



Helicopter Maneuvers

Manual A step-by-step illustrated guide to performing all helicopter flight operations

Ryan Dale



Helicopter Maneuvers Manual
by Ryan Dale

Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, Washington 98059-3153

Visit the ASA website often (www.asa2fly.com, Product Updates) to find updates posted there due to FAA regulation, policy, or procedure changes that may affect this book.

© 2011 Aviation Supplies & Academics, Inc. All rights reserved.

No part of this book shall be reproduced, stored in any retrieval system, or transmitted by any means, electronic, mechanical, xerographic, audio/visual record, or otherwise, without written permission from the publisher. While every precaution has been taken in the preparation of this book, the publisher and Ryan Dale assume no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein. None of the material in this guide supersedes any documents, procedures, or regulations issued by the Federal Aviation Administration.

Illustrations based on the author's original drawings.
Cover photo: Robinson Helicopter Company

ASA-HELI-FM-PD

PDF eBook ISBN 978-1-56027-908-2
Print Book ISBN 978-1-56027-891-7

Contents

Introduction.....	v
Chapter 1 Ground Operations	1
Preflight Inspection	2
Engine Starting and Rotor Engagement	6
Before Takeoff Check	10
Vertical Takeoff to a Hover	12
Surface Taxi	14
Hover Taxi	16
Hovering Exercises	18
Vertical Landing from a Hover	22
Post-Flight Procedures	24
Chapter 2 Basic Maneuvers	27
Straight-and-Level Flight	28
Normal Climbs	30
Normal Descents	32
Level Turns	34
Acceleration	36
Deceleration	38
Chapter 3 Airport Operations	41
Normal Takeoff from a Hover	42
Normal Takeoff from the Surface	44
Traffic Pattern Operations	46
Normal Approach to a Hover	48
Normal Approach to the Surface	50
Go-Around Procedure	52

Chapter 4 Performance Operations	55
Maximum Performance Takeoff and Climb	56
High Altitude (Running) Takeoff	58
High Altitude (Running) Landing	60
Steep Approach to a Hover	62
Steep Approach to the Surface	64
Rapid Decelerations (Quick Stops)	66
Chapter 5 Off-Airport Operations	69
Slope Operations	70
High/Low Reconnaissance	72
Confined Area Operations	74
Pinnacle/Platform Operations	76
Chapter 6 Emergency Operations	79
Straight-In Autorotation with Power Recovery	80
180° Autorotation with Power Recovery	82
Power Failure at a Hover (Hovering Autorotation)	84
Power Failure at Altitude (Forced Landings)	86
Low Rotor RPM Recognition and Recovery	88
Settling-With-Power	90
Tail Rotor Failure	92
Appendix	97
Private Checklist	97
Commercial Checklist	97
Flight Instructor Checklist	98

Preflight Inspection

Purpose

The pilot is the final authority in determining the airworthiness of the helicopter. This can be accomplished by conducting a visual inspection of the aircraft and aircraft documents.

Description

Prior to a visual inspection, check the maintenance logs to ensure compliance with:

- Annual inspections (once every 12 calendar months)
- Pitot-static/transponder Inspections (once every 24 calendar months)
- Airworthiness directives
- 100-hour inspections (if required)
- Oil changes (if required)
- Minimum equipment lists (MEL) (if associated with the helicopter)

After inspecting the maintenance records, proceed to the aircraft and ensure that the required paperwork is on board prior to flight. The acronym **ARROW** is a great tool to help you remember what is required:

Airworthiness Certificate

Registration Certificate

Radio Station License (required when flying outside the US)

