THEORY OF ROTARY WING FLIGHT PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

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How to Use This Guide

This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:

1. Start with a Diagnostic Review

Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.

2. Study in Short, Focused Sessions

Break your study time into manageable blocks (e.g. 30 – 45 minutes). Review a handful of questions, reflect on the explanations.

3. Learn from the Explanations

After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.

4. Track Your Progress

Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.

5. Simulate the Real Exam

Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.

6. Repeat and Review

Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.

There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!

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Questions

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1. Why is hunting necessary in the articulated/rigid rotor system?

A. Increases rotor RPM

B. Improves lift at high speeds

C. Relieves the stress forces on the blade caused by flapping

D. Reduces drag

2. With an increase in the speed of air over a surface, what happens to dynamic and static pressure?

A. Dynamic pressure increases and static pressure decreases

B. Both dynamic and static pressures increase

C. Dynamic pressure decreases while static increases

D. Both decrease

3. What is an airfoil?

A. The straight line along the wing

B. A surfaced body or structure designed to produce a lift or thrust force when subjected to airflow

C. The wing tip

D. The center of gravity

4. How is precession overcome?

A. Increasing The Main Rotor RPM

B. Offsetting The Linkage In The Cyclic Pitch Control System To Create An Input 90 Degrees Ahead Of The Desired Action

C. Reducing Blade Twist At The Root

D. Anti-Torque/Tail Rotor Thrust

5. Which term corresponds to the plane traced by the blade tips during rotation?

A. Chord Line

B. Angle of Incidence

C. Tip Path Plane

D. Resultant relative wind

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6. Describe the relationship between drag and resultant relative wind.

A. Perpendicular

B. Anti-Parallel To Resultant Relative Wind

C. Parallel To And In The Same Direction As Resultant Relative Wind

D. At 90 Degrees To Lift

7. Describe the relationship of lift to resultant relative wind.

A. Parallel

B. Perpendicular

C. Oblique

D. At 45 Degrees

8. What is a disadvantage of a nonsymmetrical airfoil in rotor aerodynamics?

A. Center Of Pressure Movement Causes Twisting Force And Stress On The Airfoil

B. Increased Stall Resistance

C. Lower Angle Of Attack Requirements

D. Reduced Drag During High-Speed Flight

9. Define settling with power.

A. A condition of powered flight in which the helicopter settles in its own downwash

B. A non-powered descent

C. A stall in a hover

D. A shallow descent with flare

10. List the required recovery procedures for settling with power.

A. Increase airspeed with cyclic; Reduce collective pitch as altitude permits to adjust rotor RPM to normal operating range

B. Decrease airspeed; Increase collective pitch

C. Hover in place; Increase collective pitch

D. Increase throttle; Apply left pedal

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Answers

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1. C
2. A
3. B
4. B
5. C
6. C
7. B
8. A
9. A
10. A

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Explanations

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1. Why is hunting necessary in the articulated/rigid rotor system?

A. Increases rotor RPM

B. Improves lift at high speeds

C. Relieves the stress forces on the blade caused by flapping

D. Reduces drag

In articulated and rigid rotor systems, blades are allowed to move in the flap direction to respond to changing aerodynamic loads. This motion, often labeled as hunting, is the blade's natural adjustment to lift variations across the rotor disk. By flapping, a blade can relieve the bending moments and peak stresses that would otherwise occur at the root when lift changes rapidly or gusts hit the rotor. That load-relief role is the central reason hunting is built into these systems. The other choices miss this key function: rotor speed is controlled by the engine and governor, not by hunting; lifting capability at high speeds and overall drag reduction aren't the primary purposes of this flap/lead-lag behavior.

2. With an increase in the speed of air over a surface, what happens to dynamic and static pressure?

A. Dynamic pressure increases and static pressure decreases

B. Both dynamic and static pressures increase

C. Dynamic pressure decreases while static increases

D. Both decrease

When air speeds up over a surface, Bernoulli's principle for incompressible, steady flow along a streamline applies: P + 1/2 ρ v^2 remains constant. The dynamic pressure term 1/2 ρ v^2 increases as velocity increases, so to keep the total pressure the same, the static pressure P must decrease. In other words, faster flow over the surface means higher dynamic pressure and lower static pressure. This is why the correct choice states dynamic pressure increases while static pressure decreases.

3. What is an airfoil?

A. The straight line along the wing

B. A surfaced body or structure designed to produce a lift or thrust force when subjected to airflow

C. The wing tip

D. The center of gravity

An airfoil is the cross sectional shape of a surface (like a wing or blade) that is designed to generate lift (and, in some cases, thrust) as it moves through air. The curved upper surface and flatter lower surface cause air to move faster over the top, creating lower pressure there and producing an upward lifting force, while pressure is higher beneath. This aerodynamic interaction is what makes flight possible. The other options describe parts or properties of the wing or aircraft that aren't the airfoil itself: a straight line along the wing isn't the surface shape, the wing tip is just a edge of the wing, and the center of gravity is a mass property.

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4. How is precession overcome?

A. Increasing The Main Rotor RPM

B. Offsetting The Linkage In The Cyclic Pitch Control System To Create An Input 90 Degrees Ahead Of The Desired Action

C. Reducing Blade Twist At The Root

D. Anti-Torque/Tail Rotor Thrust

Gyroscopic precession means that when you command a change in the rotor plane in one direction, the rotor tends to respond 90 degrees later. To make the rotor tilt in the direction you intend, the cyclic input must be applied a bit ahead of the desired motion. This lead is achieved by offsetting the linkage in the cyclic pitch control system so the blade pitch changes 90 degrees ahead of the action you want. In other words, the control system is phased to produce the correct tilt despite the gyroscopic delay. Increasing main rotor RPM would not fix precession; in fact, it can amplify the gyroscopic effect. Reducing blade twist at the root changes aerodynamics but not the timing of the gyroscopic response. Anti-torque/tail rotor thrust deals with yaw and torque balance, not the cyclic timing issue.

