cruise

B. Sufficient thrust despite the higher induced drag

C. No thrust, relying on momentum

D. A reduction in propeller pitch to zero

12. A blocked pitot tube affects the airspeed indicator, a pitot-static instrument. The aerodynamic risk of an unreliable airspeed reading is:

A. Inadvertently approaching the critical angle of attack unaware

B. An automatic increase in the wing's lift

C. A guaranteed reduction in induced drag

D. The propeller changing pitch on its own

13. Lowering the landing gear (on a retractable-gear aircraft) and extending flaps both increase drag. The combined aerodynamic effect on approach is:

A. A steeper descent at a controlled airspeed

B. An increase in the airplane's cruise efficiency

C. A reduction in the required runway length to zero

D. An increase in the wing's maximum lift coefficient only

14. The four-stroke engine's power stroke produces the rotational energy that the propeller converts to thrust. If the engine produces less power at altitude, the airplane's:

A. Stall speed decreases proportionally

B. Excess power and climb capability decrease

C. Induced drag is eliminated

D. Maximum certificated weight increases

15. A wing twist on a propeller blade and a wing's planform both serve to manage angle of attack. The propeller's twist specifically:

A. Increases the airplane's gross weight capacity

B. Equalizes the angle of attack from the faster tip to the slower root

C. Reduces the engine's oil temperature in cruise

D. Eliminates the need for a magneto check

16. During a steep turn, load factor and stall speed both increase. The engine and propeller must respond by providing:

A. Less thrust, since the turn reduces drag

B. No change, since turns require no extra power

C. Additional thrust to maintain airspeed against increased induced drag

D. Zero thrust, relying on the bank to sustain the turn

17. A pilot applies carburetor heat, which routes warmer, less dense air into the engine. The immediate effect on engine power is:

A. A slight increase in power output

B. A slight decrease in power output

C. No change in power whatsoever

D. A complete loss of engine power

18. The ammeter shows the charging system's state, an electrical function. A total electrical failure in day VFR affects flight primarily by:

A. Disabling radios and electric instruments, not engine thrust

B. Stopping the engine and removing all thrust

C. Increasing the wing's critical angle of attack

D. Forcing an immediate stall of the airplane

19. Both excess weight and high density altitude raise the stall speed and lengthen takeoff. The shared aerodynamic mechanism is:

A. A reduction in the wing's required angle of attack

B. An increase in available engine power

C. The wing must reach a higher true airspeed to produce the needed lift

D. A decrease in the airplane's induced drag

20. A magneto check reveals an excessive RPM drop on one magneto. The performance concern this raises is:

A. The wing's stall speed has increased

B. The propeller has changed to a coarse pitch

C. The engine may not produce full rated power for takeoff

D. The airplane's center of gravity has shifted aft

21. Engine oil cools as well as lubricates. Sustained operation at high power and high density altitude raises the concern of:

A. The wing stalling at a lower angle of attack

B. The propeller losing its twist

C. The ammeter showing a positive charge

D. Elevated oil temperature requiring monitoring

22. The fuel-air mixture must be correct for efficient combustion. At high density altitude, the air is less dense, so for proper combustion the pilot may need to:

A. Increase the propeller pitch automatically

B. Lean the mixture to match the thinner air

C. Lower the wing flaps for more lift

D. Reduce the angle of attack to climb

23. A wing produces lift through a pressure difference; the pitot-static system measures pressure to indicate airspeed. A static port blockage therefore affects:

A. The engine's ignition timing

B. The propeller's blade pitch

C. The altimeter and vertical speed indicator

D. The wing's actual lift production

24. Both ground effect and flaps can allow an airplane to become airborne at a lower speed. The hazard they share on takeoff is:

A. An automatic increase in engine power

B. A permanent reduction in stall speed after liftoff

C. A guaranteed steeper climb than charted

D. Lifting off at a speed too low to sustain flight once clear of the effect

25. The propeller converts engine power to thrust, which overcomes drag. In steady level flight, thrust and drag are:

A. Always greater on the thrust side, accelerating the airplane

B. Always greater on the drag side, decelerating the airplane

C. Equal, keeping the airspeed constant

D. Unrelated to the airplane's airspeed

26. A pilot notices the engine running rough and losing power, with carburetor heat applied. Considering both systems and aerodynamics, the immediate priority is to:

