



Transport
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Study and Reference Guide

Private and Commercial Pilot Licence
including Aeroplane to Helicopter
Pilot Licences

Helicopter

Fifth Edition
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Canada

You may reproduce this guide as required and it can be found at
<http://www.tc.gc.ca/CivilAviation/General/Exams/Guides.htm>

GENERAL

KNOWLEDGE REQUIREMENTS

NOTE: The new Canadian Aviation Regulations (CARs) replace the Air Regulations, Air Navigation Orders, Air Regulation Series and the Personnel Licensing Handbook. While the implementation date for some of the CARs may be delayed, candidates are required to have a sound understanding of the appropriate CARs and will be examined on them from December 10, 1996 onward.

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 Rating – 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 Rating – 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, 4.0, 7.0 and 8.0 of this study guide.

SECTION 1: AIR LAW AND PROCEDURES**PART I – GENERAL PROVISIONS**

101 – INTERPRETATION

101.01 Interpretation

103 – ADMINISTRATION AND COMPLIANCE

103.02 Inspection of Aircraft, Requests for Production of Documents and Prohibitions

103.03 Return of Canadian Aviation Documents

103.04 Record Keeping

PART III – AERODROMES AND AIRPORTS

300– INTERPRETATION

300.01 Interpretation

301– AERODROMES

301.01 Application

301.04 Markers and Markings

301.06 Wind Direction Indicator

301.07 Lighting

301.08 Prohibitions

301.09 Fire Prevention

302 – AIRPORTS

302.10 Prohibitions

302.11 Fire Prevention

PART IV – PERSONNEL LICENSING AND TRAINING

400 – GENERAL

400.01 Interpretation

401 – FLIGHT CREW PERMITS, LICENCES AND RATINGS

401.03 Requirements to Hold a Flight Crew Permit, Licence or Rating

401.04 Flight Crew Members of Aircraft Registered in Contracting States other than Canada

401.05 Recency Requirements

401.08 Personal Logs

401.10 Crediting of Flight Time Acquired by a Co-pilot

→ 401.35 ATPL Privileges – Helicopter

401.44 VFR Over-The-Top Rating

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→ 404– MEDICAL REQUIREMENTS

- 404.03 Requirement to Hold a Medical Certificate (MC)
- 404.04 Issuance and Validity Period of MC
- 404.06 Prohibitions regarding Exercise of Privileges
- 404.10 MC Requirements for Personnel Licences
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PART VI – GENERAL OPERATING AND FLIGHT RULES

600 – INTERPRETATION

600.01 Interpretation

→ 601– AIRSPACE STRUCTURE, CLASSIFICATION AND USE

- 601.01 Airspace Structure
- 601.02 Airspace Classification
- 601.03 Transponder Airspace
- 601.04 IFR or VFR Flight in Class F Special Use Restricted Airspace or Class F Special Use Advisory Airspace
- 601.06 VFR Flight in Class A Airspace
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FOREST FIRE FLIGHT RESTRICTIONS

- 601.14 Interpretation
- 601.15 Forest Fire Aircraft Operating Restrictions
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- 601.17 Exceptions