5. Which term corresponds to the plane traced by the blade tips during rotation?

A. Chord Line

B. Angle of Incidence

C. Tip Path Plane

D. Resultant relative wind

The planed geometry traced by the outer ends of the blades as they rotate is called the tip path plane. It represents the plane in which the blade tips move around the hub. In hover, this plane is essentially aligned with the rotor disk, but in forward flight the plane tilts as a result of flapping and cyclic input, which helps balance lift between the advancing and retreating blades. The other terms describe different blade characteristics: the chord line is simply the line along the blade's cross-section, the angle of incidence is the blade's angle relative to the local wind, and the resultant relative wind is the vector sum of the aircraft's airspeed and the induced flow. Thus, the term that specifically corresponds to the plane traced by the blade tips is the tip path plane.

6. Describe the relationship between drag and resultant relative wind.

A. Perpendicular

B. Anti-Parallel To Resultant Relative Wind

C. Parallel To And In The Same Direction As Resultant Relative Wind

D. At 90 Degrees To Lift

Drag is the aerodynamic force component that runs along the direction of the air flowing past the surface—the resultant relative wind. The resultant relative wind is the actual airflow direction seen by the blade, formed by the combination of the aircraft's forward motion and the rotor-induced inflow. Since drag always resists the motion through the air, it points in the same direction as that airflow. In other words, drag is parallel to the resultant relative wind and acts in the same direction as the wind is moving past the surface. Lift, by comparison, would be perpendicular to this wind.

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7. Describe the relationship of lift to resultant relative wind.

A. Parallel

B. Perpendicular

C. Oblique

D. At 45 Degrees

Lift is perpendicular to the resultant relative wind. The relative wind is the actual air velocity seen by the blade or wing—it's the combination of the blade's motion through the air and any induced flow. Lift arises from deflecting that airflow downward, creating a pressure difference between the surfaces, so the reaction force points normal to the incoming air. In other words, the lift vector is at a right angle to the relative wind, while drag would align with the relative wind.

8. What is a disadvantage of a nonsymmetrical airfoil in rotor aerodynamics?

A. Center Of Pressure Movement Causes Twisting Force And Stress On The Airfoil

B. Increased Stall Resistance

C. Lower Angle Of Attack Requirements

D. Reduced Drag During High-Speed Flight

The key idea here is how a nonsymmetric (cambered) airfoil behaves differently from a symmetric one as the angle of attack changes, and what that means for a rotor blade. A cambered airfoil has lift that tends to be accompanied by a nonzero pitching moment, and the point along the chord where the aerodynamic lift effectively acts— the center of pressure—shifts with the angle of attack. On a rotor blade, this shifting center of pressure creates a twisting tendency about the blade's longitudinal axis. In other words, as the blade moves through different AoA during rotation, gusts, or blade-flap motion, the lift doesn't just push the blade up or down; it tends to twist it, producing torsional loads that the blade must resist. This torsional loading increases structural stress and can complicate blade design and pitch control, making cambered airfoils less favorable for rotor systems in terms of structural loads. The other statements don't describe the rotor-specific drawback of cambered airfoils as accurately. Cambered profiles don't inherently provide more stall resistance; in many cases they stall earlier or more abruptly. They do not always require lower angles of attack to generate lift; cambered airfoils actually produce lift at smaller AoA, which is advantageous in other contexts but contributes to the twisting moment in rotation. And cambered airfoils do not typically reduce drag during high-speed flight; their drag characteristics at high speed aren't inherently better than symmetric counterparts and can be worse due to the camber.

9. Define settling with power.

A. A condition of powered flight in which the helicopter settles in its own downwash

B. A non-powered descent

C. A stall in a hover

D. A shallow descent with flare

Settling with power is when the helicopter is still in powered flight but begins to descend into its own downwash. The rotor wash stacks up in the rotor disk and recirculates, reducing the effective lift the rotor can produce. Because of this, the aircraft continues to descend despite power being applied, and the descent rate can increase unless you change the flight path to exit the downwash. This is different from a non-powered descent, which has no thrust from the rotor to begin with, and from a stall in hover, which refers to a blade angle/lift issue rather than downwash recirculation. It's also not a shallow descent with flare, which is a controlled, slower descent with forward speed and a flare maneuver to cushion landing.

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10. List the required recovery procedures for settling with power.

A. Increase airspeed with cyclic; Reduce collective pitch as altitude permits to adjust rotor RPM to normal operating range

B. Decrease airspeed; Increase collective pitch

C. Hover in place; Increase collective pitch

D. Increase throttle; Apply left pedal

Settling with power happens when a helicopter descends through its own downflow with insufficient forward speed, causing a vortex ring state where rotor lift drops and rotor RPM can fall despite power being applied. The correct recovery is to push the cyclic forward to increase airspeed and move out of the downwash, while at the same time reducing collective enough to allow rotor RPM to recover toward normal. As you gain forward speed and rotor RPM comes back up, you can resume a climb. In contrast, actions that decrease airspeed or simply hover or add power without improving translational flow won't escape the vortex ring state.

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Next Steps

Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.

As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.

If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at hello@examzify.com.

Or visit your dedicated course page for more study tools and resources:

https://theoryofrotarywingflight.examzify.com

We wish you the very best on your exam journey. You've got this!

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