Transport Canada Transports Canada

TP 2476E
(revised 11/2005)

Study and Reference Guide

Private and Commercial Pilot Licence including Aeroplane to Helicopter Pilot Licences

Helicopter

Fifth Edition
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TC-1001757

Canada

Other related TC Publications:

TP 13728 - Private and Commercial - Pilot Licences - Helicopter

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GENERAL

KNOWLEDGE REQUIREMENTS

Applicants for Private and Commercial Pilot Licences in the Helicopter Category shall thoroughly understand the operational provisions of the CARs and Air Traffic Rules and Procedures that are appropriate to the licence, and in accordance with flight under the Visual Flight Rules (VFR).

Applicants for the Private Pilot Licence shall have a basic understanding of the remaining subjects in this guide. As well, they must have the ability to apply these subjects practically where required.

Applicants for the Commercial Pilot Licence shall have a good understanding of the remaining subjects in this guide with the ability to apply them practically where required. They shall also know those sections presented in this guide related to Part VII of the CARs - Commercial Air Services, applicable to the duties and responsibilities of a Commercial Pilot employed in a commercial air service operating VFR.

All applicants must also be able to read the examination questions in either English or French without assistance.

Subjects marked with a bullet (•) are considered essential knowledge for the Commercial Pilot Licence candidates.

EXAMINATIONS

Applicants for the Private and Commercial Pilot Licence in the Helicopter Category shall demonstrate their knowledge by writing a Transport Canada multiple choice examination on subjects contained in this guide.

Examination	Questions	Time Limit	Pass Mark
Private Pilot – Helicopter (PPHEL)	100	3 hours	60%

Examination	Questions	Time Limit	Pass Mark
Commercial Pilot – Helicopter (CPHEL)	100	3½ hours	60%

These examinations are sectionalized into four mandatory subject areas and require an overall pass mark of 60%. As well, the candidate must achieve 60% in each of the four subject areas. They are:

Mandatory Subjects	Study and Reference Guide Sections
AIR LAW.....	Air Law and Procedures – Section 1
NAVIGATION ……..	Navigation - General – Section 6 Navigation and Radio Aids – Section 7
METEOROLOGY……....	Meteorology – Section 4
AERONAUTICS AND GENERAL KNOWLEDGE.....	Airframes, Engines and Systems – Section 2 Theory of Flight – Section 3 Instruments – Section 5 Flight Operations – Section 8 Human Factors – Section 9

Although the overall and supplementary examinations contain questions related mostly to the sections shown under the above four mandatory subject areas, there may be occasions where knowledge from an unrelated section is required to arrive at the correct response. For example,
a practical question on fuel calculations under Navigation - Section 6 may require knowledge of VFR fuel requirements under Air Law - Section 1.

Applicants who obtain less than 60% on the overall examination will, for licensing purposes, be required to rewrite the complete paper. The rewrite provisions detailed in the CARs Part IV apply.

SUPPLEMENTARY EXAMINATIONS

Applicants who obtain 60% or more on the main examination (PPHEL or CPHEL), but who fail one or more mandatory subject areas will be assessed a partial pass. During one sitting they will be required to write supplementary examinations for each subject area failed.

Details on the mandatory subject area supplementary examinations are as follows:

Private Pilot Licence

Examination	Questions	Time Limit	Pass Mark
AIR LAW (PHLAW)	20	1 hour	60%
NAVIGATION (PHNAV)	25	2 hours	60%
METEOROLOGY (PHMET)	25	1½ hours	60%
AERONAUTICS – GENERAL KNOWLEDGE (PHGEN)	35	1½ hours	60%

Commercial Pilot Licence

Examination	Questions	Time Limit	Pass Mark
AIR LAW (CHLAW)	20	1 hour	60%
NAVIGATION (CHNAV)	25	2 hours	60%
METEOROLOGY (CHMET)	25	1½ hours	60%
AERONAUTICS – GENERAL KNOWLEDGE (CHGEN)	35	1½ hours	60%

NOTE: When writing more than one supplementary examination, the maximum time allowed shall be the sum of the times indicated for each examination, not to exceed 3 hours for the Private Pilot supplementary examinations and 3½ hours for the Commercial Pilot supplementary examinations.