602 – OPERATING AND FLIGHT RULES

GENERAL

- 602.01 Reckless or Negligent Operation of Aircraft
- 602.02 Fitness of Flight Crew Members
- 602.03 Alcohol or Drugs – Crew Members
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- 602.06 Smoking
- 602.07 Aircraft Operating Limitations
- 602.08 Portable Electronic Devices
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- 602.11 Aircraft Icing
- 602.12 Overflight of Built-up Areas or Open-Air Assemblies of Persons during Take-offs, Approaches and Landings
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- 602.14 Minimum Altitudes and Distances
- 602.15 Permissible Low Altitude Flight
- 602.16 Flights over Open-Air Assemblies of Persons or Built-up Areas – Helicopters with External Loads
- 602.17 Carriage of Persons during Low Altitude Flight
- 602.19 Right-of-Way – General
- 602.20 Right-of-Way – Aircraft Manoeuvring on Water
- 602.21 Avoidance of Collision
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- 602.24 Formation Flight
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- 602.26 Parachute Descents
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- 602.28 Aerobatic Manoeuvres with Passengers
- 602.30 Fuel Dumping
- 602.31 Compliance with Air Traffic Control Instructions and Clearances
- 602.34 Cruising Altitudes and Cruising Flight Levels
- 602.35 Altimeter Setting and Operating Procedures in the Altimeter-Setting Region
- 602.36 Altimeter Setting and Operating Procedures in the Standard Pressure Region
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- 602.59 Equipment Standards
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- 602.96 General
- 602.97 VFR and IFR Aircraft Operations at Uncontrolled Aerodromes within an MF Area
- 602.98 General MF Reporting Requirements
- 602.99 MF Reporting Procedures before Entering Manoeuvring Area
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- 602.101 MF Reporting Procedures on Arrival
- 602.102 MF Reporting Procedures when Flying Continuous Circuits
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- 602.105 Noise Operating Criteria

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- 602.114 Minimum Visual Meteorological Conditions for VFR Flight in Controlled Airspace
- 602.115 Minimum Visual Meteorological Conditions for VFR Flight in Uncontrolled Airspace
- 602.116 VFR Over-The-Top
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- 602.136 Continuous Listening Watch
- 602.138 Two-way Radiocommunication Failure in VFR Flight

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- 602.143 Emergency Radio Frequency Capability
- 602.144 Interception Signals, Interception of Aircraft and Instructions to Land
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- 604.10 Checklist
- 604.11 Operational Flight Data Sheet
- 604.16 Flight Attendant Requirement
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- 604.26 Flight Time Limitations
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- 604.28 Split Flight Duty Time
- 604.29 Extension of Flight Duty Time
- 604.30 Unforeseen Operational Circumstances
- 604.31 Delayed Reporting Time
- 604.32 Requirements for Time Free from Flight Duty
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- 604.38 Survival Equipment
- 604.39 First Aid Kits
- 604.41 Hand-Held Fire Extinguishers

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- 604.65 Designation of Pilot-in-command and Second-in-command
- 604.66 Crew Member Qualifications
- 604.68 Validity Period
- 604.73 Training Program

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- 604.80 Requirements relating to Operations Manual
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- 605.03 Flight Authority
- 605.04 Availability of Aircraft Flight Manual
- 605.05 Markings and Placards
- 605.06 Aircraft Equipment Standards and Serviceability
- 605.07 Minimum Equipment Lists
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- 605.23 Restraint System Requirements
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- 605.25 General Use of Safety Belts and Restraint Systems
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- 605.39 Use of ELT
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- 605.85 Maintenance Release and Elementary Work
- 605.86 Maintenance Schedule
- 605.87 Transfer of Aeronautical Products between Maintenance Schedules
- 605.88 Inspection after Abnormal Occurrences

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- 605.93 Technical Records – General
- 605.94 Journey Log Requirements
- 605.95 Journey Log – Carrying on Board
- 605.96 Requirements for Technical Records other than the Journey Log
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- 700.15 Flight Time Limitations
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- 700.17 Unforeseen Operational Circumstances
- 700.18 Delayed Reporting Time
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- 700.20 Flight Crew Positioning
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702.01 Application

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- 702.13 Flight Authorization
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- 702.16 Carriage of Persons
- 702.17 VFR Flight Minimum Flight Visibility – Uncontrolled Airspace
- 702.18 Night, VFR OTT and IFR Operations
- 702.19 Entering or Leaving a Helicopter in Flight
- 702.20 Aircraft Operating over Water
- 702.21 Helicopter Class D External Loads
- 702.22 Built-up Area and Aerial Work Zone
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- 702.43 Additional Equipment for Single-pilot Operations
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- 702.65 Flight Crew Member Qualifications
- 702.67 Validity Period