A. Maintain airspeed and a safe glide attitude while troubleshooting

B. Pull the nose up sharply to gain altitude

C. Increase the angle of attack toward the critical angle

D. Bank steeply to return to the airport

27. The wing's angle of attack determines lift and stall, while engine power determines thrust. To climb, a pilot must coordinate:

A. Reduced pitch and reduced power

B. Increased pitch only, with no power change

C. A steep bank with idle power

D. Increased pitch (angle of attack) with added power

28. A propeller at high RPM and a wing at high angle of attack both have limits. Exceeding the wing's limit causes a stall; exceeding safe engine/propeller RPM causes:

A. An automatic reduction in the wing's lift

B. A decrease in the airplane's stall speed

C. Potential engine or propeller overstress and damage

D. An increase in the airplane's gross weight

29. The induction system delivers air for combustion; the wing needs airflow for lift. Both are degraded by:

A. Reduced air density at high density altitude

B. An increase in the local atmospheric pressure

C. A decrease in the outside air temperature alone

D. A forward shift of the center of gravity

30. A trim tab relieves control pressure on a surface such as the elevator. By holding a pitch attitude, trim helps the pilot maintain:

A. A consistent angle of attack and airspeed in a climb or cruise

B. A higher maximum engine RPM

C. A reduced fuel burn regardless of power

D. A lower never-exceed speed

31. A pilot at high density altitude finds the airplane reluctant to climb. Integrating systems and aerodynamics, the cause is:

A. The wing's critical angle of attack has decreased

B. The propeller has automatically coarsened its pitch

C. The ammeter is showing a discharge

D. Reduced engine power and propeller efficiency leave little excess power

32. The magnetos fire the spark plugs to drive the power stroke. If one magneto fails in flight, the engine:

A. Stops immediately, requiring a glide

B. Loses all thrust within seconds

C. Increases power on the remaining magneto

D. Continues running on the other magneto with slightly reduced power

33. Both a blocked static port and an aft center of gravity create flight hazards, but through different paths. The aft CG specifically degrades:

A. The accuracy of the airspeed indicator

B. The engine's ignition redundancy

C. Longitudinal stability and stall recovery

D. The fuel system's delivery to the engine

34. A pilot reduces power and lowers the nose to descend. Aerodynamically, lowering the nose primarily:

A. Increases the wing's angle of attack

B. Increases the engine's power output

C. Reduces the angle of attack and can increase airspeed

D. Raises the airplane's stall speed

35. The electrical system powers the avionics but not the running ignition. A pilot losing the alternator should, integrating both concerns:

A. Pull the nose up to reduce electrical demand

B. Shed nonessential electrical load while continuing powered flight

C. Shut down the engine to conserve the battery

D. Increase the angle of attack to the critical limit

36. A wing's lift depends on air density, airspeed, and angle of attack. On a hot, high-elevation day, the reduced density means the wing must:

A. Reduce its angle of attack to produce lift

B. Produce more lift at a lower true airspeed

C. Stall at a lower true airspeed than at sea level

D. Reach a higher true airspeed to produce the required lift

37. A pilot performs a run-up and finds normal magneto drops and stable oil pressure. This confirms readiness for takeoff because it verifies:

A. The wing's critical angle of attack is correct

B. The center of gravity is within limits

C. The ignition and lubrication systems are functioning to produce power safely

D. The airspeed indicator is reading accurately

38. Induced drag (from lift) and parasite drag (from shape) both must be overcome by thrust. The engine works hardest against induced drag during:

A. High-speed cruise at low angle of attack

B. A descent with the power at idle

C. A slow climb at high angle of attack

D. Taxi operations on the ground

39. A pilot reduces throttle, reducing thrust below drag. The airplane will:

A. Decelerate, and if pitch is unchanged, begin to descend

B. Accelerate due to the reduced drag

C. Climb on the remaining excess thrust

D. Maintain constant airspeed indefinitely

40. Considering the whole powerplant-airframe system, the safest response to any partial power loss in a light airplane is to first:

A. Increase the angle of attack to the critical limit

B. Apply full aft elevator to climb away

C. Bank steeply toward the nearest terrain

D. Establish and maintain a safe glide airspeed and attitude

ANSWER KEY WITH EXPLANATIONS

1. B — Lift, produced by a pressure difference across the airfoil. A propeller blade is a rotating airfoil whose thrust is produced the same way a wing produces lift—a pressure difference across the airfoil. The force simply acts forward rather than upward.

