ROBINSON HELICOPTER COMPANY
FLIGHT TRAINING GUIDE

R22/R44
PRIVATE PILOT RATING
ROTORCRAFT HELICOPTER

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R22/R44 PRIVATE PILOT RATING
ROTORCRAFT HELICOPTER

FLIGHT TRAINING SYLLABUS

ENROLLMENT PREREQUISITES
The student must be able to read, speak, write and understand the English language and hold at least a current third class medical certificate.

FLIGHT TRAINING COURSE OBJECTIVES
The student will obtain the aeronautical skill and experience necessary to meet the requirements of a private pilot certificate with a rotorcraft category rating and a helicopter class rating.

FLIGHT TRAINING COURSE COMPLETION STANDARDS
The student will demonstrate through flight test and school records the necessary aeronautical skill and experience to obtain a private pilot certificate with a rotorcraft category rating and a helicopter class rating.

FLIGHT TRAINING SYLLABUS
The flight training will be accomplished in three stages. Hours shown in each lesson and stage of training are based on the average rate of student learning and are offered as a guide to the instructor. Times used on individual lessons and stages may be adjusted to meet individual student needs. Above average students may require less time to meet lesson, stage, or course completion standards, but must meet at least the minimum times specified below for 14 CFR Part 61.

COURSE COMPLETION TIMES

AVERAGE COURSE TIME

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MINIMUM COURSE TIME (14 CFR PART 61)

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PRIVATE PILOT FLIGHT TRAINING COURSE OUTLINE

STAGE 1 ................................................................. Page 1.1

20 Hours Dual
0.5 Hour Solo

Lessons 1-18 include all pre-solo requirements and some practice in advanced maneuvers, e.g. Maximum Performance Take Offs, Steep Approaches, Quick Stops.

Stage 1 Flight Check Lesson 17 ........................................... Page 1.19

STAGE 2 ................................................................. Page 1.23

9 Hours Dual (1.5 Hours Night)
4.5 Hours Solo

Lessons 19-29 include training for solo operations, off-airport operations, night traffic pattern operations, hazardous flight conditions and emergency operations.

Stage 2 Flight Check Lesson 29 ........................................... Page 1.34

STAGE 3 ................................................................. Page 1.36

11 Hours Dual (7 Hours X-C, 1.5 Hours Night)
5 Hours Solo (5 Hours X-C)

Lessons 30-39 include cross-country training including emergencies, solo cross-country, solo practice and preparation for the FAA flight check.

Stage 3 Flight Check Lesson 39 ........................................... Page 1.48
STAGE 1

DUAL – 20.0 hours

SOLO – 0.5 hour

STAGE 1 OBJECTIVES

During this stage the student will obtain the foundation for all future helicopter training. He will become familiar with the R22/R44 helicopter and will gain proficiency in all procedures and maneuvers necessary for his first supervised solo flight.

STAGE 1 COMPLETION STANDARDS

At the completion of this stage the student will satisfactorily pass the Stage 1 Flight Check, thereby demonstrating the knowledge and ability to safely conduct solo flights in the local area.
LESSON 1
1.0 Hour Dual

OBJECTIVES
The student will be introduced to the Robinson R22/R44 helicopter and the importance of a proper preflight inspection. He will gain an understanding of safety precautions to be followed and will complete the awareness training required by SFAR 73 prior to manipulating the flight controls.

LESSON CONTENT

Introduction

1. Awareness Training
   a. Emergency management
   b. Mast bumping
   c. Low rotor rpm (blade stall)
   d. Low G hazards
   e. Rotor rpm decay

2. Preflight Preparation Procedures
   a. Required documents
   b. Aircraft logbooks
   c. Use of checklists
   d. Preflight inspection
   e. Helicopter servicing
   f. Fuel system and octane
   g. Equipment checks
   h. Ground safety procedures
   i. Cockpit management
   j. Emergency equipment and survival gear

3. Flight Demonstration
   a. Engine starting and rotor engagement
   b. Engine and systems check
   c. Before takeoff check
   d. Hovering
   e. Normal takeoff from a hover
   f. Normal approach to a hover
   g. Engine shutdown
   h. After landing and securing

4. Student Practice
   a. Straight and level flight
   b. Shallow (10 degree) and medium (20 degree) bank, turns in both directions
   c. Climbs and descents
   d. Flight at various airspeeds
LESSON 1 (Continued)

COMPLETION STANDARDS

At the completion of this lesson the student, with instructor assistance, will be able to conduct a preflight inspection, use checklists, and start the engine. He will gain an understanding of the use of the flight controls and display an understanding of ground safety. He will understand the main elements of the SFAR 73 awareness training subjects.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 2 1.0 Hour Dual

LESSON CONTENT

Review
1. Preflight inspection / cockpit management
2. Engine Starting
3. Engine and systems checks
4. Before takeoff check
5. Straight and level flight – student practice
6. Shallow and medium bank turns in both directions – student practice
7. Climbs and descents – student practice
8. Flight at various airspeeds
9. Engine shutdown
10. Ground safety procedures
11. Emergency equipment and survival gear

Introduction
1. Climbing turns
2. Descending turns
3. Radio communications
4. Hovering
5. Collision avoidance procedures.
6. Wind drift correction
7. Wake turbulence and wind shear avoidance
8. Airport/heliport markings
9. Airport/heliport operations

COMPLETION STANDARDS
The student will be able to conduct the preflight inspection accurately with instructor assistance and will display increased understanding and proficiency in the use of the flight controls to control aircraft attitude.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
OBJECTIVES

During this lesson the student will continue to gain proficiency in basic flight maneuvers and will be further introduced to the airport environment.

LESSON CONTENT

Review

1. Preflight inspection
2. Engine starting
3. Engine and systems preflight check
4. Straight and level flight
5. Shallow and medium bank turns – both directions
6. Climbs and descents with and without turns
7. Radio communications
8. Hovering
9. Collision avoidance procedures
10. Wake turbulence and wind shear avoidance
11. Airport/heliport markings
12. Airport/heliport operations
13. Engine shutdown

Introduction

1. Normal/crosswind takeoff from a hover
2. Normal/crosswind approach to a hover
3. Airport traffic patterns, including entry and departure procedures

COMPLETION STANDARDS

The student will have a basic understanding of the airport environment with regard to helicopter operations, and will be able to perform the preflight inspection, engine starting, engine and systems preflight checks, and engine shutdown, unassisted. He will display increased proficiency in coordinated helicopter control, and will maintain altitude within 300 feet during turns and airspeed changes.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
OBJECTIVES
This lesson will review flight maneuvers previously introduced and emphasize how crosswinds affect these maneuvers.

LESSON CONTENT

Review
1. Hovering
2. Normal/crosswind takeoff from a hover
3. Normal/crosswind approach to a hover
4. Traffic pattern procedures

Introduction
1. Vertical takeoff to a hover
2. Landing from a hover
3. Ground reference maneuvers
4. Sideward, forward, and rearward hovering
5. Hovering turns
6. Hover taxi

COMPLETION STANDARDS
The student will increase proficiency in attitude control during takeoffs and approaches and he will understand how crosswind components affect these maneuvers.

INSTRUCTOR'S COMMENTS AND RECOMMENDATIONS:
LESSON 5  1.0 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

The student will practice basic maneuvers, concentrating on hovering.

LESSON CONTENT

Review

1. Vertical takeoff to a hover
2. Hovering – sideward, forward, rearward and turns
3. Normal/crosswind takeoff from a hover
4. Normal/crosswind approach to a hover
5. Landing from a hover
6. Ground reference maneuvers
7. Hover taxi

COMPLETION STANDARDS

The student will show increased proficiency during takeoffs, traffic pattern operations, approaches and hovering.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 6  1.0 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
The student will continue to practice basic maneuvers.

LESSON CONTENT
Review
1. Vertical takeoff to a hover
2. Hovering – sideward, forward, rearward and turns
3. Normal/crosswind takeoff from a hover
4. Normal/crosswind approach to a hover
5. Hover taxi

COMPLETION STANDARDS
The student will show increased proficiency during takeoffs, traffic pattern operations, approaches and hovering.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 7 1.0 Hour Dual 0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

The student will continue to practice pre-solo maneuvers and will be introduced to maximum performance takeoffs and steep approaches.

LESSON CONTENT

Review

1. Vertical takeoff to a hover
2. Hovering
3. Normal takeoff from a hover
4. Normal approach to a hover
5. Landing from a hover

Introduction

1. Maximum performance takeoff and climb
2. Steep approach
3. Steep Turns – 30 degree bank angle
4. Air Taxi

COMPLETION STANDARDS

The student will demonstrate proper radio communications and traffic pattern procedures. Takeoffs will be performed unassisted, but approaches will be performed with instructor assistance. During straight and level flight and turns, altitude will be maintained within 250 feet, airspeed within 20 kts, and heading within 25 degrees. During climbs and descents the level off will be accomplished within 250 feet of the assigned altitude, airspeed will be maintained within 20 kts, and heading within 25 degrees.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 8  1.0 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will concentrate on takeoffs, approaches, and hovering maneuvers to build proficiency.

LESSON CONTENT

Review
1. Normal takeoffs and approaches
2. Maximum performance takeoffs and climbs
3. Steep approaches
4. Hovering – sideward, rearward, forward and turns
5. Steep turns – 30 degree bank angle
6. Air Taxi

Introduction
1. Go Aroun ds

COMPLETION STANDARDS

The student will demonstrate an increased proficiency while hovering. He will also gain an increased understanding of maximum performance takeoffs and steep approaches.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 9 1.0 Hour Dual 0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
During this lesson the student will concentrate on areas of weakness.

LESSON CONTENT
Review
1. Areas of student weakness

COMPLETION STANDARDS
The student will demonstrate an increased proficiency in areas of weakness.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 10  
1.0 Hour Dual  
0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
The student will practice weak areas and will be introduced to autorotations.

LESSON CONTENT
Review
1. Areas of student weakness

Introduction
1. Straight in autorotations with power recovery
2. Rapid decelerations – quick stops

COMPLETION STANDARDS
The student will demonstrate an increased proficiency in areas of weakness. He will gain an understanding of autorotations, and the power recovery and further develop control coordination with the introduction of quick stops.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 11  1.0 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will review pre-solo maneuvers as necessary and will be introduced to systems and equipment malfunctions.

LESSON CONTENT

Review
1. Pre-solo maneuvers as necessary
2. Straight in autorotations with power recovery
3. Rapid decelerations – quick stops

Introduction
1. Emergency procedures and equipment malfunctions
   a. R22/R44 Pilot’s Operating Handbook
   b. Alternator failure
   c. Electrical fire or smoke in the cockpit
   d. Tachometer failure
   e. Caution lights
   f. Warning lights
   g. RHC safety notices
2. Settling with power – recognition and recovery
3. Governor failure

COMPLETION STANDARDS

At the completion of this lesson the student will show increased proficiency in all pre-solo maneuvers. During straight and level flight and turns, altitude will be maintained within 200 feet, airspeed within 15 kts, and heading within 20 degrees. During climbs and descents the level off will be accomplished within 200 feet of the assigned altitude, airspeed will be maintained within 15 kts, and heading within 20 degrees. He will gain an understanding of the conditions that result in settling with power and systems and equipment malfunctions. During governor off operations, rpm will be maintained within 4%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 12 1.0 Hour Dual 0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will continue to practice autorotations and be introduced to the recognition and recovery techniques of recovery from low rotor rpm.

LESSON CONTENT

Review

1. Straight in autorotation
2. Takeoffs and approaches
3. Rapid decelerations – quick stops
4. Governor failure

Introduction

1. Recognition and recovery from low rotor rpm
   a. During cruise flight
   b. On takeoff
   c. At a hover

2. Hovering autorotation

COMPLETION STANDARDS

During straight in autorotation, the student will demonstrate proper entry techniques, maintain airspeed between 55 and 75 kts and rotor rpm in the green. He will gain an understanding of the effects of low rotor rpm, its recognition and proper recovery techniques.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 13  
1.5 Hour Dual  
0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will be a review of important pre-solo maneuvers.

LESSON CONTENT

Review

1. Takeoffs and approaches
2. Hovering – sideward, rearward, forward and turns
3. Straight in autorotation
4. Hovering autorotation
5. Rapid decelerations – quick stops
6. Recognition and recovery from low rotor rpm
7. Settling with power – recognition and recovery
8. Governor failure

COMPLETION STANDARDS

The student will demonstrate increased proficiency in all pre-solo maneuvers. During governor off operations, rpm will be maintained within 3%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 14 1.5 Hour Dual 0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will be introduced to 180 degree autorotation and the effects of turns during autorotative descents.

LESSON CONTENT

Review

1. Pre-solo maneuvers as necessary

Introduction

1. 180 degree autorotation with power recovery
2. Simulated engine failure – Forced landing

COMPLETION STANDARDS

The student will gain an understanding of the importance of attitude and rpm control during 180 degree autorotation. During forced landings the student will understand the need to immediately lower the collective to prevent a low rotor rpm situation and techniques for controlling rpm during autorotative descents.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 15  1.5 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will continue practicing pre-solo maneuvers, concentrating on takeoffs, approaches and autorotations.

LESSON CONTENT

Review
1. Normal takeoffs and approaches
2. Maximum performance takeoffs and climbs
3. Steep approaches
4. 180 degree autorotation with power recovery
5. Simulated engine failure – Forced landing

COMPLETION STANDARDS

1. During takeoffs, student will be able to maintain proper attitude control and heading.
2. During approaches, proper approach angles will be maintained with only minor corrections and rate of closure will not be excessive.
3. Entry into autorotation will be smooth, exercising proper attitude, trim, and rpm control. The flare and power recovery will be performed at prescribed altitudes.
4. During forced landings the student will lower the collective so as to prevent the rpm from decaying below 90%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 16  1.5 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson is a review of all pre-solo maneuvers in preparation for the student’s first supervised solo. During this lesson, the RHC safety checkout will be completed.

LESSON CONTENT

Oral Discussion

1. ATC/Traffic pattern procedures
2. Emergency procedures and equipment malfunctions

Review

1. Preflight inspection
2. Engine starting
3. Engine and systems preflight check
4. Vertical takeoff to a hover
5. Hovering - sideward, rearward, forward and turns
6. Radio communications
7. Normal takeoff from a hover
8. Traffic pattern procedures/collision avoidance precautions
9. Autorotative descents with power recovery
10. Hovering autorotation
11. Simulated engine failure – Forced landing
12. Normal approach to a hover
13. Recognition and recovery from low rpm
14. Governor failure
15. Landing from a hover

COMPLETION STANDARDS

The student will demonstrate the knowledge and proficiency to safety solo the helicopter.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 1 FLIGHT CHECK

OBJECTIVES

During this stage check the Chief Flight Instructor or a designated instructor will evaluate the student’s proficiency on the listed Stage 1 maneuvers and procedures to determine if the student is ready to solo the helicopter and be advanced to Stage 2.

LESSON CONTENT

Review

1. Preflight inspection
2. Engine starting
3. Engine and systems preflight check
4. Vertical takeoff to a hover
5. Hovering - sideward, rearward, forward and turns
6. Radio communications
7. Normal takeoffs from a hover
8. Traffic pattern procedures/collision avoidance precautions
9. Autorotative descents with power recovery
10. Hovering autorotation
11. Simulated engine failure – Forced landing
12. Recognition and recovery from low rpm
13. Rapid decelerations - quick stops
14. Normal approach to a hover
15. Governor failure
16. Engine shutdown

Oral Examination

1. Pilot’s Operating Handbook
   a. Airworthiness requirements
   b. Limitations
   c. Normal procedures
   d. Emergency procedures
2. RHC Safety Notices
3. FAR Parts 61 and 91
4. Airspace rules and airport procedures

COMPLETION STANDARDS

This lesson and Stage 1 will be complete when the student displays skill and understanding while performing the maneuvers necessary to safety conduct solo flights in the local training area. He will maintain altitude within 150 feet, airspeed within 15 kts, and heading within 15 degrees. During governor off operations, rpm will be maintained within 2%. The student will also demonstrate sufficient knowledge of emergency
operations, the R22/R44 Pilot’s Operating Handbook, and RHC Safety Notices.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 18
1.0 Hour Dual
0.5 Hour Solo
1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the instructor will review all Stage 1 and pre-solo requirements to check the student’s readiness for solo flight. During the second portion of this lesson, the student will conduct his first supervised solo flight.

LESSON CONTENT

Pre-Solo Written Test
1. FAR Parts 61 and 91
2. R22/R44 limitations and flight characteristics
3. Airspace rules and airport procedures

SFAR 73 Awareness Training Review
1. Energy management
2. Mast bumping
3. Low G hazards
4. Rotor rpm decay

Review
1. Normal/crosswind takeoffs and approaches
2. Hovering maneuvers
3. Radio communications
4. Straight in autorotations
5. Emergency procedures and equipment malfunctions

First Supervised Solo Flight
1. Vertical takeoffs to a hover
2. Hovering
3. Landings from a hover
4. Three normal takeoffs, traffic patterns, and normal approaches

COMPLETION STANDARDS

The dual portion of this lesson will be complete when the instructor has reviewed the student logbook to ensure all flight time and maneuver requirements have been met, has made the appropriate FAR Part 61 and SFAR 73 endorsements, and has reviewed with the student all incorrect answers to the pre-solo written test. The student will demonstrate the ability to safely solo the helicopter while adhering to established traffic pattern procedures and must satisfactorily pass the pre-solo written test with a minimum score of 80%.