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- 703.01 Application

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- 703.18 Operational Flight Plan – Subsection (2)
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- 703.21 Admission to Pilot's Compartment
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- 703.23 Aircraft Operating over Water
- 703.24 Number of Passengers in Single-engined Aircraft
- 703.25 Carriage of External Loads
- 703.26 Simulation of Emergency Situations
- 703.27 VFR Flight Obstacle Clearance Requirements
- 703.28 VFR Flight Minimum Flight Visibility – Uncontrolled Airspace
- 703.29 VFR Flight Weather Conditions
- 703.32 Enroute Limitations
- 703.33 VFR OTT Flight
- 703.34 Routes in Uncontrolled Airspace
- 703.36 Minimum Altitudes and Distances
- 703.37 Weight and Balance Control
- 703.38 Passenger and Cabin Safety Procedures
- 703.39 Briefing of Passengers

AIRCRAFT EQUIPMENT REQUIREMENTS

- 703.64 General Requirements
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- 703.82 Equipment Standards and Inspection

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- 703.106 Distribution of Company Operations Manual
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- 704.01 Application

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- 704.12 Operating Instructions
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- 704.17 Operational Flight Plan – Subsection (2)
- 704.19 Checklist
- 704.20 Fuel Requirements – Paragraph (b)
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- 704.23 VFR Flight Obstacle Clearance Requirements
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- 704.25 VFR Flight Weather Conditions
- 704.28 VFR OTT Flight
- 704.29 Routes in Uncontrolled airspace
- 704.31 Minimum Altitudes and Distances
- 704.32 Weight and Balance Control
- 704.33 Apron and Cabin Safety Procedures
- 704.34 Briefing of Passengers

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- 704.46 Take-off Weight Limitations
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- 704.62 General Requirements
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- 704.68 Shoulder Harnesses

EMERGENCY EQUIPMENT

- 704.83 Hand-held Fire Extinguisher

PERSONNEL REQUIREMENTS

- 704.107 Designation of Pilot-in-command and Second-in-command
- 704.108 Flight Crew Member Qualifications
- 704.111 Validity Period
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704.122 Distribution of Company Operations Manual

704.123 Aircraft Operating Manual

704.124 Standard Operating Procedures

NOTAM**A.I.P. CANADA**

- 1 A.I.P. CANADA
- 2 Supplements
- 3 Aeronautical Information Circulars
- 4 Aviation Notices and AIRAC Canada

**TRANSPORTATION SAFETY BOARD OF
CANADA (TSB) – (A.I.P. GEN 3.0)****AIR TRAFFIC SERVICES AND
PROCEDURES**

- 1 Air Traffic and Advisory Services
- 2 Flight Service Stations
- 3 Communications Procedures
- 4 Radar Service
- 5 ATC Clearances and Instructions
- 6 Wake Turbulence Separation
- 7 Airport/Aerodrome Operations –
Uncontrolled
- 8 Airport/Aerodrome Operations –
Controlled
- 9 Mandatory and Aerodrome Traffic
Frequencies
- 10 VFR En Route Procedures
- 11 VFR Holding Procedures
- 12 Simultaneous Intersecting Runway
Operations (SIRO)

OPERATIONS IN DOMESTIC AIRSPACE

- 1 Altimeter Setting Procedures
- 2 Cruising Altitudes
- 3 Profile Descent
- 4 Leaving or Entering Uncontrolled
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- 5 Uncontrolled Airspace Procedures

SECTION 2: AIRFRAMES, ENGINES AND SYSTEMS

AIRFRAMES

- 1 Types of Construction

LANDING GEAR

- 1 Types

ENGINES-RECIPROCATING

- 1 Types
- 2 Four Stroke Cycle
- 3 Methods of Cooling
- 4 Principles of the Magneto
- 5 Dual Ignition
- 6 Exhaust System
- 7 Ancillary Controls
- 8 Turbo-charging
- 9 Effect of Density Altitude/Humidity
- 10 Limitations and Operation
- 11 Instruments