2. D — Reduced thrust, degrading climb and acceleration. Carburetor ice restricts airflow and cuts power, reducing the thrust the propeller can produce and degrading climb and acceleration. It does not change the wing's critical angle or stall speed.

3. A — Increases the blade's angle of attack toward its critical limit. Increasing blade pitch without a speed change raises the blade's angle of attack, just as raising a wing's pitch does. Pushed too far, the blade can approach its critical limit.

4. A — Slightly more power available for thrust and climb. The more complete burn from dual ignition yields slightly more power, which translates to more thrust and climb capability. It does not directly change induced drag or stall speed.

5. D — Glide, balancing lift and weight without thrust. A seized engine removes thrust, so the airplane must glide, balancing lift against weight with no thrust available. Climb and level flight are impossible without power.

6. A — A slower, steeper approach without gaining speed. Flaps add both lift and drag, allowing a slower, steeper approach without the airplane gaining speed. They do not raise cruise or never-exceed speed.

7. B — A reduced rate of climb due to less excess power. With less engine power and propeller efficiency at altitude, there is less excess power, so climb rate falls. Takeoff distance lengthens rather than shortens.

8. B — Increase the angle of attack and the lift produced. Raising the nose increases the wing's angle of attack and, up to the critical angle, the lift produced. Beyond that angle the wing would stall.

9. D — Maintaining efficient blade angle of attack across flight conditions. A constant-speed propeller adjusts blade angle to keep an efficient angle of attack across climb, cruise, and descent. It does not eliminate the oil system or affect the wing's stall speed.

10. B — Continues normal powered flight with thrust intact. Because the magnetos are independent of the electrical system, an alternator failure leaves the engine—and thus thrust—intact. Only electrical equipment is affected.

11. B — Sufficient thrust despite the higher induced drag. A slow climb at high angle of attack has high induced drag, so the engine must provide enough thrust to overcome it. Less or no thrust would not sustain the climb.

12. A — Inadvertently approaching the critical angle of attack unaware. An unreliable airspeed reading can lead a pilot to inadvertently slow toward the critical angle of attack without realizing it. It does not change lift or propeller pitch on its own.

13. A — A steeper descent at a controlled airspeed. Adding gear and flap drag lets the airplane descend more steeply while holding a controlled airspeed. It does not improve cruise efficiency or eliminate runway needs.

14. B — Excess power and climb capability decrease. Less engine power at altitude means less excess power, reducing climb capability. Stall speed and gross weight are not changed by the power reduction.

15. B — Equalizes the angle of attack from the faster tip to the slower root. The propeller's twist equalizes the angle of attack along the blade, compensating for the tip moving faster than the root. It is unrelated to weight, oil temperature, or the magneto check.

16. C — Additional thrust to maintain airspeed against increased induced drag. A steep turn raises load factor and induced drag, so the engine must supply more thrust to hold airspeed. Turns do require extra power, contrary to the other options.

17. B — A slight decrease in power output. Carburetor heat introduces warmer, less dense air, which slightly reduces power output. The trade-off is acceptable because it clears or prevents ice.

18. A — Disabling radios and electric instruments, not engine thrust. A total electrical failure in day VFR disables radios and electric instruments but not the engine, which runs on the magnetos. Thrust and basic control remain.

19. C — The wing must reach a higher true airspeed to produce the needed lift. Both excess weight and high density altitude require the wing to reach a higher true airspeed to generate the necessary lift, lengthening takeoff and raising stall speed. The shared mechanism is the higher true airspeed needed.

20. C — The engine may not produce full rated power for takeoff. An excessive magneto drop signals an ignition fault that may prevent full rated power, a takeoff concern. It does not affect stall speed, propeller pitch, or CG.