The solo portion of the lesson when the student has completed the first supervised solo flight.
LESSON 18 (continued)

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 2

DUAL – 9.0 hours/1.5 Night

SOLO – 4.5 hours

STAGE 2 OBJECTIVES

The student will continue to be instructed in advanced maneuvers in preparation for the introduction of off-airport operations. He will also increase his confidence and refine his piloting skills during solo practice.

STAGE 2 COMPLETION STANDARDS

This stage will be complete when the student satisfactorily passes the Stage 2 flight check, thereby demonstrating the knowledge and proficiency to safely perform advanced maneuvers and off-airport operations.

Note – At no time during the student’s solo practice lessons will he attempt any of the following maneuvers:

1. Autorotative descents of any kind
2. Hovering autorotation
3. Simulated engine failure – Forced landing
4. Settling with power
5. Recovery from low rpm
6. Governor failure
7. Running landings
8. Slope landings/takeoffs
LESSON 19
0.5 Hour Dual
0.5 Hour Solo
0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
During the dual portion of this lesson, the instructor will review takeoff, traffic pattern, and approach procedures to check the student’s readiness for the second supervised solo flight. During the solo portion of the lesson the student will conduct his second supervised solo flight.

LESSON CONTENT
Review
1. Normal takeoff from a hover
2. Traffic pattern procedures
3. Hovering
4. Normal approach to a hover

Introduction
1. Slope landings
2. Slope takeoffs

Second Supervised Solo Flight
1. Vertical takeoffs to a hover
2. Hovering
3. Landings from a hover
4. Three normal takeoffs, traffic patterns, and normal approaches

COMPLETION STANDARDS
The student will gain confidence in his ability to safely solo the helicopter.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 20  
0.5 Hour Dual  
0.5 Hour Solo  
0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
During this lesson the student will review pre-solo maneuvers in preparation for his third supervised solo flight.

LESSON CONTENT

Review
1. Maximum performance takeoffs
2. Steep approaches
3. Hovering autorotation
4. Autorotative descents with power recovery
5. Recognition and recovery from low rotor rpm
6. Slope takeoffs and landings

Second Supervised Solo Flight
1. Vertical takeoffs to a hover
2. Hovering
3. Landings from a hover
4. Normal takeoffs, traffic patterns, and normal approaches

COMPLETION STANDARDS
The student will increase his proficiency in advanced maneuvers and gain additional confidence in his ability to safely solo the helicopter.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 21  1.0 Hour Solo  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will practice the listed maneuvers to increase his proficiency and confidence in solo flight.

LESSON CONTENT

Practice
1. Maximum performance takeoff and climb
2. Steep approach
3. Normal takeoff from a hover
4. Normal approach to a hover
5. Hovering – sideward, rearward, forward and turns

COMPLETION STANDARDS

This lesson will be complete when the student has practiced the assigned maneuvers.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
OBJECTIVES

This lesson will introduce the student to off-airport operations in confined areas, and will stress the importance of performance planning and off-airport operating procedures. The student will gain an understanding of hazards associated with off-airport operations and review those previously covered.

LESSON CONTENT

Oral Discussion

1. Weight and balance calculations and considerations
2. Performance planning
   a. Limit manifold pressure – maximum power available
   b. Hover performance – IGE, OGE
   c. Never exceed speed

Review

1. Settling with power
2. Power failure at altitude – Forced landing

Introduction

1. Confined area and pinnacle operations
   a. High reconnaissance
   b. Low reconnaissance
   c. Confined area & pinnacle approach and departure
2. Hazardous conditions
   a. Obstructions – natural and man-made
   b. Landing surface conditions
   c. Dynamic rollover – slope operations

COMPLETION STANDARDS

This lesson will be complete when the student demonstrates the ability to plan and execute a high and low reconnaissance. He will be able to select suitable landing areas and demonstrate good judgment in his traffic pattern procedures.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 23 1.0 Hours Dual 0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson, the student will be introduced to shallow approaches to a running landing and some of the emergencies that may require a running landing.

LESSON CONTENT

Review

1. Normal takeoff from a hover
2. Normal approach to a hover
3. Traffic pattern procedures
4. Autorotative descents with power recovery
5. Hovering autorotation
6. Recognition and recovery from low rotor rpm

Introduction

1. Partial power failure
2. Shallow approach and running landings

COMPLETION STANDARDS

The student will gain an understanding of what conditions necessitate more advanced takeoffs and approaches. During autorotative descents the student will maintain airspeed between 60 and 75 kts and rotor rpm within the green range. Directional control during simulated power failure at a hover will be within 10 degrees and proper drift control will be exercised. The student will be able to recognize and recover from a low rpm situation prior to the rpm decaying below 90%. The student will gain an understanding of the conditions requiring a shallow approach and running landing.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 24  1.0 Hour Solo

OBJECTIVES

During this lesson the student will practice the maneuvers assigned by the instructor to increase proficiency and solo experience.

LESSON CONTENT

Practice

1. Maneuvers assigned by the flight instructor

COMPLETION STANDARDS

This lesson will be complete when the student has practiced the listed maneuvers.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 25  1.5 Hours Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will review off-airport operations in confined areas and running landings.

LESSON CONTENT

Review

1. Maximum performance takeoff and climb
2. Steep approach
3. Confined area and pinnacle operations
4. Slope operations
5. Shallow approach and running landing

COMPLETION STANDARDS

The student will demonstrate proper attitude and power control during high altitude takeoffs and maximum performance takeoffs. Heading will be maintained within 15 degrees during maximum performance takeoffs and a smooth transition to normal climb will be demonstrated. The student will maintain translational lift until ground contact during a shallow approach and running landing and demonstrate proper use of the cyclic during slope operations. During straight and level flight and turns, altitude will be maintained within 100 feet, airspeed within 10 kts, and heading within 10 degrees. The student will properly conduct the high/low reconnaissance when conducting confined area operations and select an approach angle that will ensure obstacle clearance.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 26  1.5 Hours Dual Night  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will familiarize the student with the special considerations and characteristics of helicopter flight at night.

LESSON CONTENT

Introduction

1. Preflight planning
   a. Night flight planning considerations
   b. Preflight inspection for night flight
   c. Night vision techniques
   d. Personal lighting devices

2. Night Flight
   a. Hovering
   b. Use of landing/search light and other switches/circuit breakers
   c. Normal takeoff from a hover
   d. Local area night orientation
   e. Traffic pattern operations
   f. Normal approach to a hover
   g. Airport lighting
   h. Straight in autorotation
   i. Hovering autorotation

COMPLETION STANDARDS

The student will become familiar with helicopter flight in the night environment, including airport/heliport lighting; locating and identifying switches, circuit breakers, etc.; and the types and uses of various personal lighting devices.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 27  1.5 Hour Solo  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES
During this lesson the student will practice the maneuvers assigned by the instructor to increase proficiency and solo experience.

LESSON CONTENT
Practice
1. Maneuvers assigned by the flight instructor

COMPLETION STANDARDS
This lesson will be complete when the student has practiced the listed maneuvers.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 28  1.0 Hours Dual  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will review Stage 2 maneuvers in preparation for the Stage 2 flight check.

LESSON CONTENT

Review

1. Confined area and pinnacle operations
2. Maximum performance takeoff and climb
3. Steep approach
4. Anti-torque failure
5. Shallow approach and running landings
6. Autorotative descents
7. Slope operations
8. Rapid deceleration – quick stops
9. Recovery from low rotor rpm
10. Partial power failure
11. Hovering autorotation
12. Systems and equipment malfunctions
13. Simulated engine failure – Forced landing
14. Maneuvers selected by the instructor

COMPLETION STANDARDS

At the completion of this lesson, the student will have demonstrated increased proficiency in all advanced maneuvers. He will demonstrate early recognition and immediate recovery from all hazardous flight conditions and a good understanding of off-airport operations, emergencies, and systems and equipment malfunctions.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 2 FLIGHT CHECK

OBJECTIVES

During this lesson, the Chief Flight Instructor or a designated instructor will determine that the student meets the knowledge, proficiency and performance standards required in performing advanced maneuvers and off-airport operations.

LESSON CONTENT

Oral Examination

1. Weight and balance computation
2. Performance planning
3. Hazardous conditions
   a. Adverse winds and turbulence
   b. Settling with power
   c. Dynamic rollover

Review

1. Confined area and pinnacle operations
2. Shallow approach/running landing
3. Slope operations
4. Autorotative descents
5. Rapid deceleration – quick stops
6. Recovery from low rpm
7. Hovering autorotation
8. Simulated engine failure – Forced landing
9. Maneuvers selected by the instructor

COMPLETION STANDARDS

1. During takeoffs and climbs, the student will demonstrate proper attitude and heading control.
2. During approaches, proper sight picture, rate of closure, and ground track will be demonstrated.
3. While conducting slope operations the student will demonstrate proper use of the cyclic and collective.
4. During autorotative descents rotor rpm will be maintained in the green arc. Airspeed will be maintained between 60 to 70 kts, and the power recovery will be executed smoothly and properly.
5. While executing a hovering autorotation, the student will maintain heading with 10 degrees and proper drift control will be exercised.
6. The student will demonstrate knowledge and understanding of systems and equipment malfunctions.
7. The student will be able to recognize and recover from low rpm prior to 90%.
LESSON 29 (cont’d)

STAGE 2 FLIGHT CHECK (cont’d)

COMPLETION STANDARDS (cont’d)

8. The student will exercise proper planning and good judgment with conducting off-airport operations.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 3

DUAL – 11.0 Hours/7.0 Cross-country/1.5 Night Cross-country

SOLO – 5.0 Hours Cross-country

STAGE 3 OBJECTIVES

The student will be instructed in maneuvers and procedures necessary for a cross-country flight. He will learn operations within the ATC environment and develop the skills necessary for solo flights to unfamiliar airports. Additionally, the student will receive instruction and increase his proficiency in all private pilot operations in preparation for the Stage 3 Flight Check.

STAGE 3 COMPLETION STANDARDS

This Stage will be complete when the student satisfactorily passes the Stage 3 Flight Check, demonstrating the knowledge and proficiency outlined in the current FAA Rotorcraft-Helicopter Practical Test Standard for Private Pilot.
LESSON 30  1.5 Hours Dual X-C  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will be introduced to helicopter cross-country planning and procedures. The flight will consist of at least two legs and will be conducted using pilotage and dead reckoning.

LESSON CONTENT

Introduction

1. Preflight planning
   a. Aeronautical Information Manual
   b. Sectional and Terminal area charts
   c. Course selection
   d. Procurement/analysis of weather reports and forecasts
   e. Aircraft performance – best range airspeed, fuel endurance, ground speed
   f. Cross-country flight log
   g. Fuel requirements

2. Cross-Country Flight
   a. Navigation
      1) Pilotage
      2) Dead reckoning – with magnetic compass
   b. Estimating visibility in flight
   c. Recognition and avoidance of hazardous terrain

3. Airport Operations
   a. Navigation
   b. Opening and closing flight plan
   c. Airport traffic control procedures
      1) ATIS
      2) Control tower/CTAF

4. Emergency Procedures
   a. Complete or partial power loss – forced landing
   b. System and equipment malfunctions – precautionary landing
   c. Collision avoidance and wake turbulence precautions, wind shear avoidance

COMPLETION STANDARDS

At the completion of this lesson, the student will be able to plan a VFR cross-country flight. He will be prepared for VFR navigation and have the knowledge to deal with some cross-country emergencies.
LESSON 30 (cont’d)

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 31  2.0 Hours Dual X-C  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will expand the student’s understanding of cross-country operations and emergency procedures in preparation for his first solo cross-country flight. The flight will consist of three legs using pilotage, dead reckoning and radio navigation.

LESSON CONTENT

Review

1. Preflight planning
   a. Weather briefing
   b. Course selection
   c. Cross-country flight log
   d. VFR flight plan

2. Cross-Country flight operations
   a. Opening and closing flight plan
   b. Pilotage navigation – check points

3. Air traffic control procedures

4. Emergency Procedures
   a. Complete or partial power loss
   b. System and equipment malfunction

Introduction

1. Radio Navigation (VOR/GPS) and Radar Services

2. Adverse weather – estimating critical weather in flight

3. Diversion to alternate
   a. As a preventative measure
   b. Airport selection
   c. Estimating time enroute

4. Lost procedures
   a. Heading selection
      1) Proceeding to last known position
      2) Proceeding to nearest prominent land mark
   b. Altitude selection
      1) Climb VFR as appropriate
      2) Best altitude for communications
      3) Best altitude for chart interpretation
LESSON 31 (cont’d)

Introduction (cont’d)

4. Lost procedures (cont’d)
   c. Obtaining assistance
      1) ATC facility – frequencies and services
      2) FSS facility – frequencies and services
      3) Transponder operation
      4) Nav aids – communications and navigation

d. Emergency landing
   1) Deteriorating weather
   2) Low fuel
   3) Area selection

5. Lost Communications
   a. Transponder operation
   b. Airport operations – ATC light signals

COMPLETION STANDARDS

This lesson will be complete when the student demonstrates the ability to perform a cross-country flight using pilotage, dead reckoning and radio navigation. Upon completion he should be ready for his first solo cross-country flight and will understand and be capable of executing the procedures used to divert to an alternate airport as appropriate to his first solo cross-country. He will also select the best course of action when given a lost situation.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 32  1.5 Hours Dual Night X-C  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES
This lesson will familiarize the student with night cross-country procedures. The flight will be over 50 nm total distance and will emphasize pilotage in the night environment.

LESSON CONTENT
Review
1. Preflight planning
   a. Weather briefing
   b. Course selection
   c. Altitude selection

2. Cross-Country flight
   a. Pilotage
   b. Radio navigation (VOR/GPS)

Introduction
1. Night flying considerations
   a. Chart interpretation
   b. Minimum altitude
   c. Cockpit lighting
   d. Airport lighting

2. Night emergency procedures

COMPLETION STANDARDS
Upon completion of this lesson, the student will show an increased understanding of preflight planning, especially with regard to night cross-country operations. The student should act promptly to simulated emergencies, exhibiting good judgment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 33  1.0 Hours Solo X-C  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will be the student's first solo cross-country flight. The instructor will select a relatively easy course and review all preflight planning and make appropriate endorsements.

LESSON CONTENT

1. Preflight planning – Checked by instructor
   a. Sectional charts
   b. Altitude selection
   c. Course selection
   d. Checkpoint selection
   e. Distance measurements
   f. Computation of flight time, headings, and fuel requirements
   g. Weather briefing
   h. Aircraft performance
   i. Navigation log
   j. VFR flight plan
   k. Weight and balance

2. Cross-Country flight
   a. Departure
   b. Establishing desired course
   c. Opening flight plan/closing flight plan
   d. Pilotage and dead reckoning
   e. Proper radio communications

3. Airport operations
4. Instructor limitations

COMPLETION STANDARDS

The student will conduct the assigned cross-country flight. The instructor will determine how well the flight was conducted by oral examination and will check to be sure all required flight log entries have been made.

INSTRUCTOR'S COMMENTS AND RECOMMENDATIONS:
LESSON 34  1.5 Hours Solo X-C  1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will gain additional confidence and understanding of cross-country flight operations. This flight will consist of a longer course than the initial solo cross-country flight.

LESSON CONTENT

1. Preflight planning – Checked by instructor
   a. Sectional charts
   b. Altitude selection
   c. Course selection
   d. Checkpoint selection
   e. Distance measurements
   f. Computation of flight time, headings, and fuel requirements
   g. Weather briefing
   h. Aircraft performance
   i. Navigation log
   j. VFR flight plan
   k. Weight and balance

2. Cross-country flight
   a. Departure
   b. Establishing desired course
   c. Opening flight plan/closing flight plan
   d. Pilotage and dead reckoning
   e. VOR/GPS navigation
   f. Computing ground speed and ETA
   g. Proper radio communications

3. Airport operations

COMPLETION STANDARDS

The student will conduct the assigned cross-country flight. The instructor will determine how well the flight was conducted by oral examination and will check to be sure all required flight log entries have been made.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LES S O N 3 5

2.0 Hours Dual X-C

1.0 Hour Pre/Post Flight Discussion

OBJECTIVES

This lesson will be a longer cross-country flight with landings at three different airports. The student will be able to demonstrate a complete understanding of cross-country procedures.

LESSON CONTENT

Review

1. Preflight planning
   a. Weather
   b. Course
   c. Altitude
   d. Weight and balance
   e. VFR flight plan

2. Cross-country flight
   a. Pilotage, dead reckoning, radio navigation (VOR/GPS)
   b. Diversion to an alternate
   c. Lost procedures
   d. Emergency procedures

Introduction

1. Ground speed check – estimating time of arrival

COMPLETION STANDARDS

Upon completion of this lesson, the student will:

1. Demonstrate a thorough understanding of cross-country procedures;
2. Be able to verify the position of the helicopter with 3 nm at all times;
3. Arrive at checkpoints at ± 5 minutes of his estimate;
4. Maintain selected altitude ± 100 feet;
5. Maintain the desired airspeed ± 10 knots;
6. Maintain the desired heading ± 10 degrees; and,
7. During radio navigation, locate his position relative to the radio facility and track along a given radial or bearing.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 36 2.5 Hours Solo X-C 1.5 Hour Pre/Post Flight Discussion

OBJECTIVES

This solo cross-country flight will consist of at least 100 nm total distance with landings at a minimum of three airports, one unfamiliar to the student. One segment of the flight will be at least 25 nm straight line distance from takeoff to landing. If the student has not made any solo takeoffs, traffic patterns and landings at an airport with an operating control tower, such an airport should be selected for this flight and these three operations should be accomplished.