ENGINES-TURBINE

- 1 Types
- 2 Principles of Operation
- 3 Methods of Cooling
- 4 Particle Separators
- 5 Power Turbine Governor
- 6 Bleed Air System
- 7 Accessory Drives
- 8 Turbine Temperature Measurement
- 9 Torque Sensing
- 10 Instruments
- 11 Ignition and Auto-relight System
- 12 Effects of Density Altitude/Humidity
- 13 Limitations

CARBURATION

- 1 Theory of Operation
- 2 Fuel-Air Mixture
- 3 Mixture Controls
- 4 Carburettor Icing
- 5 Use of Carburettor Heat and Its Effect on Mixture

FUEL INJECTION

- 1 Principle of Operation
- 2 Icing
- 3 Alternate Air

ELECTRICAL SYSTEM

- 1 Battery/Starter- Generator/Alternator
- 2 Lighting
- 3 Ammeter , Load Meter and Warning/Caution Systems
- 4 Bus Bars
- 5 Circuit Breakers/Fuses
- 6 Grounding/Bonding

LUBRICATING SYSTEMS AND OILS

- 1 Types/Viscosity/Grades and Seasonal Use
- 2 Purposes
- 3 Methods of Lubrication
- 4 Venting
- 5 Chip Detectors
- 6 Filters
- 7 Pressure Relief
- 8 Oil Cooler

FUEL SYSTEM AND FUELS

- 1 Types/Colour/Properties
- 2 Density/Weight
- 3 Additives
- 4 Contamination and Deterioration
- 5 Venting and Baffling
- 6 Fuel Pumps, Lines, Filters and Drains
- 7 Induction Manifold / Fuel Control Unit
- 8 Detonation/Pre-ignition Causes and Effects
- 9 Vapour Lock
- 10 Fuel Heater
- 11 Primers
- 12 Fuel Management -Ground and Air
- 13 Fuel Handling Fuelling Aircraft
- 14 Grounding/Bonding

TRANSMISSIONS AND GEARBOXES

- 1 Types
- 2 Main Rotor
- 3 Tail Rotor
- 4 Intermediate
- 5 Drive Shafts
- 6 Mounting System
- 7 Clutches/Free-Wheeling Unit
- 8 Accessory Gearbox
- 9 Instruments

HYDRAULICS

- 1 Pump
- 2 Reservoir
- 3 Servo Actuators
- 4 Filters
- 5 Valves/Switches/Gauges

OTHER AIRCRAFT SYSTEMS

- 1 Heating
- 2 Fire Detection and Protection
- 3 Ant-Ice/De-Ice
- 4 Cargo Hook/Personnel Hoisting
- 5 Emergency Floatation
- 6 Rotor Brakes

SECTION 3: THEORY OF FLIGHT

PRINCIPLES OF FLIGHT

- 1 Bernoulli's Theorem
- 2 Newton's Laws

DEFINITIONS

- 1 Aerofoil
- 2 Relative Airflow and Angle of Attack
- 3 Chord Line
- 4 Camber
- 5 Lift
- 6 Weight
- 7 Drag
- 8 Thrust
- 9 Pitch Angle/Angle of Incidence
- 10 Rotor Disc
- 11 Tip Path Plane
- 12 Coning
- 13 Feathering
- 14 Flapping
- 15 Dragging, Leading and Lagging
- 16 Phase Lag/Advance Angle
- 17 Coriolis Effect
- 18 Induced Flow
- 19 Dissymmetry of Lift

AERODYNAMICS

- 1 Four Basic Forces
- 2 Blade Design
- 3 Pressure Distribution about an Aerofoil
- 4 Rotor Systems (Main/Tail)
- 5 Velocities Affecting Rotor Systems
- 6 Translational Lift/Flight
- 7 Transitions
- 8 Tail Rotor Drift/Roll
- 9 Theory of Autorotation and Flare
- 10 Reverse Flow
- 11 Blade Stall
- 12 Over Pitching
- 13 Settling with Power
- 14 Recirculation
- 15 Vortex Ring State
- 16 Ground Resonance