AEROPLANE TO HELICOPTER LICENCE EXAMINATIONS

Pilots who hold a valid Private, Commercial or Airline Transport Pilot Licence in the Aeroplane Category and who wish to apply for a Private Pilot Licence, Helicopter Category, shall demonstrate their knowledge by writing the following Transport Canada multiple choice examination.

Examination	Questions	Time Limit	Pass Mark
Private Pilot Helicopter Licence – Alternate Category (PHRAC)	35	1½ hours	60%

Pilots who hold a valid Commercial or Airline Transport Pilot Licence in the Aeroplane Category and who wish to apply for a Commercial Pilot Licence, Helicopter Category, shall demonstrate their knowledge by writing the following Transport Canada multiple choice examination.

Examination	Questions	Time Limit	Pass Mark
Commercial Pilot Helicopter Licence – Alternate Category (CHRAC)	35	1½ hours	60%

The PHRAC and CHRAC examinations are based on subjects contained in Sections 1.0, 2.0, 3.0, 8.0 and 9.0 of this study guide.

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TRANSPORTATION SAFETY BOARD OF CANADA (TSB) - (A.I.M. GEN 3.0)

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8 Detonation/Pre-ignition Causes and Effects
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• 2 Blade Design
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• 4 Rotor Systems (Main/Tail)
5 Velocities Affecting Rotor Systems
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3 Structural Limitations
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• 2 Collective
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1 Number / Speed of Blades
2 Rotor Blade Vortices
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  2 Vertical Structure
- 3 ICAO Standard Atmosphere

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- 5 Effects of both Pressure and Temperature

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  2 Deflection caused by the Earth's Rotation
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  2 Formation
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  5 Factors that Determine Weather
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  5 Discontinuities Across Fronts
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  3 Stationary Front
  4 TROWAL and Upper Fronts

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  6 Icing in Clear Air (Hoar Frost)
  7 Collection Efficiency
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  2 Life Cycle
- 3 Classification - Air mass, Frontal, Squall Line, Convective, Orographic and Nocturnal
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  2 Aviation Weather Information Service (AWIS)
  3 Flight Service Stations (FSS)
  4 Weather Broadcasts by FSS
  5 Atmospheric Environment Service Weather Briefing
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  4 AWOS
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- 2 Decoding
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- 5 Upper Level Winds and Temperature Forecasts (FD)
- 6 Significant In-flight Weather Warning Messages (SIGMET)

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- 1 Times Issued and Validity Periods
- 2 Symbols and Decoding

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4 Prognostic Surface Chart

5 Upper Level Chart - ANAL (850 - 700 mb)

6 Significant Weather Prognostic Chart
FL100 - 250 (700 - 400 mb)

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- 1 Pitot Static System
- 2 Airspeed Indicator
  3 Altimeter and Encoding Altimeter
  4 Radio / Radar Altimeter
- 5 Outside Air Temperature
- 6 Turn-and-bank Indicator / Turn Co-ordinator
  7 Vertical Speed Indicator (VSI)
- 8 Heading Indicator
- 9 Attitude Indicator (AI)
- 10 Radio Magnetic Indicator (RMI)
  11 Horizontal Situation Indicator (HIS)
  12 Flight Director

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1 Flight Management System (FMS)
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1 Construction
2 Use
3 Limitations and Faults
4 Gyromagnetic Remote Indicating Compass

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3 Enroute Low Altitude Charts

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1 Time Zones and Relation to Longitude

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- 1 Heading and True Airspeed
- 2 Wind and Wind Speed
- 3 IAS - CAS - EAS - TAS
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- 5 Time
- 6 Weight and Balance

7 Fuel Load / Zero Fuel Weight
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1 Flight Plan
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- 1 Use of Aeronautical Charts
- 2 Calculation of Heading and Groundspeed
- 3 Use of Radio Aids to Determine Position and Transferring Position Lines