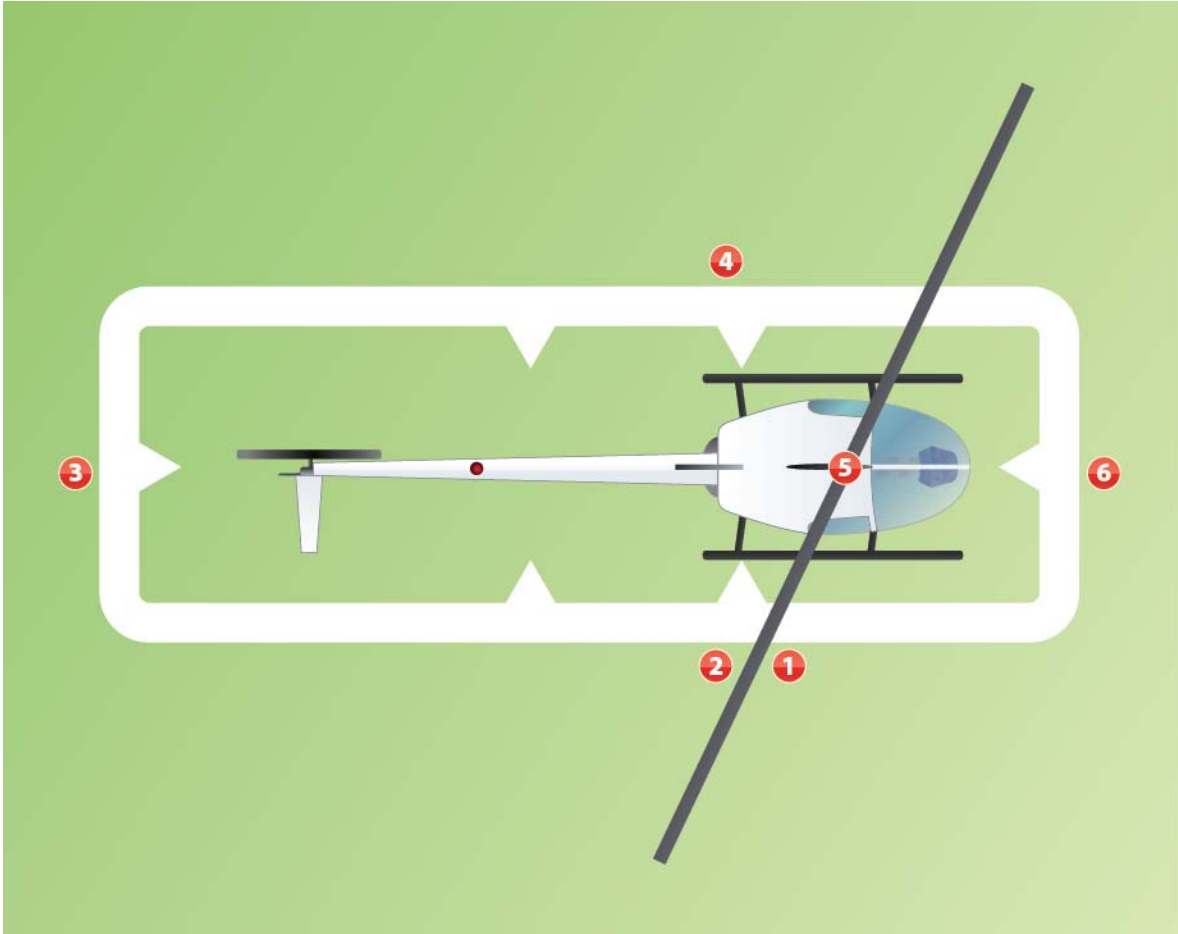
Operating Handbook—Pilot's Operating Handbook (POH) or Rotorcraft Flight Manual (RFM)

Weight and Balance—This includes an equipment list specific to the helicopter

Now is a good time to check the fuel level so additional fuel can be ordered if necessary. After filling the tank, allow time for the fuel to settle and any contaminants that might be present to sink to the bottom before checking the fuel quality.