LESSON CONTENT

1. Preflight planning – Checked by instructor
   a. Sectional charts
   b. Altitude selection
   c. Course selection
   d. Checkpoint selection
   e. Distance measurements
   f. Computation of flight time, headings, and fuel requirements
   g. Weather briefing
   h. Aircraft performance
   i. Navigation log
   j. VFR flight plan
   k. Weight and balance

2. Cross-country flight
   a. Departure
   b. Establishing desired course
   c. Opening flight plan/closing flight plan
   d. Pilotage and dead reckoning
   e. VOR/GPS navigation
   f. Computing ground speed and ETA
   g. Proper radio communications

3. Airport operations

COMPLETION STANDARDS

The student will conduct the assigned cross-country flight. The instructor will determine how well the flight was conducted by oral examination and will check to be sure all required flight log entries have been made.

INSTRUCTOR'S COMMENTS AND RECOMMENDATIONS:
LESSON 37  1.0 Hour Dual  0.5 Hour Pre/Post Flight Discussion

OBJECTIVES

During this lesson the student will review traffic pattern operations, advanced takeoff and landings, and emergency procedures in order to maintain proficiency.

LESSON CONTENT

Review

1. Maximum performance takeoff and climb
2. Steep approach
3. Normal approach/takeoff
4. Shallow approach, running landing
5. Rapid deceleration – quick stops
6. Slope operations
7. Autorotative descents
8. Hovering autorotation
9. Partial power failure
10. Recovery from low rotor rpm
11. Systems and equipment malfunction

COMPLETION STANDARDS

At the completion of this lesson the student will have demonstrated increased proficiency in all advanced maneuvers.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
OBJECTIVES

During this lesson the student will review basic flight maneuvers and emergency operations in preparation for the Stage 3 and final flight check.

LESSON CONTENT

Review

1. Normal takeoff from a hover
2. Normal approach to a hover
3. Maximum performance takeoff and climb
4. Steep approach
5. Governor failure
6. Shallow approach/running landing
7. Rapid deceleration – quick stop
8. Slope operations
9. Autorotative descents with power recovery
10. Hovering autorotation
11. Settling with power
12. Systems and equipment malfunctions
13. Partial power failure
14. Recovery from low rotor rpm
15. Simulated engine failure – Forced landings

COMPLETION STANDARDS

1. During takeoff and climbs the student will demonstrate proper altitude and heading control, correcting for crosswind as appropriate.
2. During approaches, proper angle, rate of closure, and ground track will be demonstrated, correcting for crosswind as appropriate and terminating within 3 feet of designated point.
3. During running landings the student will make a smooth transition from descent to surface contact at or slightly above effective translational lift, using less than hovering power, and beyond but within 50 feet of designated point.
4. During simulated hazardous flight conditions the student will demonstrate immediate recognition and recovery.
5. During forced landings, the student will maintain rotor rpm within allowable limits immediately lowering the collective. He will establish an appropriate attitude maintaining airspeed as necessary. He will select a suitable landing area and maneuver so as to arrive at the selected area in trim, with acceptable rpm, airspeed and descent rate, and in position to make a safe autorotative landing.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 3 AND FINAL FLIGHT CHECK

OBJECTIVES

During this lesson the Stage 3 and Final Flight Check will be conducted by the Chief Flight Instructor or a designated instructor. He will evaluate the student’s readiness for the Private Pilot – Helicopter flight test.

LESSON CONTENT

Review

1. Oral examination
   a. R22/R44 Pilot’s Operating Handbook
   b. Weight and balance computation
   c. Aircraft performance
   d. Cross-country flight planning
   e. Weather briefing
   f. Federal Aviation Regulations – Parts 1, 61 and 91
   g. Areas selected by the Chief Flight Instructor

2. Flight check
   a. Cross-country flight operations
   b. Normal and emergency maneuvers chosen by the Chief Flight Instructor

COMPLETION STANDARDS

The student will demonstrate the knowledge and proficiency that meets or exceeds the minimum standards as outlined in the current FAA Rotorcraft-Helicopter Practical Test Standards for Private Pilot.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
GROUND TRAINING COURSE OBJECTIVES

The student will obtain the necessary aeronautical knowledge and meet the prerequisites specified in FAR Part 61 for the *Private Pilot – Helicopter* knowledge test.

GROUND TRAINING COURSE COMPLETION STANDARDS

The student will demonstrate through oral and written tests and records that he meets the prerequisites specified in FAR Part 61 and has necessary aeronautical knowledge to pass the *Private Pilot – Helicopter* knowledge test.

INITIAL CERTIFICATION STUDENTS

The 35 hours of ground training will be accomplished in three stages. Each of these instructional units is described in the succeeding pages.

ADDITIONAL AIRCRAFT RATING STUDENTS

Stage 1, consisting of 13 hours of ground training, is the only required stage for additional aircraft rating students.

COURSE COMPLETION TIME – 35 HOURS

STAGE CHECKS

GROUND TRAINING SYLLABUS

<table>
<thead>
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<th>Stage</th>
<th>Written Exam</th>
<th>Grade</th>
<th>Date</th>
<th>Chief Ground Instructor</th>
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<tbody>
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<td>Stage 3</td>
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FAA KNOWLEDGE TEST

*Private Pilot – Helicopter* Knowledge Test

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JUN 2016
PRIVATE PILOT GROUND TRAINING COURSE OUTLINE

STAGE 1 ................................................................. Page 2.1

13 Hours Ground Training

Lessons 1-7 include study of helicopter components, systems, instruments, and basic aerodynamics. Additionally, the method and importance of accurately determining helicopter weight and balance performance will be introduced.

Stage 1 Ground Training Review Lesson 7 ........................................ Page 2.13

STAGE 2 ................................................................. Page 2.15

13 Hours Ground Training

Lessons 8-14 includes study of aviation weather, the flight computer, and the Aeronautical Information Manual.

Stage 2 Ground Training Review Lesson 14 ................................. Page 2.24

STAGE 3 ................................................................. Page 2.25

9 Hours Ground Training

Lessons 15-19 includes study of VFR charts, the navigation plotter, radio navigation, cross-country planning, physiological and psychological considerations, and federal aviation regulations.

Stage 3 Ground Training Review Lesson 19 ................................. Page 2.31
STAGE 1

GROUND TRAINING – 13.0 hours

STAGE 1 OBJECTIVES

During Stage 1 the student will study helicopter components, systems, instruments, and basic aerodynamics. Additionally, the method and importance of accurately determining helicopter weight and balance performance will be introduced.

STAGE 1 COMPLETION STANDARDS

Stage 1 will be complete when the student has passed the Stage 1 written examination with a minimum score of 70%. The instructor will review each incorrect response to assure complete understanding before advancing the student to Stage 2.
LESSON 1 2.0 Hours Ground Training

OBJECTIVES

This lesson will introduce the student to the R22/R44 helicopter’s components, systems and instruments.

LESSON CONTENT

1. Helicopter Components
   a. Main rotor
   b. Tail rotor
   c. Transmission
   d. Powerplant
   e. Swashplate assembly
   f. Gearboxes
   g. Drive train and tailcone
   h. Clutch
   i. Governor

2. Flight Controls
   a. Cyclic
   b. Collective
   c. Throttle and governor
   d. Pedals

3. Electrical System
   a. Battery
   b. Alternator
   c. Circuit breakers
   d. Magnetos
   e. Aircraft lights
      1) Navigation/position lights
      2) Anti-collision light
      3) Landing light

4. Fuel and Fuel System
   a. Proper fuel
   b. Fuel system operation
   c. Fuel contamination
      1) Preventative measures
      2) Elimination measures

5. Oil and Oil System
   a. Type and quantity
   b. Oil system operation
LESSON 1 (cont’d)

LESSON CONTENT (cont’d)

6. Instruments – Function, Markings and Limitations
   a. Engine
      1) Dual tachometer
      2) Manifold pressure
   b. Flight - function, markings and limitations
      1) Pitot-static system
         a) Pitot-static source
         b) Alternate pitot-static source
         c) Airspeed indicator
         d) Pressure altimeter
         e) Vertical speed indicator
      2) Magnetic compass

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 2 2.0 Hours Ground Training

OBJECTIVES
During this lesson the student will study basic aerodynamics to gain an understanding of the principles of helicopter flight.

LESSON CONTENT
1. The Four Forces
   a. Lift
   b. Weight
   c. Thrust
   d. Drag

2. Airfoils
   a. Symmetrical vs. unsymmetrical
   b. Leading edge
   c. Trailing edge
   d. Chord line
   e. Relative wind
   f. Angle of attack
   g. Bernoulli’s principle
   h. Newton’s third law of motion
   i. Tip path plane

3. Factors Affecting Lift and Drag
   a. Surface area
   b. Angle of attack
   c. Velocity of airflow
   d. Air density
   e. Blade stall

4. The Three Axes
   a. Longitudinal – roll
   b. Lateral – pitch
   c. Vertical – yaw

5. Torque
   a. Newton’s third law of motion
   b. Tail rotor thrust
   c. Controlling torque

6. Rotor Systems
   a. Fully articulated
   b. Semi-rigid
   c. rigid
LESSON 2 (cont’d)

LESSON CONTENT (cont’d)

7. Vibrations
   a. Resonance
      1) Sympathetic
      2) Ground
   b. Low frequency
   c. Medium frequency
   d. High frequency

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 3 2.0 Hours Ground Training

OBJECTIVES

During this lesson the student will continue to gain an understanding of the principles of helicopter flight.

LESSON CONTENT

1. Hovering Flight
   a. Lift and thrust resultant
   b. Weight and drag
   c. Axis of rotation
   d. Coning
      1) Lift
      2) Centrifugal force
   e. Blade flapping
   f. Coriolis effect
   g. Translating tendency or drift
   h. Direction of airflow
   i. Ground effect
   j. Forward, sideward and rearward hovering
      1) Lift and thrust resultant
      2) Weight and Drag
   k. Gyroscopic precession
   l. Pendular action

2. Forward Flight
   a. Lift and thrust resultant
   b. Weight and drag
   c. Translational lift
   d. Dissymmetry of lift
   e. Transverse flow effect
   f. Retreating blade stall
      1) Causes
      2) Corrections
   g. Loss of tail rotor effectiveness

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.
LESSON 3 (cont’d)

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 4 2.0 Hours Ground Training

OBJECTIVES

During this lesson the student will be introduced to the aerodynamics of turns, loads and autorotative descents.

LESSON CONTENT

1. The Turn
   a. Lift components in a turn
      1) Vertical component
      2) Horizontal component
      3) Total lift resultant
   b. Weight and centrifugal force in a turn
   c. Angle of bank vs. angle of attack
   d. Angle of bank vs. rate of turn

2. Loads and Load Factor
   a. How conditions of flight affect loads
      1) Straight and level flight
      2) Turns
      3) Flares
   b. Load factor
      1) Definition
      2) Effect of angle of bank on load factor
      3) Effect of turbulence and high gross weight on load factor
      4) Effect of density altitude and pilot technique on load factor

3. Autorotative Descents
   a. Definition
   b. Free wheeling unit
   c. Direction of airflow
   d. Rotor rpm
      1) In turns
      2) Effect of flares
      3) Effect of updrafts and downdrafts
   e. Airspeed
      1) Manufacturer’s minimum autorotational airspeed
      2) Minimum rate of descent airspeed
      3) Maximum glide distance airspeed
   f. Hovering autorotation
      1) Torque effect
      2) Translating tendency or drift
LESSON 4 (cont’d)

3. Autorotative Descents (cont’d)
   g. Energy management

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 5  2.0 Hours Ground Training

OBJECTIVES

During this lesson the student will be introduced to the helicopter flight manual and helicopter performance.

LESSON CONTENT

1. The R22/R44 Helicopter Flight Manual
   a. Operating limitations
      1) Airspeed
      2) Rotor
      3) Powerplant
      4) Type of operation
      5) Fuel useability
      6) Instrument markings
   b. Operating procedures
      1) Emergency procedures
      2) Takeoff and landing procedures
      3) Checklists
         a) Preflight
         b) Engine starting and warmup
         c) Engine shutdown
   c. Performance information
      1) Performance charts
         a) Types of charts
         b) Interpretation of charts
      2) Placard information
   d. Angle of bank vs. rate of turn

2. Helicopter Performance
   a. Effect of density altitude
      1) Definition
      2) Air density
      3) Pressure altitude
      4) Temperature
      5) Moisture
      6) Computing density altitude on chart
      7) Effect on hovering, takeoff and rate of climb
LESSON 5 (cont'd)

2. Helicopter Performance (cont'd)

b. Effect of gross weight
   1) On power available
   2) On hovering ceiling
   3) On takeoff and rate of climb

c. Effect of wind
   1) On wind
   2) Strong wind
   3) Gusty wind
   4) Wind direction

d. Carburetor icing
   1) Causes and indications
   2) Elimination
   3) Safety Notice #25

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 6 2.0 Hours Ground Training

OBJECTIVES
During this lesson the student will be introduced to weight and balance theory and computations.

LESSON CONTENT
1. Weight and Balance Definitions
   a. Empty weight
   b. Gross weight
   c. Maximum gross weight
   d. Useful load
   e. Datum
   f. Arm
   g. Moment
   h. Center of gravity

2. Weight and Balance Determinations
   a. Computation method – longitudinal/lateral
   b. Graph method
   c. Table method

3. Weight and Balance Management
   a. Weight adjustment
   b. Center of gravity adjustment
   c. Fuel burn-off
   d. Effect of out-of-balance loading

COMPLETION STANDARDS
This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 7  1.0 Hour Ground Training

OBJECTIVES

This lesson will be a review of material presented in Lessons 1 through 6, in preparation for the Stage 1 Written Examination.

LESSON CONTENT

Review as necessary.

COMPLETION STANDARDS

This lesson and Stage 1 will be complete when the student has passed the Stage 1 Written Examination, with a minimum score of 70%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 2

GROUND TRAINING – 13.0 hours

STAGE 2 OBJECTIVES

During Stage 2 the student will be introduced to aviation weather, the flight computer, and the Aeronautical Information Manual.

STAGE 2 COMPLETION STANDARDS

Stage 2 will be complete when the student has passed the Stage 2 Written Examination with a minimum score of 70%. The instructor will review each incorrect response to assure complete understanding before advancing the student to Stage 3.
LESSON 8  2.0 Hours Ground Training

OBJECTIVES

During this lesson the student will obtain a basic understanding of weather elements and their importance to the pilot.

LESSON CONTENT

1. The Earth's Atmosphere
   a. Composition
   b. Vertical structure
   c. International standard atmosphere – ISA

2. Temperature
   a. Temperature measurement
   b. Temperature lapse rate

3. Atmospheric Pressure and Altimetry
   a. Atmospheric pressure measurements
   b. Sea level pressure
   c. Station pressure
   d. Pressure variations
   e. Pressure systems

4. Winds
   a. Basic theory of general circulation
   b. Coriolis force
   c. Pressure gradient force
   d. Friction effect
   e. Local wind systems

5. Moisture
   a. Physical states
   b. Measurements
      1) Relative Humidity
      2) Dew Point
      c. Condensation and sublimation products
         1) Clouds and fog
         2) Precipitation
         3) Dew and frost

6. Stability
   a. Causes
   b. Effects
LESSON 8 (cont’d)

7. Clouds
   
a. Composition
b. Formation and structure
c. Types
d. Recognition

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 9 2.0 Hours Ground Training

OBJECTIVES

This lesson will complete the introduction of basic weather elements.

LESSON CONTENT

1. Air Masses
   a. Source regions
   b. Classification and characteristics of air masses
   c. Air mass modification

2. Fronts
   a. Definition
   b. Types
   c. Associated weather and characteristics

3. Turbulence
   a. Convective currents
   b. Obstructions to wind flow
   c. Wind shear
   d. Clear air turbulence
   e. Categories of turbulence intensity

4. Structural Icing
   a. Types
   b. Causes
   c. Effects
   d. Intensity
   e. Prevention and elimination

5. Thunderstorms
   a. Conditions necessary for formation
   b. Formation and life cycle
   c. Hazards
   d. Avoidance procedures

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
OBJECTIVES

During this lesson the student will learn to interpret and apply aviation weather reports and forecasts prepared by the national weather service.

LESSON CONTENT

1. Methods of Collecting Weather Data
   a. Surface observations
   b. Upper air observations
   c. Radar observations
   d. Satellite observations
   e. Pilot reports – pireps

2. Prior/Current Weather Conditions
   a. Surface analysis chart
   b. Metar
   c. Weather depiction chart
   d. Radar summary chart
   e. Winds aloft chart
   f. Awos, Asos, and Atis Reports

3. Forecast
   a. Area forecast – FA
   b. Terminal Aerodrome Forecast – TAF
   c. Winds aloft forecast – FD

4. Metar and TAF Codes

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 11   2.0 Hours Ground Training

OBJECTIVES
This lesson will introduce the flight computer and its use in navigational computations.

LESSON CONTENT
1. Calculator Side
   a. Explanation of markings
   b. Mileage and speed conversions
   c. Time, speed and distance computations
   d. Fuel consumption
   e. Airspeed computations
   f. True/density altitude computations

2. Wind Face Side
   a. Explanation of markings
   b. The wind triangle
   c. Ground speed
   d. Wind correction angle
   e. True headings

COMPLETION STANDARDS
This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 12  2.0 Hours Ground Training

OBJECTIVES

This lesson will introduce the use of the Aeronautical Information Manual and other information available to the pilot.