4 Gyro Steering Techniques in Areas of Compass Unreliability

- 5 Maintaining a Flight Log (Air Position)

6 Determination of Wind Velocity
7 Use of Canada Flight Supplement (CFS)

SECTION 7: NAVIGATION AND RADIO AIDS

DEFINITIONS

- 1 Meridian
- 2 Prime Meridian
- 3 Longitude
- 4 Equator
- 5 Latitude
- 6 Great Circle
- 7 Rhumb Line
- 8 Variation
- 9 Isogonal
- 10 Agonic Line
- 11 Deviation
- 12 Track
- 13 Heading
- 14 Airspeed
- 15 Ground Speed
- 16 Air Position
- 17 Ground Position
- 18 Bearing
- 19 Wind Velocity
- 20 Drift

MAPS AND CHARTS

- 1 Characteristics of Projections
- 2 VTA - Transverse Mercator Projection
- 3 VNC - Lambert Conformal Conic Projection
- 4 WAC - Lambert Conformal Conic Projection
- 5 Topographical Symbols
- 6 Elevation and Contours (Relief)
- 7 Aeronautical Information
- 8 Scale and Units of Measurement
- 9 Locating Position by Latitude and Longitude
- 10 Navigational Aids
- 11 Enroute Low Altitude Charts

TIME AND LONGITUDE

- 1 24 Hour System
- 2 Time Zones and Relation to Longitude
- 3 Conversion of UTC to Local and Vice Versa

PILOT NAVIGATION

- 1 Use of Aeronautical Charts
- 2 Measurement of Track & Distance
- 3 Map Reading
- 4 Setting Heading - Visual Angle of Departure
- 5 Check Points and Pin-Points
- 6 Plotting Bearings
- 7 Use of Position Lines to Obtain a Fix
- 8 Ground Speed Checks and E.T.A. Revisions
- 9 Track Made Good
- 10 Determining Drift by 10° Lines
- 11 Double Track Error Method to Regain Track
- 12 Sum of Opening and Closing Angles to Destination
- 13 Visual Alteration Method of Correcting to Track
- 14 Diversion to Alternate
- 15 Return to Departure Point (Reciprocal Track)
- 16 Low Level Navigation
- 17 Deduced (Dead) Reckoning (DR Navigation)
- 18 In-flight Log and Mental Calculations
- 19 Procedures When Lost
- 20 Air and Ground Position
- 21 Variation and Deviation
- 22 True Track, Magnetic Track
- 23 True, Magnetic and Compass Headings
- 24 Indicated and Calibrated Airspeed (IAS, CAS)
- 25 True Airspeed, Ground Speed (TAS, G/S)
- 26 Compass Errors
- 27 Radio Communications (as per Section 1)

TRIANGLE OF VELOCITIES

- 1 True Airspeed and Heading
- 2 Wind Velocity
- 3 Ground Speed and Track

NAVIGATION COMPUTERS

- 1 True Heading and True Airspeed
- 2 Applying the Wind
- 3 True Track and Ground Speed
  4 Magnetic Heading and Magnetic Track
- 5 Density Altitude and True Altitude
  6 Indicated, Calibrated and True Airspeed
- 7 Time, Ground Speed and Distance
- 8 Fuel Consumption and Conversions
- 9 Climbs and Descents

PRE FLIGHT PREPARATION

  1 Factors Affecting Choice of Route
  2 Map Preparation
- 3 Meteorological Information
  4 NOTAM
  5 Selection of Check Points
- 6 Fuel Requirements
- 7 Weight and Balance
- 8 Use of the Canada Flight Supplement
- 9 Documents to be Carried in Aircraft
  10 Flight Plans and Itineraries
  11 Flight Log Forms
  12 Aircraft Serviceability

RADIO THEORY

  1 Wave Length and Frequency
  2 Frequency Bands
  3 Characteristics of Low, High and Very High Frequency Radio Waves
  4 Frequency Bands Used in Navigation and Communication