1 Main Rotor Transmission Access

Cowl doors	Open
Static source	Check
Master switch	On
Warning lights	Check
Fuel gauge	Check quantity
Master switch	Off
Fuel quantity/cap	Confirm and secure
M/R transmission bolts and mounts	Secure, check for slippage
M/R trans: oil level, Telatemp	Check
M/R trans: chip detector	Wiring and safety
Upper frame assembly	Check for bends, cracks; secure
T/R push-pull tube	Check condition, secure; check travel, play
Forward flex coupling	Check bolts for slippage, cracks
Middle flex coupling	Check bolts for slippage, cracks
Clutch actuator bearing and Telatemp	Check condition
T/R bell crank	Secure; check travel, play
V-belts and pulley	Check condition
Wiring harness	Check condition and secure
Sheet metal structures	Inspect rivets; check for wrinkles and cracks
Cowl door	Closed



2 Engine Area—Right Side

Left magneto	Check condition and secure
Starter relay	Secure, insulators
Lower frame assembly	Bends, cracks, secure
Engine (general)	Leaks, cracks, secure
Oil cooler and lines	Check condition and secure
Oil cooler access	Clear
Starter, ring gear	Check condition, secure
Lower sheave bearing, Telatemp	Check condition
Fan and scroll	Check condition, secure

3 Tail Cone/Rotor

Attaching points	Bolts, cracks, slippage
Antenna, strobe	Check condition, secure
Tail cone (right side)	Check condition, rivets
Strobe light	Check condition, secure
Stabilizers, stinger	Check condition, cracks, secure
T/R gear box oil level	Check condition, safeties, secure
Anti-collision light	Check condition, secure
T/R gear box chip detector	Wiring, secure
T/R bell crank	Check condition, travel, secure
T/R P/C links	Check condition, play, secure
T/R Telatemp	Check
T/R blades	Check condition, secure, weights
Tail cone (left side)	Check condition, rivets
Tail cone attaching points	Bolts, cracks, slippage
Clutch actuator and wiring harness	Check condition, secure

4 Engine Area—Left Side

Lower sheave, V-belts, ring gear, Telatemp ...	Check condition
Alternator, belt and hose	Check condition and secure
Engine (general)	Leaks, cracks, secure
Engine oil	5–6 quarts
Right magneto	Check condition, secure
Fuel line and gascolator	Check condition, secure
Throttle carburetor linkage	Secure, leaks
Lower frame assembly	Bends, cracks, secure

5 Main Rotor

Pitch change links	Check play, safety wires
M/R seals, grips and root	Check condition, cracks, secure
M/R blades	Check condition, lamination, clean, level
Hub and hinge bolts	Check condition, cracks, bolt slippage
Boot and swash plates	Secure, check condition, play
M/R push-pull tube	Check condition, play

M/R blades	Turned to 3 and 9 o'clock positions
Mast cowling	Check condition, secure
Pitot tube	Positioned straight, forward, unobstructed
Fuel tank cap	Check quantity, secure
M/R tip/blade	Weights secure, blade condition

6 Cabin

Left skid gear, shoes and X-tubes	Check condition, secure
Navigation light	Secure, check condition
Fuselage and door (left)	Check condition, rivets, cotter pin
Bubble and trim string	Check condition, cracks, clean
Vent and landing lights	Unobstructed, clean, working
Lower fuselage and antenna	Check condition, rivets, cracks
Right skid gear, shoes and X-tubes	Check condition, secure
Navigation light	Secure, check condition
Fuselage and door (right)	Check condition, rivets, cotter pin
Hobbs time	Check
Required documents	Remember "ARROW" acronym
Fire extinguisher	Check
Auxiliary fuel tank sump	Drain
Main fuel tank sump	Drain
Gascolator	Drain

Common Errors

- Rushing the preflight in anticipation of flight.
- Not asking questions because you're afraid of looking ignorant.
- Merely going through the motions instead of doing a thorough check.

Tips

The preflight inspection is *very important*, so take your time! Always ask a mechanic if you're unsure about anything you find. Pilots will learn a lot about the systems of the helicopter when inspecting the aircraft prior to flight. If the preflight begins to feel routine, try doing it in reverse order. This will slow you down and help ensure that you're thoroughly checking everything on the list. Another way to vary the routine is to start in the middle of the list and complete it from a different starting point.

Private and Commercial PTS

Objective: To determine that the applicant—

1. Exhibits knowledge of the elements related to preflight inspection. This includes recognizing which items must be inspected, the reasons for checking each item, and how to detect possible defects.
2. Inspects the helicopter with reference to an appropriate checklist.
3. Verifies the helicopter is in condition for safe flight.