LESSON CONTENT

1. The Aeronautical Information Manual
   a. Basic flight manual and ATC procedures
      1) Navigation aids
      2) Airport and heliport markings and lighting
      3) Airspace
         a) Class A, B, C, D, E, and G
         b) Prohibited, restricted, and warning areas
         c) MOA, alert areas
         d) Other airspace
         e) Temporary Flight Restrictions – TFR
      4) Services available to pilots
      5) Airport and Heliport operations
      6) Emergency procedures
      7) Good operating practices

2. Airport Facility Directory
   a. Content
   b. Use – Legend
   c. Applications

3. The Advisory Circular System

4. The Notam System
   a. Notam L
   b. Notam D
   c. Notam FDC

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 13 2.0 Hours Ground Training

OBJECTIVES

This lesson will increase the student’s understanding of airport and heliport operations and facilities, and services available to pilots.

LESSON CONTENT

1. Airports and Heliports
   a. Runway numbering
   b. Active runways
   c. Runway and heliport markings
   d. Taxiways
   e. Parking areas
   f. Field elevation
   g. Wind direction indicators
   h. Airport and heliport lighting
   i. Airport traffic patterns
      1) Airplanes
      2) Helicopters

2. Radio Communications
   a. Frequency assignment plan
   b. Contact procedure
   c. Microphone technique
   d. Aircraft call signs
   e. Radio phraseology
   f. Light signals

3. Airport and Heliport Communications
   a. Controlled airports and heliports
      1) Automatic terminal information service – ATIS
      2) Tower control
      3) Ground control
   b. Uncontrolled airports and heliports
      1) Common traffic advisory frequency (CTAF)
      2) Unicom
      3) Multicom
      4) AWOS, ASOS

4. Other ATC Facilities and Services
   a. Air route traffic control center
   b. Approach control
   c. Departure control
LESSON 13 (cont'd)

5. FSS Services Available
   a. Flight watch
   b. Transcribed weather broadcasts
   c. Scheduled weather broadcasts
   d. In-flight services available to the pilot

6. Emergency Procedures
   a. Emergency locator transmitter
   b. Emergency VHF frequency – 121.5
   c. Transponder codes

COMPLETION STANDARDS
This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 14 1.0 Hour Ground Training

OBJECTIVES

This lesson will be a review of material presented in Lessons 8 through 13 in preparation for the Stage 2 Written Examination.

LESSON CONTENT

Review as necessary.

COMPLETION STANDARDS

This lesson and Stage 2 will be complete when the student has passed the Stage 2 Written Examination, covering the material presented in Lessons 8 through 13, with a minimum score of 70%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
STAGE 3

GROUND TRAINING – 9.0 hours

STAGE 3 OBJECTIVES

During Stage 3 the student will be introduced to VFR charts, the navigation plotter, radio navigation, cross-country planning, physiological and psychological considerations, and federal aviation regulations.

STAGE 3 COMPLETION STANDARDS

Stage 3 will be complete when the student has passed the Stage 3 Written Examination with a minimum score of 70%. The instructor will review each incorrect response to assure complete understanding before advancing the student to Stage 4.
LESSON 15  
2.0 Hours Ground Training

OBJECTIVES

This lesson will introduce VFR charts and the navigation plotter, and their use in planning and conducting cross-country flights.

LESSON CONTENT

1. VFR charts
   a. General considerations
      1) Types of VFR charts
   b. Symbols and markings
      1) Latitude and longitude
      2) Magnetic variation
      3) Topography
      4) National Airspace System
      5) Navigation aids
      6) Aerodromes, heliports and flight service stations
      7) Legend – other markings

2. The Navigation Plotter
   a. Mileage scales
   b. Azimuth scale
   c. Plotting and measuring courses

3. Application of Navigation Methods
   a. Pilotage
   b. Dead reckoning

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 16 2.0 Hours Ground Training

OBJECTIVES
This lesson will introduce radio navigation and its application in cross-country flight.

LESSON CONTENT
1. **VHF Omni directional Range System – VOR**
   a. Receiver components
      1) Omni-bearing selector – OBS
      2) Course deviation indicator – CDI
      3) To-From indicator
   b. VOR radials
   c. VOR navigation
   d. VOR navigation procedures
   e. VOR indications
   f. VOR orientation
   g. Position fixing
   h. Intercepting a radial
   i. VOR test signals – VOT

2. **Distance Measuring Equipment – DME**
3. **Area Navigation – RNAV**
4. **Automatic Direction Finder – ADF**
5. **Global Positioning System – GPS**
   a. System description
   b. VFR use of GPS
   c. Database currency
   d. RAIM

6. **VHF Omni directional Range System – VOR**
   a. Radar
      1) Radar vectors
      2) Traffic advisories
      3) Sequencing
      4) Transponder
         a) Phraseology
         b) Modes and codes
   b. VHF Direction Finder

COMPLETION STANDARDS
This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.
LESSON 16 (Cont'd)

INSTRUCTOR'S COMMENTS AND RECOMMENDATIONS:
LESSON 17 2.0 Hours Ground Training

OBJECTIVES

This lesson incorporates the subjects of previous lessons into the planning of a cross-country flight.

LESSON CONTENT

1. Chart Selection
2. Weather Briefing and Course Selection
3. Navigation Log
   a. True course
   b. Altitude selection
   c. Winds aloft and temperature
   d. Wind correction angle
   e. True airspeed, ground speed
   f. True heading
   g. Magnetic variation
   h. Magnetic heading
   i. Deviation
   j. Compass heading
   k. Time estimates – ETE and ETA
   l. Fuel requirements
4. Airport Information for Destination
   a. VFR charts
   b. Airport Facilities Directory
5. VFR Flight Plan
   a. Filing
   b. Opening
   c. Extending if necessary
   d. Closing/Cancelling

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LESSON 18   2.0 Hours Ground Training

OBJECTIVES

This lesson reviews the Federal Aviation Regulations discussed as an integral part of previous lessons and introduces other regulations applicable to the private pilot’s certification. In addition, the student will be introduced to physiological and psychological factors which can affect the comfort and safety of the pilot and his passengers.

LESSON CONTENT

1. Federal Aviation Regulations
   a. FAR Part 1
   b. FAR Part 61
   c. FAR Part 91
   d. NTSB, Part 830

2. Physiological Considerations
   a. Fatigue
   b. Hypoxia
   c. Alcohol
   d. Drugs
   e. Vertigo
   f. Carbon monoxide
   g. Vision
   h. Middle ear

3  Psychological Considerations
   a. Anxiety
   b. Stress

COMPLETION STANDARDS

This lesson will be complete when, by oral examination, the student displays an understanding of the material presented and has completed the study assignment.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
LEsson 19 
1.0 hour ground Training

OBJECTIVES

This lesson will be a review of material presented in Lessons 1 through 18 in preparation for the Stage 3 and Final Written Examination.

LESSON CONTENT

Review as necessary.

COMPLETION STANDARDS

This lesson and Stage 3 will be complete when the student has passed the Stage 3 and Final Written Examination, covering the material presented in Lessons 1 through 18, with a minimum score of 70%.

INSTRUCTOR’S COMMENTS AND RECOMMENDATIONS:
INTRODUCTION

The intention of this guide is to aid both the student and instructors while conducting training in the R22. It should be understood that because of the many variables in geographic location, altitudes, loading and individual instructor techniques, minor modifications to certain maneuvers might be necessary. For the purposes of training, the following parameters should be adhered to:

- Normal Climb: 60 KTS @ 104% RPM
- Normal Cruise: 75 KTS @ 102%–104% RPM
- Hovering: 5 feet @ 104% RPM
- Takeoffs: 104% RPM
- Autorotative Descents: 60–70 KTS
- Maximum Hover Speed – Forward: 10 KTS Groundspeed
- Maximum Hover Speed – Lateral/Rearward: 5 KTS Groundspeed
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<td>Enhanced Autorotation Procedures</td>
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</table>
STRAIGHT AND LEVEL FLIGHT

PURPOSE:

To fly the helicopter at a constant airspeed, altitude, and heading.

DESCRIPTION:

Attitude or pitch control with the cyclic is the most important aspect of straight and level flight. A level flight attitude is best determined by referencing the horizon with a fixed point in the cockpit, such as the magnetic compass or the tip path plane. The pilot will be able to detect changes in attitude by noting changes between the fixed point and the horizon. Airspeed is determined by attitude and controlled by the cyclic. As in all helicopters, the R22 cyclic control is very sensitive and requires very slight pressure to effect a change. Normal cruise airspeed for training is 75 KTS.

Altitude is controlled primarily by the collective. Each collective movement will require a corresponding pedal adjustment to maintain the aircraft in trim. An increase of collective will require left pedal. A collective decrease will require right pedal. Additionally, when the collective is increased, the nose will tend to rise, requiring slight forward cyclic to maintain a level or cruise flight attitude. The opposite is true with a decrease in collective – the nose will move down, requiring a slight aft cyclic.

The governor will control RPM. However, should the governor fail, the RPM is correlated and few throttle adjustments will be required. High manifold pressure settings or high-density altitude conditions will require the pilot to maintain RPM with throttle, in the event of a governor failure. An increase in collective will require an increase in throttle to prevent low RPM. A decrease in collective will require a decrease in throttle to prevent high RPM.

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<td>Heading</td>
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<td>± 5°</td>
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NORMAL CLIMBS AND DESCENTS

PURPOSE:

To change altitude at a controlled rate in a controlled attitude.

DESCRIPTION:

Climbs

For training purposes, climb airspeed is 60 KTS at 500 feet per minute rate of climb. From straight and level flight at 75 KTS, clear above the aircraft. Initiate the climb by increasing collective to climb power (manifold pressure setting which will provide a 500 ft/min climb at 60 KTS). The governor will maintain the RPM. Maintain aircraft trim with a slight amount of left pedal and apply aft cyclic to adjust the attitude to a “60 KT climb attitude.” 50 feet prior to reaching the level-off altitude, begin the level off lowering the nose to a 75 KT attitude with forward cyclic, decreasing the collective slowly to cruise power (manifold pressure setting for level flight at 75 KTS). Maintain aircraft trim with right pedal. Throughout the climb and level off, continually crosscheck outside references – (attitude and heading) with inside references – (flight instruments).

Descents

For training purpose, descent airspeed is 60 KTS at 500 feet per minute rate of descent. From straight and level flight at 75 KTS, clear below the aircraft. Initiate the descent by decreasing collective to a manifold pressure setting that will provide a 500 ft/min descent at 60 KTS. Maintain aircraft trim with a slight amount of right pedal, the governor will maintain the RPM. Apply aft cyclic to adjust the attitude to a “60 KT attitude.” 50 feet prior to reaching the level off altitude, begin the level off by increasing the collective slowly to cruise power. Maintain aircraft trim with left pedal. Apply forward cyclic to adjust the attitude to a level flight attitude. Throughout the descent and level off, continually crosscheck outside references – (attitude and heading) with inside references – (flight instruments).

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TURNS

PURPOSE:
To turn the aircraft using a constant angle of bank at a constant airspeed and altitude.

DESCRIPTION:
From straight and level flight at 75 KTS, clear the aircraft in the direction of turn. Smoothly apply cyclic towards the direction of turn until the desired angle of bank is reached. Unlike an airplane, the pedals should not be used to assist the turn. Use the horizon as a reference to maintain a 75 KT attitude and desired angle of bank with cyclic. As the angle of bank increases, additional collective may be required to maintain altitude. Keep the aircraft in trim with the pedals. Begin the recovery from the turn just prior to reaching the desired rollout heading. Apply cyclic opposite the direction of turn, and if any collective has been added during the turn, reduce it back to cruise power, while maintaining aircraft trim.

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<tr>
<td>Roll out Heading</td>
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<td>± 5°</td>
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ACCELERATION / DECELERATION

PURPOSE:
To increase pilot control co-ordination. Maintaining a constant altitude, accelerate to 85 KTS, decelerate to 60 KTS, and then accelerate back to 75 KTS.

DESCRIPTION:
From straight and level flight at 75 KTS, slowly increase the collective approximately 2” above cruise power, adding left pedal and forward cyclic. As the aircraft begins to accelerate, adjust cyclic, collective and pedals, (the governor will control the RPM) as necessary to stabilize at 85 KTS and level flight. Begin the deceleration by slowly reducing the collective co-coordinated with right pedal and aft cyclic. Again, use all controls slowly and smoothly as necessary to decelerate to 60 KTS and level flight. Accelerate back to 75 KTS by increasing collective to cruise power, left pedal and forward cyclic to attain level flight at 75 KTS.

Throughout the maneuver, a constant crosscheck of airspeed, altitude, attitude, RPM and trim must be maintained.

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TAKEOFF TO A HOVER

PURPOSE:

To transition from the ground to a stabilized 5-foot hover.

DESCRIPTION:

After completing a pre-takeoff check, clear the helicopter left and right. With the collective full down and the cyclic and pedals neutralized, slowly increase the throttle. As the RPM passes 80%, the governor will activate and increase the RPM to 104%. Increase the collective and a small amount of left pedal will be required to compensate for the increased torque. As the helicopter becomes light on the skids, select a reference point 50 to 75 feet in front of the helicopter and neutralize all aircraft movement with the cyclic and pedals. Continue to increase the collective smoothly and slowly, maintaining heading with slight pedal corrections. Since the R22 normally hovers in a nose low attitude with two occupants, the heels of the skids will break ground first. Compensate with aft cyclic. As the helicopter becomes light on the skids, extreme caution must be used to avoid any rearward or lateral movement since this can cause an immediate rollover. Should any lateral or rearward movement occur, immediately lower the collective and begin again. The helicopter should rise vertically, maintaining heading with pedals, position over the ground with cyclic, and altitude with the collective. After attaining a stabilized 5-foot hover, perform hover check:

1. RPM – 104%
2. Engine instruments – Green Range
3. Hover power – (Manifold Pressure)
4. Carb Heat – As Necessary

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<tr>
<td>Position</td>
<td>10’ Circle</td>
<td>5’ Circle</td>
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</table>
LANDING FROM A HOVER

PURPOSE:
To land the helicopter from a 5-foot hover.

DESCRIPTION:
From a stabilized 5-foot hover, headed into the wind, slightly lower the collective to establish a slow rate of sink. A small amount of right pedal will be needed to maintain heading. The cyclic will be used to maintain position over the ground. Vision should be directed 50 – 75 feet in front of the helicopter. Do not look immediately in front of the helicopter, as this will lead to over controlling.

As the helicopter descends to about 6 inches, additional downward pressure on the collective may be necessary to overcome the increase in ground effect. As the skids make ground contact, neutralize all aircraft movement with cyclic and pedals, continuing to smoothly lower the collective until it is full down. Due to the nose low attitude of the R22 with two people aboard, the toes of the skids will normally touch first on level terrain. A slight amount of forward cyclic will be necessary as ground contact is made. During solo flight, the attitude of the R22 is level and will not require forward cyclic when ground contact is made.

CAUTION
Do not allow the helicopter to land with any rearward or sideward movement.

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<td>Drift</td>
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HOVERING FLIGHT

PURPOSE:
To maneuver the helicopter forward, sideward, rearward and turn the aircraft while hovering.

DESCRIPTION:

Forward, sideward and rearward flight
From a stabilized 5-foot hover, headed into the wind, move the cyclic smoothly towards the desired direction of flight. Maintain heading with small pedal corrections and altitude with collective. As movement begins, adjust the cyclic to keep the groundspeed at a constant rate equivalent to a normal walk. Reference points along the direction of flight can be used to maintain correct ground track. To stop the movement, apply cyclic opposite to the direction of movement until the helicopter stops. During all phases of hovering, cyclic changes should be small and smooth to minimize the effects of over controlling or pendular action.

Crosswind hovering is accomplished in much the same manner. The cyclic must be inclined into the wind enough to cancel out any tendency for the helicopter to drift.

Hovering Turns
Hovering turns are accomplished by use of the pedals. With the helicopter headed into the wind, apply pedal in the desired direction of turn. As the helicopter turns, counter pressures on the opposite pedal should be used to maintain a slow, constant rate of turn. (A rate of 360° in 15 seconds is recommended.)

Cyclic is used to control attitude and position over the ground and should be continually adjusted into the wind to avoid drifting and excessive attitude changes during the turn. Maintain a constant altitude with the collective. Normally, a slight altitude and RPM loss will occur in a left turn due to the increased pitch of the tail rotor blades. This can be corrected with a slight increase in collective and the governor will increase throttle if necessary. Right turns produce just the opposite effect. A decrease in the tail rotor pitch will cause a slight increase in RPM and altitude. If necessary, compensate by slightly lowering the collective and the governor will reduce throttle. As the desired heading is reached, stop the turn by applying slight pressure on the opposite pedal.

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<td>Ground Track</td>
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TRAFFIC PATTERN OPERATIONS

PURPOSE:
For training purposes, traffic pattern operations are used for the practice of continual takeoffs and landings.

DESCRIPTION:

Upwind Leg
After takeoff, assume a normal climb at 60 KTS. Upon reaching a predetermined point on the ground, begin a 90° turn to crosswind.

Crosswind Leg
Maintain ground track by crabbing the helicopter into the wind. 50 feet prior to reaching 500 feet AGL, begin a level off by accelerating slowing to 75 KTS and reducing the power to cruise power. Upon reaching a predetermined point on the ground, begin a 90° turn to downwind.