21. D — Elevated oil temperature requiring monitoring. Sustained high power at high density altitude can elevate oil temperature, since oil also cools the engine, so monitoring is required. It does not change stall behavior or propeller geometry.

22. B — Lean the mixture to match the thinner air. At high density altitude the thinner air requires leaning the mixture for proper combustion. Propeller pitch, flaps, and angle of attack do not address the mixture.

23. C — The altimeter and vertical speed indicator. A static-port blockage affects the static-pressure instruments—altimeter and VSI (and airspeed accuracy)—not ignition, propeller pitch, or actual lift. These instruments share the static source.

24. D — Lifting off at a speed too low to sustain flight once clear of the effect. Both ground effect and flaps can allow liftoff at a speed too low to sustain flight once the airplane climbs out of ground effect, risking a settle-back. This is a key takeoff hazard.

25. C — Equal, keeping the airspeed constant. In steady level flight, thrust equals drag, holding airspeed constant. An imbalance would accelerate or decelerate the airplane.

26. A — Maintain airspeed and a safe glide attitude while troubleshooting. With rough running and power loss, the first priority is to fly the airplane—maintaining airspeed and a safe attitude—while troubleshooting. Pulling up sharply or banking steeply risks a stall.

27. D — Increased pitch (angle of attack) with added power. Climbing requires raising pitch (angle of attack) and adding power for the needed excess power. Reducing pitch or power would not climb.

28. C — Potential engine or propeller overstress and damage. Exceeding safe RPM can overstress and damage the engine or propeller, just as exceeding the wing's critical angle causes a stall. Each component has its own limit.

29. A — Reduced air density at high density altitude. Both the induction system and the wing are degraded by reduced air density at high density altitude—less air for combustion and less air for lift. Lower density, not higher pressure, is the culprit.

30. A — A consistent angle of attack and airspeed in a climb or cruise. Trim holds a pitch attitude, helping the pilot maintain a consistent angle of attack and airspeed without constant control pressure. It does not change RPM, fuel burn, or V_{NE}.

31. D — Reduced engine power and propeller efficiency leave little excess power. At high density altitude, reduced engine power and propeller efficiency leave little excess power, so the airplane climbs poorly. The wing's critical angle and propeller pitch are not the cause.

32. D — Continues running on the other magneto with slightly reduced power. The dual ignition system lets the engine keep running on the remaining magneto if one fails, with only a slight power reduction. It does not stop or lose all thrust.

33. C — Longitudinal stability and stall recovery. An aft CG degrades longitudinal stability and stall recovery, a distinct hazard from a static-port blockage. It does not affect the airspeed indicator, ignition, or fuel delivery.

34. C — Reduces the angle of attack and can increase airspeed. Lowering the nose reduces the angle of attack and tends to increase airspeed in a descent. It does not raise stall speed or engine power.

35. B — Shed nonessential electrical load while continuing powered flight. Losing the alternator, the pilot sheds nonessential electrical load to preserve the battery while continuing powered flight, since the engine runs on the magnetos. Shutting down the engine or pulling the nose up is unnecessary.

36. D — Reach a higher true airspeed to produce the required lift. In thin, hot, high air the wing must reach a higher true airspeed to generate the required lift, lengthening the takeoff roll. It does not reduce the needed angle of attack or lower the true stall speed.

37. C — The ignition and lubrication systems are functioning to produce power safely. Normal magneto drops and stable oil pressure confirm the ignition and lubrication systems are working, supporting safe power for takeoff. The run-up does not verify CG, stall angle, or airspeed accuracy.

38. C — A slow climb at high angle of attack. Induced drag peaks at high angle of attack and low speed, so the engine works hardest against it during a slow climb. High-speed cruise is dominated by parasite drag instead.

39. A — Decelerate, and if pitch is unchanged, begin to descend. Reducing thrust below drag causes the airplane to decelerate and, with pitch unchanged, to descend. It does not accelerate or climb.

40. D — Establish and maintain a safe glide airspeed and attitude. For any partial power loss, the first action is to fly the airplane—establishing and holding a safe glide airspeed and attitude—before troubleshooting. Pulling up or banking steeply risks a stall.