Engine Starting and Rotor Engagement

Purpose

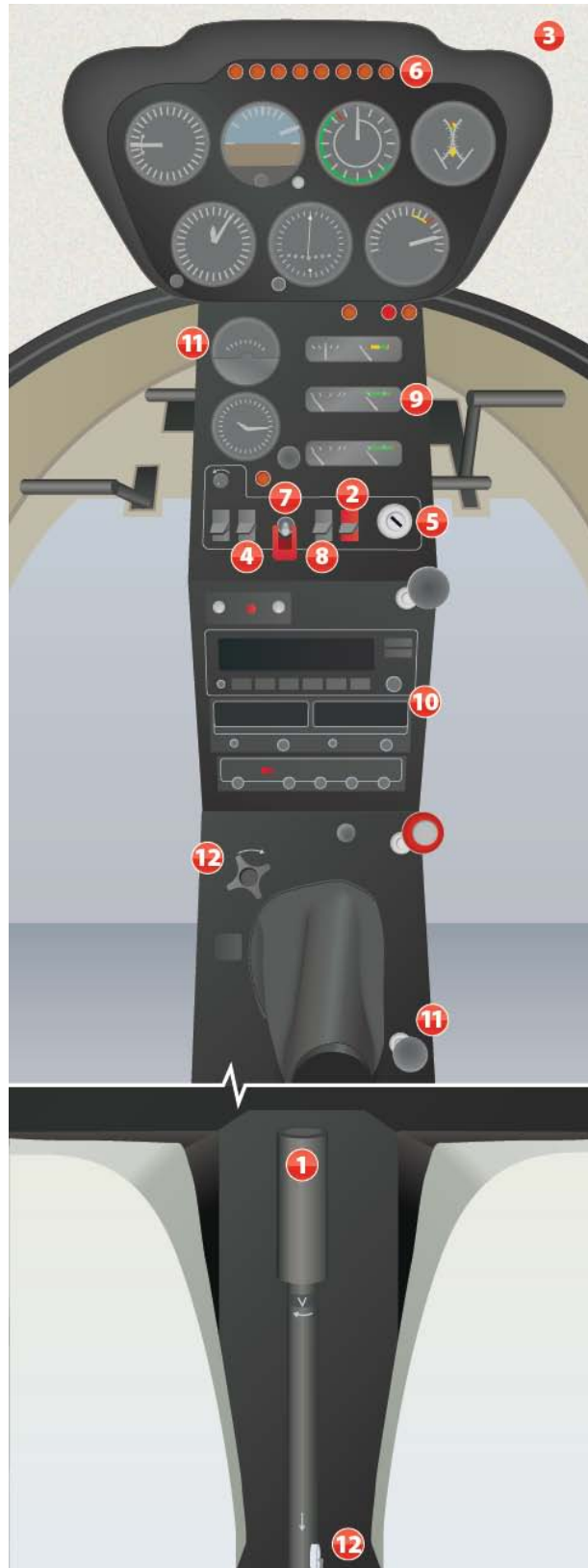
This task is used to start the helicopter and engage the rotor system safely.