Downwind Leg
Groundspeed will increase due to the downwind condition. Fly the downwind leg at 75 KTS and 500 feet AGL using ground reference points to maintain ground track. Upon reaching a predetermined point on the ground, decrease the collective to establish a descent. Once the descent is established, begin a 90° turn and start decelerating to 60 KTS. This turn will require a steeper angle of bank due to the downwind condition.

Base Leg
On base, descend to 300 feet AGL and slow to 60 KTS. Plan the turn from base to final so as to roll out aligned with the point of intended touchdown.

Final
Fly the final approach leg at 60 KTS and 300 feet AGL until the appropriate approach angle is reached.
TRAFFIC PATTERN OPERATIONS (cont’d)

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NORMAL TAKEOFF FROM A HOVER

PURPOSE:

To transition from a hover to a normal climb.

DESCRIPTION:

From a stabilized 5-foot hover, select an object(s) along the takeoff path for use as a reference point to maintain ground track. Clear the aircraft left and right with a clearing turn, then complete a before takeoff check (RPM 104%, warning lights, instruments and carb heat). Begin the takeoff with a small amount of forward cyclic to get the helicopter moving forward. If the helicopter begins to settle, increase the collective as necessary to hold altitude and maintain heading with pedals. As the airspeed increases to approximately 10 to 12 KTS, effective translational lift (ETL) will occur, and can be felt as a lateral vibration. At ETL, lift will increase noticeably causing the nose to pitch up. Apply sufficient forward cyclic to continue the acceleration and prevent the nose from rising. As airspeed increases, the streamlining of the fuselage and the increased efficiency of the tail rotor will cause a left yaw, requiring a right pedal correction. Continue to smoothly accelerate, maintaining ground track. At an altitude of 300 feet and airspeed of 55 KTS, adjust manifold pressure to climb power and slight aft cyclic to establish a 60 KT climb attitude.

CROSSWIND CONSIDERATIONS:

During crosswind takeoffs, the helicopter is flown in a slip to an altitude of 50 feet. Place the cyclic into the wind as necessary to maintain the proper ground track. Apply opposite pedal to align the fuselage with the ground track. Above 50 feet, crab the helicopter into the wind by putting the aircraft in trim and maintaining ground track with cyclic.

NOTE

During the takeoff, the acceleration to climb speed and the commensurate altitude gain should be accomplished without entering the shaded areas of the R22’s height-velocity diagram.

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<tr>
<td>Drift above 10 feet</td>
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NORMAL APPROACH TO A HOVER

PURPOSE:
To transition from flight at altitude to a stabilized 5-foot hover.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 KTS and 300 feet AGL. When a normal approach angle of 10° is intercepted, begin the approach by lowering the collective sufficiently to get the helicopter descending down the approach angle. With the decrease in collective, the nose will tend to pitch down, requiring the aft cyclic to maintain a 60 KT attitude and right pedal to maintain heading. The pilot can determine the proper approach angle by relating the point of intended touchdown to a point on the helicopter windshield. The collective controls the angle of approach. If the touchdown point seems to be moving up on the windshield, the angle is becoming shallower, necessitating a slight increase in collective. If the touchdown point moves down on the windshield, the approach angle is becoming steeper, requiring a slight decrease in collective. The cyclic is used to control the rate of closure or how fast you are moving toward the touchdown point. Maintain entry airspeed until the apparent groundspeed and rate of closure appear to be increasing. At this point, slowly begin decelerating with slight aft cyclic, maintaining the approach angle by smoothly reducing the collective. Use the cyclic to maintain a rate of closure equivalent to a brisk walk. At approximately 25 to 40 feet, depending on wind, the helicopter will begin to lose effective translational lift. This loss will be felt as a lateral vibration and the aircraft will begin to settle. The pilot must anticipate the loss of ETL, and compensate with increased collective to maintain the approach angle, (the governor will maintain the RPM). The increase of collective will tend to make the nose rise requiring forward cyclic to maintain proper rate of closure. As the helicopter approaches an altitude of 5 feet, the collective should be increased sufficiently to hold a 5-foot hover, maintaining heading with pedals. A small aft cyclic input may be necessary to stop any forward movement.

CROSSWIND CONSIDERATIONS:
During the approach, maintain a crab into the wind and the aircraft in trim. At 50 feet of altitude, a slip should be used to align the fuselage with the ground track. Apply cyclic into the wind and opposite pedal.

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<tr>
<td>Drift below 10 feet</td>
<td>± 25 feet</td>
<td>± 10 feet</td>
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MAXIMUM PERFORMANCE TAKEOFF AND CLimb

PURPOSE:
To transition from the surface to a maximum performance climb, simulating obstruction clearance.

DESCRIPTION:
While on the ground at a reduced RPM, check the manifold pressure limit chart to determine the maximum takeoff power. Clear the aircraft left, right and overhead, then complete a before takeoff check (RPM 104%, Warning Lights, Instruments, and Carb Heat). Select a reference point(s) along the takeoff path to maintain ground track.

Begin the takeoff by getting the helicopter light on the skids. Pause and neutralize all aircraft movement. Slowly increase the collective and position the cyclic so as to break ground and maintain a 40 KT attitude (approximately the same attitude as when the helicopter is light on the skids). Continue to slowly increase the collective until the maximum takeoff power is reached. This large collective movement will require a substantial increase in left pedal to maintain heading. The governor will maintain the RPM.

At 50 feet of altitude, slowly lower the nose to a normal 60 KT climb attitude. As the airspeed passes 55 KTS, reduce the collective to normal climb power.

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<td>- 0.5&quot;</td>
</tr>
</tbody>
</table>
STEEP APPROACH TO A HOVER

PURPOSE:
To transition from flight at altitude to a hover using a steeper than normal approach angle.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 KTS and 300 feet AGL. When a steep approach angle of 15° is intercepted, begin the approach by lowering the collective to get the helicopter descending down the approach angle and coordinate right pedal for trim. Since this angle is steeper than a normal approach angle, the collective must be reduced more than for a normal approach. As in the normal approach, reference the touchdown point on the windshield to determine changes in the approach angle. Aft cyclic will be required to decelerate sooner than in a normal approach due to the steeper angle and the rate of closure will become apparent at a slightly higher altitude. Maintain a crab above 50 feet, and a slip below 50 feet.

Maintain the approach angle and rate of descent with collective, rate of closure with cyclic, and trim with pedals. Loss of ETL will occur higher during a steep approach requiring an increase in collective to prevent settling, forward cyclic for proper rate of closure, and left pedal for trim. Terminate at a stabilized 5-foot hover.

CAUTION
Avoid high rates of descent at airspeeds below 30 KTS.

PERFORMANCE STANDARDS:

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<tr>
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<th>Private</th>
<th>Commercial</th>
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</thead>
<tbody>
<tr>
<td>Heading</td>
<td>± 10°</td>
<td>± 5°</td>
</tr>
<tr>
<td>Termination</td>
<td>± 10 feet</td>
<td>± 5 feet</td>
</tr>
</tbody>
</table>
STRAIGHT-IN AUTOROTATION WITH POWER RECOVERY

PURPOSE:

To simulate safely landing the helicopter with a complete power loss.

DESCRIPTION:

The Entry

From level flight at 70–75 KTS, 500 to 700 feet AGL, and headed into the wind, smoothly, but firmly, lower the collective full down without reducing the throttle. Coordinate the collective movement with right pedal for trim and aft cyclic to maintain a 70 KT attitude. The RPM needles will usually split establishing an autorotative descent. If the needles do not split, reduce the throttle slightly. Crosscheck attitude, trim, rotor RPM and airspeed. With two occupants on board anticipate an increase in RPM requiring an increase of collective.

The Glide

After descent has been established, slowly reduce the airspeed to 60 to 70 KTS and maintain this attitude throughout the glide. During straight-in autorotative glides, aft cyclic movements will cause an increase in rotor RPM which is controlled by a small increase in collective. If the collective is increased to control the rotor RPM, hold or retard the throttle slightly to prevent the governor from joining the needles. Avoid a large collective increase, which will result in a rapid decay of rotor RPM and lead to “chasing the RPM.” Maintain RPM in the green (between 97% and 104% in the Beta II) and the aircraft in trim during the glide. Below 100 feet AGL, maintain the aircraft alignment with ground track with a slip. A constant 60–70 KT attitude should be held with the cyclic. Avoid looking straight down in front of the aircraft. Continually crosscheck attitude, trim, rotor RPM, and airspeed.

NOTE

Prior to the helicopter descending through 100 feet AGL, the instructor should make an immediate power recovery if the following three conditions do not exist:

1. Rotor RPM stabilized between 97% – 104% RPM.
2. Airspeed stabilized 60–70 KTS.
3. A normal rate of decent, usually less than 1500 FPM.

The Flare

At approximately 40 feet AGL, begin the flare with aft cyclic to reduce forward airspeed and decrease the rate of descent. The amount of flare will depend on wind conditions and gross weight, and should gradually be increased so that groundspeed and rate of descent are significantly decreased. Too much flare will cause the helicopter to balloon up causing a high vertical descent, as airspeed is lost.
STRAIGHT-IN AUTOROTATION WITH POWER RECOVERY (cont’d)

The Power Recovery

At approximately 8 to 10 foot skid height, begin to level the helicopter with forward cyclic. Extreme caution should be used to avoid an excessive nose high/tail low attitude below 10 feet. Just prior to achieving a level attitude, with the nose still slightly up, increase the collective maintaining heading with left pedal. If the engine RPM is below 80% increase the throttle and allow the governor to increase the RPM to 104%. Do not allow the helicopter to descend below 5 feet during the power recovery.

PERFORMANCE STANDARDS:

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<tr>
<td>Airspeed</td>
<td>+ 10 KTS</td>
<td>± 5 KTS</td>
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</table>
180° AUTOROTATION WITH POWER RECOVERY

PURPOSE:
To simulate safely landing the helicopter by turning 180° with a complete power loss.

DESCRIPTION:

The Entry
Establish the aircraft on downwind at 75 KTS and 700 feet AGL. When abeam the intended touchdown point, enter the autorotation by smoothly, but firmly, lowering the collective full down without reducing the throttle. Usually the needles will split establishing an autorotation. If the needles do not split, reduce the throttle slightly. Apply right pedal and aft cyclic to maintain the attitude. Crosscheck attitude, trim, rotor RPM, and airspeed.

The Glide / Turn
After the descent is established, apply aft cyclic to achieve a 60 to 70 KT attitude, then roll into a 180° turn. The proper angle of bank will be determined by wind velocity, but use caution to avoid an excessively steep turn, as this will increase the descent rate. Throughout the turn, it is important to maintain the proper attitude (airspeed) and keep the aircraft in trim. Changes in the aircraft’s attitude and the angle of bank will cause corresponding increases and decreases in rotor RPM. Adjust the collective as necessary in the turn to maintain rotor RPM between 97%-104%. Continually crosscheck rotor RPM when maneuvering the R22 in autorotative turns as the low inertia rotor system can allow rapid increases in rotor RPM. The turn should be completed and the helicopter aligned with the intended touchdown area prior to passing through 100 feet AGL. If the collective has been increased to load the rotor during the turn, it may have to be lowered on roll out to prevent decay in RPM.

NOTE
Prior to the helicopter descending through 100 feet AGL, make an immediate power recovery if the following conditions do not exist:

1. Aircraft aligned with the touchdown point (turn completed)
2. Rotor RPM stabilized between 97%-104 %
3. Airspeed stabilized between 60–70 KTS
4. A normal rate of descent, usually less than 1500 FPM

The Flare
Same as straight-in autorotation.

Power Recovery
Same as straight-in autorotation.
180° AUTOROTATION WITH POWER RECOVERY (cont’d)

PERFORMANCE STANDARDS:

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<tbody>
<tr>
<td>Predetermined Spot</td>
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<td>± 100 feet</td>
</tr>
<tr>
<td>RPM</td>
<td>97% – 104%</td>
<td>97% – 104%</td>
</tr>
<tr>
<td>Airspeed</td>
<td>+ 10 KTS - 5 KTS</td>
<td>± 5 KTS</td>
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</table>
POWER FAILURE AT A HOVER – HOVERING AUTOROTATION

PURPOSE:
To simulate landing the helicopter from a hover with a complete power loss.

DESCRIPTION:
Begin from a stabilized 2 to 3 foot hover at 104% RPM, over level terrain and headed into the wind. If necessary, reposition the left hand so that the throttle can easily be rolled off into the override, leaving the governor on. Firmly roll the throttle into the spring–loaded override while simultaneously adding right pedal to maintain heading. The loss of tail rotor thrust will cause a left drift requiring a slight right cyclic correction. Use caution not to raise or lower the collective when rolling off the throttle. When the aircraft has settled to approximately 1 foot, fully increase the collective, holding the throttle firmly in the spring loaded override, to cushion the landing. As the skids touch down, apply slight forward cyclic. Once firmly on the ground, lower the collective full down. Use caution to avoid any sideward or rearward movement on touchdown to prevent the possibility of a rollover.

If simulating a tail rotor failure at a hover, allow the helicopter to yaw a maximum of 90° to the right, then perform the hovering autorotation.

NOTE
Other than for a T/R failure at a hover, it is recommended that the instructor rolls the throttle off, then the student maintains heading with right pedal once the engine failure is detected.

PERFORMANCE STANDARDS:

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<td>Heading</td>
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<tr>
<td>Touchdown</td>
<td>Level</td>
<td>Level</td>
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</table>
POWER FAILURE AT ALTITUDE – FORCED LANDING

PURPOSE:
To teach the student how to recognize an engine failure, properly enter an autorotation, select a landing area and maneuver to it.

DESCRIPTION:
During cruise flight with the student at the controls; the instructor will initiate the forced landing by leaving the governor on and rolling the throttle smoothly to the idle position splitting the needles. The student will immediately lower the collective full down co-coordinated with the right pedal for trim, and aft cyclic to maintain attitude. This should be accomplished quickly enough to prevent the rotor RPM from decaying below 90%. As the rotor RPM builds back into the green, increase collective as necessary to maintain rotor RPM between 97%–104%. The instructor will control the throttle to prevent the governor from joining the needles. Once established in an autorotative descent, select an intended landing area. Maneuver the helicopter as necessary to align the aircraft with the intended landing area, generally headed into the wind. Use increases in the collective and/or forward cyclic to prevent the rotor from over speeding while maneuvering. Airspeed should be adjusted to 60–70 KTS.

Prior to passing through 100 feet, the aircraft should be aligned with the touchdown area, at 60–70 KTS, rotor RPM between 97%–104%, and in trim. Execute a power recovery and transition to normal climb.

NOTE
The instructor should apply the recommendations contained in Safety Notice #27.

PERFORMANCE STANDARDS:

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<tr>
<td></td>
<td>- 5 KTS</td>
<td></td>
</tr>
<tr>
<td>Area Selection</td>
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<td>Suitable</td>
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</table>
RAPID DECELERATION (QUICK STOP)

PURPOSE:

To simulate a condition when a rapid decrease in forward airspeed is required as in an aborted takeoff.

DESCRIPTION:

Perform a normal takeoff into the wind. Once a minimum altitude of 25 feet is attained, apply additional forward cyclic to accelerate to 40–50 KTS while maintaining altitude. Begin the quick stop by smoothly lowering the collective, adding right pedal, and simultaneously applying aft cyclic to decelerate. Apply aft cyclic as needed to maintain entry altitude throughout the deceleration. As airspeed is lost, the helicopter will begin to settle. Slowly increase the collective to control the rate of descent adding forward cyclic to level the helicopter. Maintain heading with pedals. Terminate at a stabilized 5-foot hover. Use caution to avoid terminating at a high hover or in an extreme tail low attitude.

PERFORMANCE STANDARDS:

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SHALLOW APPROACH AND RUNNING LANDING

PURPOSE:
To simulate an approach and landing when sufficient power for hovering is not available.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind at 60 KTS and 300 feet AGL. When a shallow approach angle of 5° is intercepted, begin the approach by lowering the collective to maintain the approach angle. Maintain entry airspeed until apparent rate of closure and groundspeed appear to be increasing. Begin a slow deceleration with aft cyclic, maintaining approach angle by reducing collective and the aircraft in trim. Plan to arrive at the point of intended touchdown at or slightly above effective translational lift. Prior to ground contact, insure that the helicopter is in a level attitude. After ground contact, maintain heading with pedals and slowly lower the collective for braking action allow the governor to maintain RPM (do not squeeze the throttle inhibiting the governor) until the helicopter comes to a complete stop.

Crosswind Considerations:
As in normal and steep approach, crab the helicopter above 50 feet AGL, and use a slip below 50 feet AGL to align the aircraft with the ground track.

PERFORMANCE STANDARDS:

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<tbody>
<tr>
<td>Heading</td>
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<td>± 5</td>
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<tr>
<td>Touchdown Point</td>
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<td>± 25 feet</td>
</tr>
<tr>
<td>Manifold Pressure</td>
<td>Less than hover power</td>
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</table>
SLOPE OPERATIONS

PURPOSE:
To land from a hover and takeoff to a hover from a sloping surface.

DESCRIPTION:
Prior to conducting slope operations, the pilot must be thoroughly familiar with dynamic rollover characteristics and mast bumping. For training, use a maximum slope angle of 5°.