VHF OMNIDIRECTION RANGE (VOR)

- 1 Principles of Operation
  2 Aircraft Equipment
- 3 Tuning and Identifying
- 4 Serviceability Checks
  5 Interpretation/ Orientation/ Homing
- 6 Intercepting Predetermined Radials and Tracking
- 7 Position Lines and Fixes
- 8 Time and Distance Formula
- 9 Checking Ground Speed
  10 Voice Feature
- 11 VHF (VOR) Airways and Air Routes
  12 Reception Limitations

AUTOMATIC DIRECTION FINDER (ADF)

- 1 Principles of Operation
  2 Aircraft Equipment
  3 Tuning and Identifying
  4 Serviceability Checks
  5 Interpretation/Orientation/ Homing
- 6 Intercepting Predetermined Tracks and Tracking
- 7 Position Lines and Fixes
- 8 Relative Bearings, Conversion to Magnetic and True Bearings
- 9 Time and Distance Formula
- 10 Checking Ground Speed
  11 Voice Feature
- 12 Inaccuracies and Limitations
- 13 LF/MF (NDB) Airways and Air Routes

RADIO MAGNETIC INDICATOR (RMI)

- 1 Basic Principals , Use and Limitations

GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS-GPS)

- 1 Basic Principals, Use and Limitations

OTHER RADIO AND RADAR AIDS BASIC PRINCIPALS AND USE

- 1 Distance Measuring Equipment (DME)
  2 Transponder
- 3 Emergency Locator Transmitter (ELT)
  4 VHF Direction Finding (DF) Assistance
  5 Airport Surveillance Radar (ASR) Primary and Secondary
  6 Precision Approach Radar (PAR)

SECTION 8: FLIGHT OPERATIONS

GENERAL

- 1 Pilot-In-Command Responsibilities
- 2 Winter Operations
- 3 Float Operations
- 4 Thunderstorm Avoidance
- 5 Mountain Flying Operations
- 6 Collision Avoidance - Use of Landing Lights
- 7 Marshalling Signals
- 8 Aerodrome/Heliport Marking and Lighting
- 9 Hover Taxi/Air Taxi
- 10 Obstruction Markings/Lighting
- 11 Units of Measurement and Conversion
- 12 Use of Aircraft Flight Manual Including Approved and Unapproved Operational Information

PERFORMANCE

- 1 Effects of Critical Surface Contamination
- 2 Ground Effect
- 3 Weathercock Effect
- 4 Ground Resonance
- 5 Overpitching/Rotor Droop
- 6 Blade Sailing
- 7 Power Available and Required
- 8 Range and Endurance
- 9 Loss of Tail Rotor Effectiveness
- 10 Autorotation Speeds
- 11 Best Rate of Climb (Vy)
- 12 Dynamic Rollover
- 13 Mast Bumping
- 14 Vibrations
- 15 Blade Stall
- 16 Bank/Speed vs Rate/Radius of Turn
- 17 Effect of Change of Weight or Centre of Gravity (C of G) on Performance

USE OF PERFORMANCE CHARTS

- 1 Hover Ceiling, In Ground Effect (IGE) and Out of Ground Effect (OGE)
- 2 Rate of Climb
- 3 Height Velocity Curve (HVC)
- 4 Critical Wind Azimuth
- 5 Performance (V) Speed - Vy, Vne

WEIGHT AND BALANCE

- 1 Terms (e.g. datum, arm, moment)
- 2 Locating Centre of Gravity (C of G)
- 3 C of G Limits - Longitudinal
- 4 C of G Limits - Lateral
- 5 Weight (e.g. empty, gross)
- 6 Load adjustment
- 7 Cargo Tie Down/ Passenger Loading/ External Loading

EXTERNAL LOADS

- 1 Equipment
- 2 Ground/Air Signals
- 3 Safety/Precautions
- 4 Emergencies

WAKE TURBULENCE

- 1 Causes
- 2 Effects
- 3 Avoidance

SEARCH AND RESCUE (SAR) (A.I.M. CANADA - SAR Information)