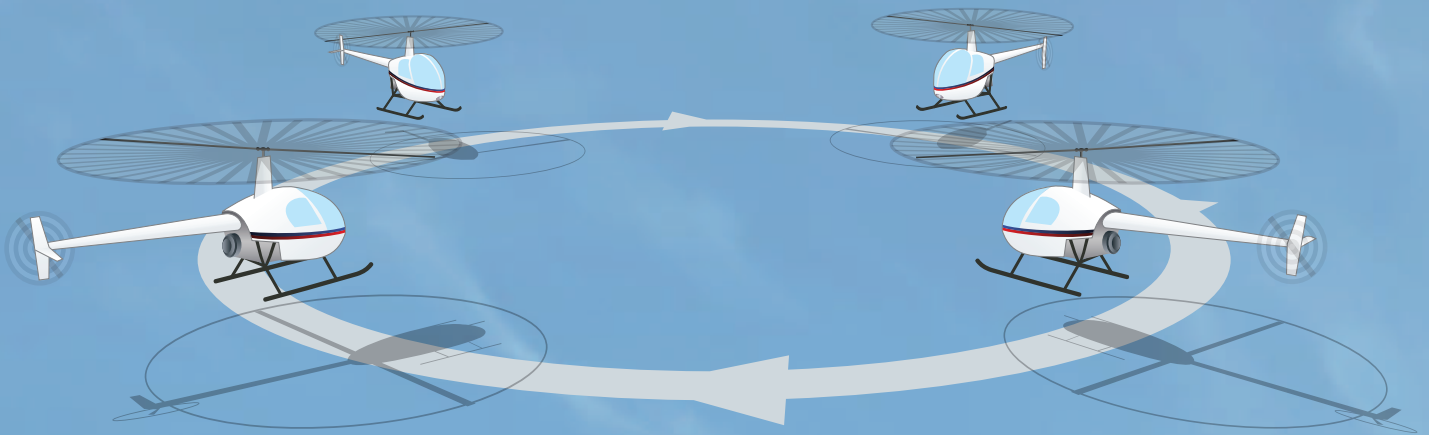
Description

Each helicopter has its own unique starting sequence depending on the make and model. In addition, operators may change the sequence of items in the POH checklist. This guide covers the engine starting procedure for the Robinson R22 helicopter and assumes that all preflight and before-starting checklists have been covered.

As a good rule of thumb, the helicopter should be placed on flat, level ground away from all obstructions and loose debris. Be sure that sufficient clearance is available around the helicopter to safely hover to your area of operations.

It is very important that you follow the factory recommended checklist for your specific aircraft. Some operators will adapt their own checklists to help with pilot “flow”; however, as the pilot-in-command (PIC) it is your responsibility to ensure that all items in the POH are covered.





Helicopter Maneuvers Manual

By Ryan Dale

An excellent resource for students and flight instructors alike, the *Helicopter Maneuvers Manual* helps pilots acquire a mental picture of each phase of flight. With this comprehensive guide, author Ryan Dale has captured his countless hours spent at the whiteboard in full-color illustrations that show exactly what to do or expect in each part of a maneuver. The information in this guide helps pilots visualize concepts learned in flight training and incorporate the Practical Test Standards into every maneuver.

The full-color illustrations and textual explanations work in conjunction with an instructor's lessons, and facilitate effective preflight and postflight briefings. The *Helicopter Maneuvers Manual* gives readers a crystal-clear picture of what level of performance is expected of them for each flight profile and includes insights into the common errors associated with each maneuver. Applicable to all helicopter models, the book also features tips for the popular Robinson R22. This book is an essential tool for any flight bag!



Author Ryan Dale holds both airplane and helicopter instructor ratings and works for a regional flight training company. While studying for his first instructor certificate, he recognized a need for more resources for aspiring helicopter pilots; besides this *Helicopter Maneuvers Manual*, Ryan also wrote the *Helicopter Oral Exam Guide* to help pilots reach their goals of flight.

Includes step-by-step instructions and supporting illustrations for all the maneuvers required for the private and commercial checkride. For example:

- Preflight Inspection
- Engine Start and Rotor Engagement
- Takeoffs
- Taxiing
- Hovering
- Approaches and Landings
- Straight-and-Level Flight
- Climbs
- Descents
- Turns
- Acceleration
- Deceleration
- Traffic Pattern Operations
- Go-Around Procedure
- High Altitude Operations
- Slope Operations
- Confined Area Operations
- Pinnacle/Platform Operations
- Power Failure at Altitude
- Autorotation
- Low Rotor RPM Recognition and Recovery
- Settling-With-Power
- Tail Rotor Failure
- Post-Flight Procedures
- And more!



Aviation Supplies & Academics, Inc.
7005 132nd Place SE
Newcastle, Washington 98059
www.asa2fly.com | 1-800-ASA-2-FLY