Slope Landings:
Position the helicopter cross slope at a stabilized 5-foot hover headed into the wind. Lower the collective slightly to establish a slow rate of sink. When upslope skid contacts the ground, begin applying lateral cyclic in the direction of the slope (upslope) to hold the skid against the slope. Maintain heading with pedals. Continue to apply cyclic into slope as the collective is lowered until the down slope skid is firmly on the ground. Once the collective is full down, center the cyclic to allow safe “head clearance” on the upslope side.

Slope Takeoffs:
The procedure for a slope takeoff is almost the exact reverse of that for a slope landing. Apply cyclic into the slope (upslope) and slowly begin to increase the collective. As the helicopter becomes light on the skids, pause and neutralize any aircraft movement. Continue to increase the collective maintaining heading with pedals. When the down slope skid breaks ground, slowly begin to center the cyclic. As a level attitude is reached, the cyclic should be approximately neutral. Continue to increase collective, maintaining position over the ground with cyclic and heading with pedals until a stabilized 5-foot hover is attained.

PERFORMANCE STANDARDS:

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<th>Commercial</th>
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<tbody>
<tr>
<td>Heading</td>
<td>± 10</td>
<td>± 5</td>
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</table>
RECOGNITION AND RECOVERY FROM LOW ROTOR RPM

PURPOSE:
To become thoroughly familiar with the recognition of low rotor RPM and the techniques of recovery. Prior to performing this maneuver, the pilot should be familiar with RHC Safety Notices #10 and #24.

DESCRIPTION:
Cruise flight, takeoff & approach
A) Entry and Recognition
During cruise flight, takeoffs and approaches, at 104% RPM, the instructor will, turn the governor off, then slowly decrease the throttle to 95% RPM. The low RPM condition will be recognized by:
1. A noticeable decrease in engine noise.
2. Aircraft vibrations and cyclic stick shake especially at higher airspeeds.
3. The low rotor RPM warning horn and light at approximately 97% RPM.

The instructor should demonstrate the further increase in vibration and decrease in engine noise by decreasing the RPM to 92% RPM.

B) Recovery Technique
Upon recognizing the low RPM condition, simultaneously add throttle and lower the collective half inch to one inch to regain operating RPM. Larger collective movements will require additional throttle due to the correlator. A gentle aft cyclic movement will prevent the nose from going down and inhibiting the recovery, but the primary recovery controls are the collective and throttle. Avoid any forward cyclic input, which will inhibit RPM recovery. Once RPM is regained, slowly raise the collective to reduce the sink rate, while closely monitoring the RPM.

At a Hover
During hovering flight at 104% RPM, the instructor will turn the governor off and slowly decrease the throttle to 95% RPM. Note the obvious decrease in engine noise and the tendency for the aircraft to settle back toward the ground. As the aircraft settles, the tendency for some pilots will be to increase the collective to stop the descent. This may only increase the RPM decay and increase the descent. Recovery is the same as in forward flight. Lower the collective simultaneously adding throttle. If RPM cannot be regained prior to ground contact, insure that the helicopter touches down in a level attitude.

PERFORMANCE STANDARDS:
The pilot should be able to recognize and recover from low rotor RPM prior to reaching 90% RPM.
VORTEX RING STATE (SETTLING WITH POWER)

PURPOSE:

To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink.

Description:

Settling with power is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1000 feet AGL.

To enter a maneuver, adjust the power to approximately 5” below hover power. Hold altitude with aft cyclic until the airspeed approaches 20 KTS. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate. Once the condition is well developed, rate of sink in excess of 2000 FPM can result. Recovery should be initiated at the first sign. The maneuver can also be entered from an OGE hover.

To recover, apply forward cyclic to increase airspeed and simultaneously reduce the collective. When the airspeed indication indicates 20–30 KTS and the trim strings have become effective, increase the collective to the 5 minute takeoff limit and adjust the cyclic to a maximum performance climb attitude. The recovery is completed when the VSI reads 0.

Another recovery technique is called the Vuichard Recovery after an FOCA inspector in Switzerland. Initiate the recovery by increasing the collective to takeoff power, simultaneously applying left pedal to maintain heading and right cyclic (10°–15° bank) to get lateral movement. Once the right side of the rotor disc reaches the upwind part of the vortex the recovery is completed. Average loss of altitude during the recovery is 20–50 ft depending on the duration of the recovery procedure.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the settling with power conditions and be able to safely recover.
ENHANCED AUTOROTATION PROCEDURES (Required by SFAR 73)

PURPOSE:

To understand the different elements that can be used to maneuver the helicopter in autorotation. This training is only recommended for students who hold at least a private pilot certificate.

DESCRIPTION:

Each element will be discussed. Once the student has an understanding of the elements, one or more can be combined in one autorotative glide.

Use of turns

Left, right or “S” turns can be used to decrease the glide distance in autorotation. It is important to maintain proper attitude and trim when turning to prevent increased descent rates. Adjust the collective as necessary in the turn to maintain rotor RPM between 97%–104%. A large turn (270°–360°) is not recommended since for much of the turn the pilot will lose sight of the landing area and will be unable to determine the effect of wind on the glide.

Use of airspeed

Airspeeds from zero to max glide airspeed (75 kts in an R22) can be used to adjust the autorotative glide distance as necessary. Maximum glide distance configuration is covered later in this maneuver so this discussion concerns reducing airspeed. It is recommended an entry altitude of 1500–2000 ft AGL be used so the student can get an extended time flying at the lower speeds in autorotation. Enter the autorotation so that a normal glide will take the helicopter well past the point of intended landing thus requiring a shortened glide distance. Once the glide is established apply aft cyclic to a 10°–15° nose high attitude. Adjust the collective as necessary to control increases in rotor RPM. At approximately 25–30 kts the nose of the aircraft will come down to a level attitude due to the upward flow of air acting on the tail cone and horizontal stabilizer. Maintain this configuration and observe the landing area moving up on the windshield. When a normal autorotative angle is achieved or approaching 500 ft AGL, lower the nose to 10°–15° nose down to increase airspeed back to the normal autorotative speed of 60–70 kts.

Use of pedals

Set the maneuver up at 1500–2000 ft AGL with the point of intended landing and the wind 90° from the helicopter’s ground track (out the left or right door). Since the left pedal is the strong pedal in autorotation, it is recommended the landing area be positioned out the left door requiring left pedal to turn. However, the student should experience use of both pedals. Enter the autorotation and slow the airspeed as in the “Use of airspeed” maneuver. Once the nose comes down to the level attitude, apply pedal to align the aircraft with the desired track towards the landing area. Use of left pedal will decrease the rotor RPM requiring the pilot to lower the collective as necessary to maintain the rotor RPM. (cont’d)
ENHANCED AUTOROTATION PROCEDURES (cont’d)

Use of pedals (cont’d)

The remainder of the maneuver is the same as the “Use of airspeed” discussion.

Use of sideward flight

The purpose of using sideward flight in an autorotative glide is when the point of intended landing is almost directly below the helicopter. Set up the condition with the wind 90° (left or right) from the aircraft’s ground track at 1500–2000 ft. Enter the autorotation directly over or just prior to the intended landing area. Decrease the airspeed as in the “Use of airspeed” maneuver. When the nose comes down to the level attitude apply lateral cyclic in the direction of the desired sideward flight and opposite pedal to prevent the aircraft from weather vaneing towards the direction of flight. The resulting slip and wind direction will move the helicopter downwind from the landing area. Once the helicopter is far enough away from the landing area stop the sideward flight with opposite cyclic. Opposite pedal is then applied (as in the “use of pedal” maneuver) to align the aircraft into the wind tracking towards the landing area and lower the nose to regain airspeed. Again, left pedal is the strong pedal in autorotation, so sideward flight to the right, requiring the use of left pedal is the easier of the two sideward flight directions.

NOTE

When using the above techniques to maneuver in autorotation the nose must be lowered to regain airspeed no lower than 500 ft AGL. Below 500 ft AGL use only turns to maneuver.

Maximum Glide Distance Configuration

In FAR Part 27 approved helicopters the maximum glide distance configuration is found in the Pilot’s Operating Handbook (POH). It is 75 kts/90% rotor RPM in the R22. The purpose in practicing this maneuver is not only to glide the furthest distance in autorotation, but also, to get the pilot accustomed to the low RPM warning system being on for extended periods and developing the pilot’s ability to determine if a glide will be “to long” or “to short”. Enter the autorotation at 1500–2000 ft to give the student an extended time to fly at the max glide configuration. Adjust the airspeed to 75 kts and increase the collective to set the rotor RPM at 90% (The low RPM horn/light will be on the entire time the RPM is below 95%). It’s very important to keep the aircraft in trim during the entire glide. While at the max glide configuration reference any movement of the point of intended landing up or down on the windshield. If the landing area moves up the glide will not reach the area and a new area should be selected. If the landing area begins to move down then the glide will take the aircraft past the area so exit the max glide configuration. Allow the rotor RPM to build back into the normal range below 500 ft.
ENHANCED AUTOROTATION PROCEDURES (cont’d)

Minimum Rate of Descent Configuration

The minimum rate of descent configuration is 53 kts/90% rotor RPM in the R22. The purpose of practicing this maneuver is not only to autorotate at the slowest descent rate, but also, to practice performing another procedure such as an air restart or mayday call while still flying the helicopter in autorotation. Enter the autorotation at 1500–2000 ft. After establishing an autorotative glide simultaneously apply aft cyclic to slow the helicopter to the appropriate airspeed and increase the collective to bring the rotor RPM down to 90%. Realize that these two control inputs compete with each other, in that the aft cyclic tends to increase the RPM while the pilot is trying to reduce the RPM with the collective. First, build proficiency establishing and maintaining the minimum rate of descent configuration then add performing a simulated air restart or mayday call into the autorotation. Return to the normal airspeed and rotor RPM prior to descending below 500 ft AGL.
INTRODUCTION

The intention of this guide is to aid both the student and instructors while conducting training in the R44. It should be understood that because of the many variables in geographic location, altitudes, loading and individual instructor techniques, minor modifications to certain maneuvers might be necessary. For the purposes of training, the following parameters should be adhered to:

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<thead>
<tr>
<th>Parameter</th>
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<td>Normal Cruise</td>
<td>90–110 KTS @ 102% RPM</td>
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<tr>
<td>Hovering</td>
<td>5 feet @ 102% RPM</td>
</tr>
<tr>
<td>Takeoffs</td>
<td>102% RPM</td>
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<tr>
<td>Autorotative Descents</td>
<td>60–70 KTS</td>
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<td>Maximum Hover Speed – Forward</td>
<td>10 KTS Groundspeed</td>
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<tr>
<td>Maximum Hover Speed – Lateral/Rearward</td>
<td>5 KTS Groundspeed</td>
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<td>Page</td>
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<td>Straight and Level Flight</td>
<td>4.1</td>
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<td>Normal Climbs and Descents</td>
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<td>Steep Approach to a Hover</td>
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<td>Straight-In Autorotation with Power Recovery</td>
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<td>180° Autorotation with Power Recovery</td>
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<td>Power Failure at a Hover – Hovering Autorotation</td>
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<td>Power Failure at Altitude – Forced Landing</td>
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<td>Rapid Deceleration (Quick Stop)</td>
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<td>Shallow Approach and Running Landing</td>
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<td>Recognition and Recovery from Low Rotor RPM</td>
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<td>Enhanced Autorotation Procedures</td>
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STRAIGHT AND LEVEL FLIGHT

PURPOSE:

To fly the helicopter at a constant airspeed, altitude, and heading.

DESCRIPTION:

Attitude or pitch control with the cyclic is the most important aspect of straight and level flight. A level flight attitude is best determined by referencing the horizon with a fixed point in the cockpit, such as the magnetic compass or the tip path plane. The pilot will be able to detect changes in attitude by noting changes between the fixed point and the horizon. Airspeed is determined by attitude and controlled by the cyclic. As in all helicopters, the R44 cyclic control is very sensitive and requires very slight pressure to effect a change. Normal cruise airspeed for training is 90 KTS.

Altitude is controlled primarily by the collective. Each collective movement will require a corresponding pedal adjustment to maintain the aircraft in trim. An increase of collective will require left pedal. A collective decrease will require right pedal. Additionally, when the collective is increased, the nose will tend to rise, requiring slight forward cyclic to maintain a level or cruise flight attitude. The opposite is true with a decrease in collective – the nose will move down, requiring a slight aft cyclic.

The governor will control RPM. However, should the governor fail, the RPM is correlated and few throttle adjustments will be required. High manifold pressure settings or high-density altitude conditions will require the pilot to maintain RPM with throttle, in the event of a governor failure. An increase in collective will require an increase in throttle to prevent low RPM. A decrease in collective will require a decrease in throttle to prevent high RPM.

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NORMAL CLIMBS AND DESCENTS

PURPOSE:
To change altitude at a controlled rate in a controlled attitude.

DESCRIPTION:

Climbs
For training purposes, climb airspeed is 60 KTS at 500 feet per minute rate of climb. From straight and level flight at 90 KTS, clear above the aircraft. Initiate the climb by increasing collective to climb power (manifold pressure setting which will provide a 500 ft/min climb at 60 KTS). The governor will maintain the RPM. Maintain aircraft trim with a slight amount of left pedal and apply aft cyclic to adjust the attitude to a “60 KT climb attitude.” 50 feet prior to reaching the level-off altitude, begin the level off lowering the nose to a 90 KT attitude with forward cyclic, decreasing the collective slowly to cruise power (manifold pressure setting for level flight at 90 KTS). Maintain aircraft trim with right pedal. Throughout the climb and level off, continually crosscheck outside references – (attitude and heading) with inside references – (flight instruments).

Descents
For training purpose, descent airspeed is 60 KTS at 500 feet per minute rate of descent. From straight and level flight at 90 KTS, clear below the aircraft. Initiate the descent by decreasing collective to a manifold pressure setting that will provide a 500 ft/min descent at 60 KTS. Maintain aircraft trim with a slight amount of right pedal, the governor will maintain the RPM. Apply aft cyclic to adjust the attitude to a “60 KT attitude.” 50 feet prior to reaching the level off altitude, begin the level off by increasing the collective slowly to cruise power. Maintain aircraft trim with left pedal. Apply forward cyclic to adjust the attitude to a level flight attitude. Throughout the descent and level off, continually crosscheck outside references – (attitude and heading) with inside references – (flight instruments).

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TURNS

PURPOSE:

To turn the aircraft using a constant angle of bank at a constant airspeed and altitude.

DESCRIPTION:

From straight and level flight at 90 KTS, clear the aircraft in the direction of turn. Smoothly apply cyclic towards the direction of turn until the desired angle of bank is reached. Unlike an airplane, the pedals should not be used to assist the turn. Use the horizon as a reference to maintain a 90 KT attitude and desired angle of bank with cyclic. As the angle of bank increases, additional collective may be required to maintain altitude. Keep the aircraft in trim with the pedals. Begin the recovery from the turn just prior to reaching the desired rollout heading. Apply cyclic opposite the direction of turn, and if any collective has been added during the turn, reduce it back to cruise power, while maintaining aircraft trim.

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ACCELERATION / DECELERATION

PURPOSE:
To increase pilot control co-ordination. Maintaining a constant altitude, accelerate to 110 KTS, decelerate to 60 KTS, and then accelerate back to 90 KTS.

DESCRIPTION:
From straight and level flight at 90 KTS, slowly increase the collective approximately 2” above cruise power, adding left pedal and forward cyclic. As the aircraft begins to accelerate, adjust cyclic, collective and pedals, (the governor will control the RPM) as necessary to stabilize at 110 KTS and level flight. Begin the deceleration by slowly reducing the collective co-coordinated with right pedal and aft cyclic. Again, use all controls slowly and smoothly as necessary to decelerate to 60 KTS and level flight. Accelerate back to 90 KTS by increasing collective to cruise power, left pedal and forward cyclic to attain level flight at 90 KTS.

Throughout the maneuver, a constant crosscheck of airspeed, altitude, attitude, RPM and trim must be maintained.

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TAKEOFF TO A HOVER

PURPOSE:
To transition from the ground to a stabilized 5-foot hover.

DESCRIPTION:
After completing a pre-takeoff check, clear the helicopter left and right. With the collective full down and the cyclic and pedals neutralized, slowly increase the throttle. As the RPM passes 80%, the governor will activate and increase the RPM to 102%. Increase the collective and a small amount of left pedal will be required to compensate for the increased torque. As the helicopter becomes light on the skids, select a reference point 50 to 75 feet in front of the helicopter and neutralize all aircraft movement with the cyclic and pedals. Continue to increase the collective smoothly and slowly, maintaining heading with slight pedal corrections. Since the R44 normally hovers in a nose high attitude with two occupants, the toes of the skids will break ground first. Compensate with forward cyclic. As the helicopter becomes light on the skids, extreme caution must be used to avoid any rearward or lateral movement since this can cause an immediate rollover. Should any lateral or rearward movement occur, immediately lower the collective and begin again. The helicopter should rise vertically, maintaining heading with pedals, position over the ground with cyclic, and altitude with the collective. After attaining a stabilized 5-foot hover, perform hover check:

1. RPM – 102%
2. Engine instruments – Green Range
3. Hover power (Manifold Pressure)
4. Carb Heat (if installed) – As Necessary

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LANDING FROM A HOVER

PURPOSE:
To land the helicopter from a 5-foot hover.

DESCRIPTION:
From a stabilized 5-foot hover, headed into the wind, slightly lower the collective to establish a slow rate of sink. A small amount of right pedal will be needed to maintain heading. The cyclic will be used to maintain position over the ground. Vision should be directed 50 – 75 feet in front of the helicopter. Do not look immediately in front of the helicopter, as this will lead to over controlling.