- 1 Types of Service Available
- 2 Emergency Locator Transmitter (ELT) Exclude Categories
- 3 Aircraft Emergencies
- 4 Survival - Basic Techniques

CRITICAL SURFACE CONTAMINATION

- 1 Clean Aircraft Concept
- 2 Frozen Contaminants
- 3 Cold Soaking Phenomenon
- 4 Practices for Pilots to Ensure a Clean Aircraft
- 5 Pre-Take-Off Inspection

SECTION 9: HUMAN FACTORS

AVIATION PHYSIOLOGY

1 Hypoxia / Hyperventilation
2 Gas Expansion Effects
3 Decompression (including SCUBA diving)
4 Vision / Visual Scanning Techniques
5 Hearing
6 Orientation / Disorientation (including visual and vestibular illusions)
7 Positive and Negative "G"
8 Circadian Rhythms / Jet Lag
9 Sleep / Fatigue
10 Toxic Hazards (CO_2)

THE PILOT AND THE OPERATING ENVIRONMENT

1 Personal Health / Exercise / Fitness
2 Obesity / Diet / Nutrition
3 Medications (prescribed and over-the-counter)
4 Substance Abuse (alcohol and drugs)
5 Pregnancy
6 Heat / Cold
7 Noise / Vibrations
8 Effects of Smoking
9 Toxic Hazards (including carbon monoxide)

AVIATION PSYCHOLOGY

• 1 The Decision-Making Process
• 2 Factors that Influence Decision-Making
3 Situation Awareness
4 Stress
5 Managing Risk
6 Attitudes
7 Workload (attention and information processing)

PILOT - EQUIPMENT / MATERIALS RELATIONSHIP

1 Controls and Displays
- Errors in Interpretation and Control
- Information Selection - eg. "glass" cockpits

2 Alerting and Warning Systems
- Appropriate Selection and Set up
- False Indications
- Distractions and Responses

3 Standard Operating Procedures (SOPs)
• 4 Correct Use of Charts, Checklists and Manuals

INTERPERSONAL RELATIONS

1 Communication with
- Flight Crew and Cabin Crew
- Passengers
- Company Management
- Flight Operations
- Maintenance Personnel
- Air Traffic Services

• 2 Crew Problem Solving and Decision-Making
3 Crew Management / Small Group Dynamics
4 Operating Pressures
- Family
- Peer Group
- Employer

RECOMMENDED STUDY MATERIAL

- List of Civil Aviation Publications (TP 3680E) - Contains titles, reference numbers, source and cost.
- Student Pilot Permit or Private Pilot Licence for Foreign and Military Applicants, Air Regulations (PSTAR) (TP 11919E)
- When in Doubt... Small and Large Aircraft - Aircraft Critical Surface Training (TP 10643E)
- Aircraft Critical Surface Contamination Examination Questions (TP 10615E)
- Helicopter Flight Training Manual (TP 9982E)
- Air Command Weather Manual (TP 9352E)
- Air Command Weather Manual Supplement (TP 9353E)
- Human Factors for Aviation - Basic Handbook (TP 12863E)
- Aeronautical Information Manual (TP 14371E)
- *Canadian Aviation Regulations (CARs)*

The Study Guide For The Radiotelephone Operator's Restricted Certificate (Aeronautical) is available free of charge from district offices of Industry Canada - Examinations and Radio Licensing (http://www.strategis.gc.ca/).

Information on text books and other publications produced by commercial publishers can be obtained through local flying training organizations, bookstores and similar sources.

Publications used in pilot training in the United States are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 - 9325, including the Basic Helicopter Handbook (AC61 13A) (http://www.access.gpo.gov/index.html).

ENQUIRIES

Information concerning the location of pilot training organizations and matters pertaining to flight crew licensing may be obtained by contacting the appropriate Regional Offices. A complete listing may be found at: http://www.tc.gc.ca/CivilAviation/General/Exams/Centres.htm