As the helicopter descends to about 6 inches, additional downward pressure on the collective may be necessary to overcome the increase in ground effect. As the skids make ground contact, neutralize all aircraft movement with cyclic and pedals, continuing to smoothly lower the collective until it is full down. Due to the nose high attitude of the R44 with two people aboard, the heels of the skids will normally touch first on level terrain. A slight amount of aft cyclic will be necessary as ground contact is made.

CAUTION
Do not allow the helicopter to land with any rearward or sideward movement.

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HOVERING FLIGHT

PURPOSE:

To maneuver the helicopter forward, sideward, rearward and turn the aircraft while hovering.

DESCRIPTION:

Forward, sideward and rearward flight

From a stabilized 5-foot hover, headed in to the wind, move the cyclic smoothly towards the desired direction of flight. Maintain heading with small pedal corrections and altitude with collective. As movement begins, adjust the cyclic to keep the groundspeed at a constant rate equivalent to a normal walk. Reference points along the direction of flight can be used to maintain correct ground track. To stop the movement, apply cyclic opposite to the direction of movement until the helicopter stops. During all phases of hovering, cyclic changes should be small and smooth to minimize the effects of over controlling or pendular action.

Crosswind hovering is accomplished in much the same manner. The cyclic must be inclined into the wind enough to cancel out any tendency for the helicopter to drift.

Hovering Turns

Hovering turns are accomplished by use of the pedals. With the helicopter headed in to the wind, apply pedal in the desired direction of turn. As the helicopter turns, counter pressures on the opposite pedal should be used to maintain a slow, constant rate of turn. (A rate of 360° in 15 seconds is recommended.)

Cyclic is used to control attitude and position over the ground and should be continually adjusted into the wind to avoid drifting and excessive attitude changes during the turn. Maintain a constant altitude with the collective. Normally, a slight altitude and RPM loss will occur in a left turn due to the increased pitch of the tail rotor blades. This can be corrected with a slight increase in collective and the governor will increase throttle if necessary. Right turns produce just the opposite effect. A decrease in the tail rotor pitch will cause a slight increase in RPM and altitude. If necessary, compensate by slightly lowering the collective and the governor will reduce throttle. As the desired heading is reached, stop the turn by applying slight pressure on the opposite pedal.

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TRAFFIC PATTERN OPERATIONS

PURPOSE:
For training purposes, traffic pattern operations are used for the practice of continual takeoffs and landings.

DESCRIPTION:

Upwind Leg
After takeoff, assume a normal climb at 60 KTS. Upon reaching a predetermined point on the ground, begin a 90° turn to crosswind.

Crosswind Leg
Maintain ground track by crabbing the helicopter into the wind. 50 feet prior to reaching 500 feet AGL, begin a level off by accelerating slowing to 75 KTS and reducing the power to cruise power. Upon reaching a predetermined point on the ground, begin a 90° turn to downwind.

Downwind Leg
Groundspeed will increase due to the downwind condition. Fly the downwind leg at 75-90 KTS (depending on the size of the pattern) and 500 feet AGL using ground reference points to maintain ground track. Upon reaching a predetermined point on the ground, decrease the collective to establish a descent. Once the descent is established, begin a 90° turn and start decelerating to 60 KTS. This turn will require a steeper angle of bank due to the downwind condition.

Base Leg
On base, descend to 300 feet AGL and slow to 60 KTS. Plan the turn from base to final so as to roll out aligned with the point of intended touchdown.

Final
Fly the final approach leg at 60 KTS and 300 feet AGL until the appropriate approach angle is reached.
TRAFFIC PATTERN OPERATIONS (cont’d)

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<tr>
<td>Airspeed</td>
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NORMAL TAKEOFF FROM A HOVER

PURPOSE:
To transition from a hover to a normal climb.

DESCRIPTION:
From a stabilized 5-foot hover, select an object(s) along the takeoff path for use as a reference point to maintain ground track. Clear the aircraft left and right with a clearing turn, then complete a before takeoff check (RPM 102%, warning lights, instruments and carb heat, if installed). Begin the takeoff with a small amount of forward cyclic to get the helicopter moving forward. If the helicopter begins to settle, increase the collective as necessary to hold altitude and maintain heading with pedals. As the airspeed increases to approximately 10 to 12 KTS, effective translational lift (ETL) will occur, and can be felt as a lateral vibration. At ETL, lift will increase noticeably causing the nose to pitch up. Apply sufficient forward cyclic to continue the acceleration and prevent the nose from rising. As airspeed increases, the streamlining of the fuselage and the increased efficiency of the tail rotor will cause a left yaw, requiring a right pedal correction. Continue to smoothly accelerate, maintaining ground track. At an altitude of 300 feet and airspeed of 55 KTS, adjust manifold pressure to climb power and slight aft cyclic to establish a 60 KT climb attitude.

CROSSWIND CONSIDERATIONS:
During crosswind takeoffs, the helicopter is flown in a slip to an altitude of 50 feet. Place the cyclic into the wind as necessary to maintain the proper ground track. Apply opposite pedal to align the fuselage with the ground track. Above 50 feet, crab the helicopter into the wind by putting the aircraft in trim and maintaining ground track with cyclic.

NOTE
During the takeoff, the acceleration to climb speed and the commensurate altitude gain should be accomplished without entering the shaded areas of the R44’s height-velocity diagram.

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NORMAL APPROACH TO A HOVER

PURPOSE:
To transition from flight at altitude to a stabilized 5-foot hover.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 KTS and 300 feet AGL. When a normal approach angle of 10° is intercepted, begin the approach by lowering the collective sufficiently to get the helicopter descending down the approach angle. With the decrease in collective, the nose will tend to pitch down, requiring the aft cyclic to maintain a 60 KT attitude and right pedal to maintain heading. The pilot can determine the proper approach angle by relating the point of intended touchdown to a point on the helicopter windshield. The collective controls the angle of approach. If the touchdown point seems to be moving up on the windshield, the angle is becoming shallower, necessitating a slight increase in collective. If the touchdown point moves down on the windshield, the approach angle is becoming steeper, requiring a slight decrease in collective. The cyclic is used to control the rate of closure or how fast you are moving toward the touchdown point. Maintain entry airspeed until the apparent groundspeed and rate of closure appear to be increasing. At this point, slowly begin decelerating with slight aft cyclic, maintaining the approach angle by smoothly reducing the collective. Use the cyclic to maintain a rate of closure equivalent to a brisk walk. At approximately 25 to 40 feet, depending on wind, the helicopter will begin to lose effective translational lift. This loss will be felt as a lateral vibration and the aircraft will begin to settle. The pilot must anticipate the loss of ETL, and compensate with increased collective to maintain the approach angle, (the governor will maintain the RPM). The increase of collective will tend to make the nose rise requiring forward cyclic to maintain proper rate of closure. As the helicopter approaches an altitude of 5 feet, the collective should be increased sufficiently to hold a 5-foot hover, maintaining heading with pedals. A small aft cyclic input may be necessary to stop any forward movement.

CROSSWIND CONSIDERATIONS:
During the approach, maintain a crab into the wind and the aircraft in trim. At 50 feet of altitude, a slip should be used to align the fuselage with the ground track. Apply cyclic into the wind and opposite pedal.

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MAXIMUM PERFORMANCE TAKEOFF AND CLIMB

PURPOSE:

To transition from the surface to a maximum performance climb, simulating obstruction clearance.

DESCRIPTION:

While on the ground at a reduced RPM, check the manifold pressure limit chart to determine the maximum takeoff power. Clear the aircraft left, right and overhead, then complete a before takeoff check (RPM 102%, Warning Lights, Instruments, and Carb Heat). Select a reference point(s) along the takeoff path to maintain ground track.

Begin the takeoff by getting the helicopter light on the skids. Pause and neutralize all aircraft movement. Slowly increase the collective and position the cyclic so as to break ground and maintain a 40 KT attitude (approximately the same attitude as when the helicopter is light on the skids). Continue to slowly increase the collective until the maximum takeoff power is reached. This large collective movement will require a substantial increase in left pedal to maintain heading. The governor will maintain the RPM.

At 50 feet of altitude, slowly lower the nose to a normal 60 KT climb attitude. As the airspeed passes 55 KTS, reduce the collective to normal climb power.

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STEEP APPROACH TO A HOVER

PURPOSE:
To transition from flight at altitude to a hover using a steeper than normal approach angle.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind, aligned with the point of intended touchdown, at 60 KTS and 300 feet AGL. When a steep approach angle of 15° is intercepted, begin the approach by lowering the collective to get the helicopter descending down the approach angle and coordinate right pedal for trim. Since this angle is steeper than a normal approach angle, the collective must be reduced more than for a normal approach. As in the normal approach, reference the touchdown point on the windshield to determine changes in the approach angle. Aft cyclic will be required to decelerate sooner than in a normal approach due to the steeper angle and the rate of closure will become apparent at a slightly higher altitude. Maintain a crab above 50 feet, and a slip below 50 feet.

Maintain the approach angle and rate of descent with collective, rate of closure with cyclic, and trim with pedals. Loss of ETL will occur higher during a steep approach requiring an increase in collective to prevent settling, forward cyclic for proper rate of closure, and left pedal for trim. Terminate at a stabilized 5-foot hover.

CAUTION
Avoid high rates of descent at airspeeds below 30 KTS.

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STRAIGHT-IN AUTOROTATION WITH POWER RECOVERY

PURPOSE:

To simulate safely landing the helicopter with a complete power loss.

DESCRIPTION:

The Entry

From level flight at 70 to 75 KTS, 500 to 700 feet AGL, and headed into the wind, smoothly, but firmly, lower the collective full down without reducing the throttle. Coordinate the collective movement with right pedal for trim and aft cyclic to maintain a 70 KT attitude. The RPM needles will usually split establishing an autorotative descent. If the needles do not split, reduce the throttle slightly. Crosscheck attitude, trim, rotor RPM and airspeed. With two occupants on board anticipate a slight increase in RPM requiring a small increase of collective.

The Glide

After descent has been established, slowly reduce the airspeed to 60 to 70 KTS and maintain this attitude throughout the glide. During straight-in autorotative glides, aft cyclic movements will cause an increase in rotor RPM which is controlled by a small increase in collective. If the collective is increased to control the rotor RPM, hold or retard the throttle slightly to prevent the governor from joining the needles. Avoid a large collective increase, which will result in a rapid decay of rotor RPM and lead to “chasing the RPM.” Maintain RPM in the green (between 97% and 102%) and the aircraft in trim during the glide. Below 100 feet AGL, maintain the aircraft alignment with ground track with a slip. A constant 60 to 70 KT attitude should be held with the cyclic. Avoid looking straight down in front of the aircraft. Continually crosscheck attitude, trim, rotor RPM, and airspeed.

NOTE

Prior to the helicopter descending through 100 feet AGL, the instructor should make an immediate power recovery if the following three conditions do not exist:

1. Rotor RPM stabilized between 97% – 102% RPM.
2. Airspeed stabilized 60 to 70 KTS.
3. A normal rate of decent, usually less than 1500 FPM.

The Flare

At approximately 40 feet AGL, begin the flare with aft cyclic to reduce forward airspeed and decrease the rate of descent. The amount of flare will depend on wind conditions and gross weight, and should gradually be increased so that groundspeed and rate of descent are significantly decreased. Too much flare will cause the helicopter to balloon up causing a high vertical descent, as airspeed is lost.
STRAIGHT-IN AUTOROTATION WITH POWER RECOVERY (cont’d)

The Power Recovery

At approximately 8 to 10 foot skid height, begin to level the helicopter with forward cyclic. Extreme caution should be used to avoid an excessive nose high/tail low attitude below 10 feet. Just prior to achieving a level attitude, with the nose still slightly up, increase the collective maintaining heading with left pedal. If the engine RPM is below 80% increase the throttle and allow the governor to increase the RPM to 104%. Do not allow the helicopter to descend below 5 feet during the power recovery.

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180º AUTOROTATION WITH POWER RECOVERY

PURPOSE:

To simulate safely landing the helicopter by turning 180º with a complete power loss.

DESCRIPTION:

The Entry

Establish the aircraft on downwind at 75 KTS and 700 feet AGL. When abeam the intended touchdown point, enter the autorotation by smoothly, but firmly, lowering the collective full down without reducing the throttle. Usually the needles will split establishing an autorotation. If the needles do not split, reduce the throttle slightly. Apply right pedal and aft cyclic to maintain the attitude. Crosscheck attitude, trim, rotor RPM, and airspeed.

The Glide / Turn

After the descent is established, apply aft cyclic to achieve a 60 to 70 KT attitude, then roll into a 180º turn. The proper angle of bank will be determined by wind velocity, but use caution to avoid an excessively steep turn, as this will increase the descent rate. Throughout the turn, it is important to maintain the proper attitude (airspeed) and keep the aircraft in trim. Changes in the aircraft’s attitude and the angle of bank will cause corresponding increases and decreases in rotor RPM. Adjust the collective as necessary in the turn to maintain rotor RPM between 97%-102%. Continually crosscheck rotor RPM, attitude and trim in the turn. The turn should be completed and the helicopter aligned with the intended touchdown area prior to passing through 100 feet AGL. If the collective has been increased to load the rotor during the turn, it may have to be lowered on roll out to prevent decay in RPM.

NOTE

Prior to the helicopter descending through 100 feet AGL, make an immediate power recovery if the following conditions do not exist:

1. Aircraft aligned with the touchdown point (turn completed)
2. Rotor RPM stabilized between 97%-102 %
3. Airspeed stabilized between 60–70 KTS
4. A normal rate of descent, usually less than 1500 FPM

The Flare

Same as straight-in autorotation.

Power Recovery

Same as straight-in autorotation.
180° AUTOROTATION WITH POWER RECOVERY (cont’d)

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POWER FAILURE AT A HOVER – HOVERING AUTOROTATION

PURPOSE:

To simulate landing the helicopter from a hover with a complete power loss.

DESCRIPTION:

Begin from a stabilized 3 to 5 foot hover at 102% RPM, over level terrain and headed into the wind. If necessary, reposition the left hand so that the throttle can easily be rolled off into the override, leaving the governor on. Firmly roll the throttle into the spring – loaded override while simultaneously adding right pedal to maintain heading. The loss of tail rotor thrust will cause a left drift requiring a slight right cyclic correction. Use caution not to raise or lower the collective when rolling off the throttle. When the aircraft has settled to approximately 1 foot, fully increase the collective, holding the throttle firmly in the spring loaded override, to cushion the landing. As the skids touch down, apply slight forward cyclic. Once firmly on the ground, lower the collective full down. Use caution to avoid any sideward or rearward movement on touchdown to prevent the possibility of a rollover.

If simulating a tail rotor failure at a hover, allow the helicopter to yaw a maximum of 90° to the right, then perform the hovering autorotation.

NOTE

Other than for a T/R failure at a hover, it is recommended that the instructor rolls the throttle off, then the student maintains heading with right pedal once the engine failure is detected.

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POWER FAILURE AT ALTITUDE – FORCED LANDING

PURPOSE:

To teach the student how to recognize an engine failure, properly enter an autorotation, select a landing area and maneuver to it.

DESCRIPTION:

During cruise flight with the student at the controls; the instructor will initiate the forced landing by leaving the governor on and rolling the throttle smoothly to the idle position splitting the needles. The student will immediately lower the collective full down co-coordinated with the right pedal for trim, and aft cyclic to maintain attitude. This should be accomplished quickly enough to prevent the rotor RPM from decaying below 90%. As the rotor RPM builds back into the green, increase collective as necessary to maintain rotor RPM between 97% – 104%. The instructor will control the throttle to prevent the governor from joining the needles. Once established in an autorotative descent, select an intended landing area. Maneuver the helicopter as necessary to align the aircraft with the intended landing area, generally headed into the wind. Use increases in the collective and/or forward cyclic to prevent the rotor from over speeding while maneuvering. Airspeed should be adjusted to 60 to 70 KTS.

Prior to passing through 100 feet, the aircraft should be aligned with the touchdown area, at 60 to 70 KTS, rotor RPM between 97%–102%, and in trim. Execute a power recovery and transition to normal climb.

NOTE

The instructor should apply the recommendations contained in Safety Notice #27.

PERFORMANCE STANDARDS:

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<th></th>
<th>Private</th>
<th>Commercial</th>
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<tbody>
<tr>
<td>RPM on Entry</td>
<td>Above 90%</td>
<td>Above 90%</td>
</tr>
<tr>
<td>Airspeed</td>
<td>+ 10 KTS</td>
<td>+ 5 KTS</td>
</tr>
<tr>
<td></td>
<td>- 5 KTS</td>
<td></td>
</tr>
<tr>
<td>Area Selection</td>
<td>Suitable</td>
<td>Suitable</td>
</tr>
</tbody>
</table>
RAPID DECELERATION (QUICK STOP)

PURPOSE:
To simulate a condition when a rapid decrease in forward airspeed is required as in an aborted takeoff.

DESCRIPTION:
Perform a normal takeoff into the wind. Once a minimum altitude of 25 feet is attained, apply additional forward cyclic to accelerate to 40 to 50 KTS while maintaining altitude. Begin the quick stop by smoothly lowering the collective, adding right pedal, and simultaneously applying aft cyclic to decelerate. Apply aft cyclic as needed to maintain entry altitude throughout the deceleration. As airspeed is lost, the helicopter will begin to settle. Slowly increase the collective to control the rate of descent adding forward cyclic to level the helicopter. Maintain heading with pedals. Terminate at a stabilized 5-foot hover. Use caution to avoid terminating at a high hover or in an extreme tail low attitude.

PERFORMANCE STANDARDS:

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<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Heading</td>
<td>± 10°</td>
<td>± 5°</td>
</tr>
<tr>
<td>Altitude</td>
<td>± 15 feet</td>
<td>± 10 feet</td>
</tr>
<tr>
<td>Termination Point</td>
<td>± 50 feet</td>
<td>± 25 feet</td>
</tr>
</tbody>
</table>
SHALLOW APPROACH AND RUNNING LANDING

PURPOSE:
To simulate an approach and landing when sufficient power for hovering is not available.

DESCRIPTION:
On final approach, the helicopter should be headed into the wind at 60 KTS and 300 feet AGL. When a shallow approach angle of 5° is intercepted, begin the approach by lowering the collective to maintain the approach angle. Maintain entry airspeed until apparent rate of closure and groundspeed appear to be increasing. Begin a slow deceleration with aft cyclic, maintaining approach angle by reducing collective and the aircraft in trim. Plan to arrive at the point of intended touchdown at or slightly above effective translational lift. Prior to ground contact, insure that the helicopter is in a level attitude. After ground contact, maintain heading with pedals and slowly lower the collective for braking action allow the governor to maintain RPM (do not squeeze the throttle inhibiting the governor) until the helicopter comes to a complete stop.

Crosswind Considerations:
As in normal and steep approach, crab the helicopter above 50 feet AGL, and use a slip below 50 feet AGL to align the aircraft with the ground track.

PERFORMANCE STANDARDS:

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<tbody>
<tr>
<td>Heading</td>
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<td>± 5°</td>
</tr>
<tr>
<td>Touchdown Point</td>
<td>± 50 feet</td>
<td>± 25 feet</td>
</tr>
<tr>
<td>Touchdown Speed</td>
<td>Above ETL</td>
<td></td>
</tr>
<tr>
<td>Manifold Pressure</td>
<td>Less than hover power</td>
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</tr>
</tbody>
</table>
SLOPE OPERATIONS

PURPOSE:
To land from a hover and takeoff to a hover from a sloping surface.

DESCRIPTION:
Prior to conducting slope operations, the pilot must be thoroughly familiar with dynamic rollover characteristics and mast bumping. For training, use a maximum slope angle of 5°.

Slope Landings:
Position the helicopter cross slope at a stabilized 5-foot hover headed into the wind. Lower the collective slightly to establish a slow rate of sink. When upslope skid contacts the ground, begin applying lateral cyclic in the direction of the slope (upslope) to hold the skid against the slope. Maintain heading with pedals. Continue to apply cyclic into slope as the collective is lowered until the down slope skid is firmly on the ground. Once the collective is full down, center the cyclic to allow safe “head clearance” on the upslope side.

Slope Takeoffs:
The procedure for a slope takeoff is almost the exact reverse of that for a slope landing. Apply cyclic into the slope (upslope) and slowly begin to increase the collective. As the helicopter becomes light on the skids, pause and neutralize any aircraft movement. Continue to increase the collective maintaining heading with pedals. When the down slope skid breaks ground, slowly begin to center the cyclic. As a level attitude is reached, the cyclic should be approximately neutral. Continue to increase collective, maintaining position over the ground with cyclic and heading with pedals until a stabilized 5-foot hover is attained.

PERFORMANCE STANDARDS:

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<td></td>
<td>± 10°</td>
<td>± 5°</td>
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</table>
RECOGNITION AND RECOVERY FROM LOW ROTOR RPM

PURPOSE:

To become thoroughly familiar with the recognition of low rotor RPM and the techniques of recovery. Prior to performing this maneuver, the pilot should be familiar with RHC Safety Notices #10 and #24.

DESCRIPTION:

Cruise flight, takeoff & approach

A) Entry and Recognition

During cruise flight, takeoffs and approaches, at 102% RPM, the instructor will, turn the governor off, then slowly decrease the throttle to 95% RPM. The low RPM condition will be recognized by:

1. A noticeable decrease in engine noise.
2. Aircraft vibrations and cyclic stick shake especially at higher airspeeds.
3. The low rotor RPM warning horn and light at approximately 97% RPM.

The instructor should demonstrate the further increase in vibration and decrease in engine noise by decreasing the RPM to 92% RPM.

B) Recovery Technique

Upon recognizing the low RPM condition, simultaneously add throttle and lower the collective half an inch to one inch to regain operating RPM. Larger collective movements will require additional throttle due to the correlator. A gentle aft cyclic movement will prevent the nose from going down and inhibiting the recovery, but the primary recovery controls are the collective and throttle. Avoid any forward cyclic input, which will inhibit RPM recovery. Once RPM is regained, slowly raise the collective to reduce the sink rate, while closely monitoring the RPM.

At a Hover

During hovering flight at 102% RPM, the instructor will turn the governor off and slowly decrease the throttle to 95% RPM. Note the obvious decrease in engine noise and the tendency for the aircraft to settle back toward the ground. As the aircraft settles, the tendency for some pilots will be to increase the collective to stop the descent. This may only increase the RPM decay and increase the descent. Recovery is the same as in forward flight. Lower the collective simultaneously adding throttle. If RPM cannot be regained prior to ground contact, insure that the helicopter touches down in a level attitude.

PERFORMANCE STANDARDS:

The pilot should be able to recognize and recover from low rotor RPM prior to reaching 90% RPM.
VORTEX RING STATE (SETTLING WITH POWER)

PURPOSE:

To demonstrate the dangerous results of operating at low airspeeds, moderate to high power settings, and high rates of sink (Vortex Ring State).

Description:

The vortex ring state is most dangerous when it happens at relatively low altitudes. The most common condition is during a steep approach with a tailwind. It should be demonstrated at an altitude of at least 1000 feet AGL.

To enter a maneuver, adjust the power to approximately 13-15 inches manifold pressure. Hold altitude with aft cyclic until the airspeed approaches 20 KTS. Allow the sink rate to increase to 300 FPM or more as the attitude is adjusted to obtain airspeed of less than 10 KTS. The aircraft will begin to shudder. Application of additional up collective will increase the vibration and sink rate while the cyclic and pedal effectiveness is reduced. Once the condition is well developed, rate of sink in excess of 2000 FPM can result. Recovery should be initiated at the first sign. The maneuver can also be entered from an OGE hover.

There are two recovery techniques:

1. The traditional technique is to apply forward cyclic to increase airspeed and simultaneously reduce the collective. When the airspeed indicates 20 –30 KTS and the trim strings have become effective raise the collective to takeoff power and adjust the cyclic to a maximum performance climb attitude. The recovery is completed when the VSI reads 0.

2. A more efficient recovery technique is called the Vuichard Recovery. Initiate the recovery by raising the collective to takeoff power (MCP at lower gross weights), simultaneously applying left pedal to maintain heading and right cyclic (10°-20° bank) to get lateral movement. Once the right side of the rotor disc reaches the upwind part of the vortex the recovery is completed. Average loss of altitude during the recovery is 20-50 ft.

PERFORMANCE STANDARDS:

The pilot must thoroughly understand and recognize the vortex ring state and be able to safely recover.
ENHANCED AUTOROTATION PROCEDURES (Required by SFAR 73)

PURPOSE:
To understand the different elements that can be used to maneuver the helicopter in autorotation. This training is only recommended for students who hold at least a private pilot certificate.

DESCRIPTION:
Each element will be discussed. Once the student has an understanding of the elements one or more can be combined in one autorotative glide.

Use of turns
Left, right or “S” turns can be used to decrease the glide distance in autorotation. It is important to maintain proper attitude and trim when turning to prevent increased descent rates. Adjust the collective as necessary in the turn to maintain rotor RPM between 97%-102%. A large turn (270°-360°) is not recommended since for much of the turn the pilot will lose sight of the landing area and will be unable to determine the effect of wind on the glide.

Use of airspeed
Airspeeds from zero to max glide airspeed (90 kts in an R44) can be used to adjust the autorotative glide distance as necessary. Maximum glide distance configuration is covered later in this maneuver so this discussion concerns reducing airspeed. It is recommended an entry altitude of 1500 ft to 2000 ft AGL be used so the student can get an extended time flying at the lower speeds in autorotation. Enter the autorotation so that a normal glide will take the helicopter well past the point of intended landing thus requiring a shortened glide distance. Once the glide is established apply aft cyclic to a 10°-15° nose high attitude. Adjust the collective as necessary to control increases in rotor RPM. At approximately 25–30 kts the nose of the aircraft will come down to a level attitude due to the upward flow of air acting on the tail cone and horizontal stabilizer. Maintain this configuration and observe the landing area moving up on the windshield. When a normal Autorotative angle is achieved or approaching 500 ft AGL, lower the nose to 10°-15° nose down to increase airspeed back to the normal autorotative speed of 60-70 kts.

Use of pedals
Set the maneuver up at 1500-2000 ft AGL with the point of intended landing and the wind 90° from the helicopter’s ground track (out the left or right door). Since the left pedal is the strong pedal in autorotation, it is recommended the landing area be positioned out the left door requiring left pedal to turn. However, the student should experience use of both pedals. Enter the autorotation and slow the airspeed as in the “use of airspeed” maneuver. Once the nose comes down to the level attitude, apply pedal to align the aircraft with the desired track towards the landing area. Use of left pedal will decrease the rotor RPM requiring the pilot to lower the collective as necessary to maintain the rotor RPM. (cont’d)
ENHANCED AUTOROTATION PROCEDURES (cont'd)

Use of pedals (cont’d)

The remainder of the maneuver is the same as the “use of airspeed” discussion.

Use of sideward flight

The purpose of using sideward flight in an autorotative glide is when the point of intended landing is almost directly below the helicopter. Set up the condition with the wind 90° (left or right) from the aircraft’s ground track at 1500 ft – 2000 ft. Enter the autorotation directly over or just prior to the intended landing area. Decrease the airspeed as in the “use of airspeed” maneuver. When the nose comes down to the level attitude apply lateral cyclic in the direction of the desired sideward flight and opposite pedal to prevent the aircraft from weather vaneing towards the direction of flight. The resulting slip and wind direction will move the helicopter downwind from the landing area. Once the helicopter is far enough away from the landing area stop the sideward flight with opposite cyclic. Opposite pedal is then applied (as in the “use of pedal” maneuver) to align the aircraft into the wind tracking towards the landing area and lower the nose to regain airspeed. Again, left pedal is the strong pedal in autorotation, so sideward flight to the right, requiring the use of left pedal is the easier of the two sideward flight directions.

CAUTION

When using the above techniques to maneuver in autorotation the nose must be lowered to regain airspeed no lower than 500 ft AGL. Below 500 ft AGL use only turns to maneuver.

Maximum Glide Distance Configuration

In FAR Part 27 approved helicopters the maximum glide distance configuration is found in the Pilot’s Operating Handbook (POH). It is 90kts/90% rotor RPM in the R44. The purpose in practicing this maneuver is not only to glide the furthest distance in autorotation, but also, to get the pilot accustomed to the low RPM warning system being on for extended periods and developing the pilot’s ability to determine if a glide will be “to long” or “to short”. Enter the autorotation at 1500 ft – 2000 ft to give the student an extended time to fly at the max glide configuration. Adjust the airspeed to 90kts and increase the collective to set the rotor RPM at 90% (The low RPM horn/light will be on the entire time the RPM is below 95%). It’s very important to keep the aircraft in trim during the entire glide. While at the max glide configuration reference any movement of the point of intended landing up or down on the windshield. If the landing area moves up the glide will not reach the area and a new area should be selected. If the landing area begins to move down then the glide will take the aircraft past the area so exit the max glide configuration. Allow the rotor RPM to build back into the normal range below 500 ft.
ENHANCED AUTOROTATION PROCEDURES (cont’d)

Minimum Rate of Descent Configuration

The minimum rate of descent configuration is 55kts/90% rotor RPM in the R44. The purpose of practicing this maneuver is not only to autorotate at the slowest descent rate, but also, to practice preforming another procedure such as an air restart or mayday call while still flying the helicopter in autorotation. Enter the autorotation at 1500 ft – 2000 ft. After establishing an autorotative glide simultaneously apply aft cyclic to slow the helicopter to the appropriate airspeed and increase the collective to bring the rotor RPM down to 90%. Realize that these two control inputs compete with each other, in that the aft cyclic tends to increase the RPM while the pilot is trying to reduce the RPM with the collective. First, build proficiency establishing and maintaining the minimum rate of descent configuration then add preforming a simulated air restart or mayday call into the autorotation. Return to the normal airspeed and rotor RPM prior to descending below 500ft AGL.
HYDRAULIC OFF APPROACH AND LANDING

PURPOSE:
To simulate an approach and landing with a hydraulic system failure.

DESCRIPTION:

NOTE
It is recommended this maneuver only be performed with an instructor at one set of controls.

During cruise flight or on downwind in the traffic pattern, the instructor will identify the hydraulic control switch, instruct the student to relax on the controls, then turn the hydraulic control switch off. Once the increase in control forces is noticed, vigorously exercise the cyclic and collective to develop a feel for the control forces that will be needed. Note a much greater force is needed to raise the collective than to lower it and fore & aft cyclic is much more difficult than lateral cyclic. Execute a shallow approach (see page 21). It is recommended the first few landings be accomplished with a running landing (see page 21). However, as proficiency increases an approach directly to the ground or to a hover may be practiced. Pilots should develop a comfort level for the type of landing they prefer, develop proficiency at that type of landing, then use that landing in the event of an actual hydraulic failure. Once the aircraft has come to a complete stop on the ground the instructor should, again, identify the hydraulic control switch, instruct the student to relax on the controls, then turn the hydraulic control switch on.

CAUTION
Once the helicopter has decelerated below ETL on the approach, the hydraulic control switch should not be turned on until the aircraft is at a full stop on the ground. If a go-around is initiated do not turn the hydraulics back on until the aircraft is above 100 ft AGL and the airspeed is above 40 knots.

PERFORMANCE STANDARDS:
Touchdown should be in a level attitude with the skids parallel to the ground track.
### SCHOOL SAFETY PROCEDURES

1. **Weather Minimums**
   - **Dual Flights** – At the discretion of the instructor.
   - **Solo Flights:**
     1. Traffic Pattern – Ceiling 700 ft. AGL, visibility 1 mile
     2. Cross-country – Ceiling 1,000 ft. AGL, visibility 3 miles
   - **Wind limitations** – Each student will observe the following surface wind limitations as directed by his or her instructor:

     | NOT TO EXCEED | STUDENT INITIALS | INSTRUCTOR INITIALS |
     |---------------|------------------|---------------------|
     | 5 KTS         | _______          | _______             |
     | 8 KTS         | _______          | _______             |
     | 10 KTS        | _______          | _______             |
     | 12 KTS        | _______          | _______             |
     | 15 KTS        | _______          | _______             |

     **UNDER NO CIRCUMSTANCES ARE STUDENTS ALLOWED TO FLY SOLO IN WINDS IN EXCESS OF 15 KTS.**

     | GUST SPREAD NOT TO EXCEED | STUDENT INITIALS | INSTRUCTOR INITIALS |
     |----------------------------|------------------|---------------------|
     | 5 KTS                      | _______          | _______             |
     | 8 KTS                      | _______          | _______             |
     | 10 KTS                     | _______          | _______             |
     | 12 KTS                     | _______          | _______             |

2. All pilots shall avoid air taxiing over any surface which has any debris or litter which may be ingested into the main or tail rotors.

3. Smoking during preflight and refuelling is prohibited.

4. In the event of a precautionary landing notify ________________ as soon as practical. The pilot in command is responsible for the aircraft until released by someone from _________________.

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**JUN 2016**  
*School Safety Procedures*
5. Each pilot shall check squawk sheet prior to each flight. All discrepancies shall be recorded in the appropriate manner on the squawk sheet.

6. A fuel reserve of 30 minutes is required on all cross-country and solo flights.

7. Pilots will not fly at an altitude less than 500 ft. above the highest obstacle unless necessary for takeoff and landings.

8. The following maneuvers will not be practised unless a flight instructor is on board:
   A. Autorotative descents
   B. Hovering autorotations
   C. Forced landing procedures
   D. Settling with power
   E. Recovery from low rotor RPM
   F. Recovery from low G conditions

9. A VFR flight plan must be filed for all solo cross-country flights. All day cross-country flights must terminate ½ hour prior to sunset.

10. The following maneuvers must have instructors’ initials before student’s solo practice:

<table>
<thead>
<tr>
<th>STUDENT INITIALS</th>
<th>INSTRUCTOR INITIALS</th>
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<tbody>
<tr>
<td>A. Quick Stops</td>
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<tr>
<td>B. Running Landings</td>
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<td>C. Confined Area Operations</td>
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<td>D. Pinnacle Operations</td>
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<tr>
<td>E. Slope Landings/Takeoff</td>
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<tr>
<td>F. Off Airport Landings</td>
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1. ____________________________  __________________
2. ____________________________  __________________
3. ____________________________  __________________

All students must read and understand these requirements. They are for your safety.

Signature: ____________________________  Date: ____________________
Safety Notices

Safety Notices have been issued by Robinson Helicopter Company as a result of various accidents and incidents. Studying the mistakes made by other pilots will help you avoid making the same errors.

Safety Notices are available on the RHC website www.robinsonheli.com, under the Publications tab.