LOAD FACTOR

- 1 Centrifugal Force/Weight
- 2 Linear/Turns
- 3 Structural Limitations
- 4 Gust Loads

FLIGHT CONTROLS

- 1 Cyclic
- 2 Collective
- 3 Control Orbits
- 4 Throttle/Governor
- 5 Tail Rotor Pedals
- 6 Aids to Stability

FORCES ACTING ON A HELICOPTER

- 1 Load Factor
- 2 Stability
- 3 Lift / Weight / Thrust / Drag

ROTOR DESIGN

- 1 Number / Speed of Blades
- 2 Rotor Blade Vortices
- 3 Limitations to Forward Speed and Vibrations
- 4 Autorotations
- 5 Tail Rotor
- 6 Ground Resonance

SECTION 4: METEOROLOGY

THE EARTH'S ATMOSPHERE

- 1 Properties
- 2 Vertical Structure
- 3 ICAO Standard Atmosphere

ATMOSPHERIC PRESSURE

- 1 Pressure Measurements
- 2 Station Pressure
- 3 Mean Sea Level Pressure
- 4 Pressure Systems and their Variations
- 5 Effects of Temperature
- 6 Horizontal Pressure Differences

METEOROLOGICAL ASPECTS OF ALTIMETRY

- 1 Pressure Altitude
- 2 Density Altitude
- 3 True Altitude
- 4 Altimeter Settings
- 5 Effects of both Pressure and Temperature

TEMPERATURE

- 1 Heating and Cooling of the Atmosphere – Convection / Advection / Radiation
- 2 Horizontal Differences
- 3 Temperature Variations with Altitude
- 4 Inversions
- 5 Isothermal Layers

MOISTURE

- 1 Relative Humidity / Dewpoint
- 2 Sublimation and Condensation
- 3 Cloud Formation
- 4 Precipitation
- 5 Saturated and Dry Adiabatic Lapse Rates

STABILITY AND INSTABILITY

- 1 Lapse Rate and Stability
- 2 Modification of Stability
- 3 Characteristics of Stable and Unstable Air
- 4 Surface Heating and Cooling
- 5 Lifting Processes
- 6 Subsidence / Convergence

CLOUDS

- 1 Classification
- 2 Formation
- 3 Types and Recognition
- 4 Associated Precipitation and Turbulence

TURBULENCE

- 1 Convection
- 2 Mechanical
- 3 Orographic
- 4 Clear Air Turbulence
- 5 VIRGA – Evaporation Cooling
- 6 Reporting Criteria
- 7 Mountain Waves

WIND

- 1 Pressure Gradient
- 2 Deflection caused by the Earth's Rotation
- 3 Low Level Winds – Variation in Surface Wind
- 4 Friction
- 5 Centrifugal Force
- 6 Veer and Back
- 7 Squalls and Gusts
- 8 Diurnal Effects
- 9 Land and Sea Breezes
- 10 Katabatic / Anabatic Effects
- 11 Topographical Effects
- 12 Wind Shear, Types and Causes

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- 1 Definition and Characteristics
- 2 Formation
- 3 Classification
- 4 Modification
- 5 Factors that Determine Weather
- 6 Seasonal and Geographic Effects
- 7 Air Masses affecting North America

FRONTS

- 1 Structure
- 2 Types
- 3 Formation
- 4 Cross-sections
- 5 Discontinuities Across Fronts
- 6 Frontal Waves and Occlusions
- 7 Frontogenesis and Frontolysis

FRONTAL WEATHER

- 1 Warm Front
- 2 Cold Front
- 3 Stationary Front
- 4 TROWAL and Upper Fronts

AIRCRAFT ICING

- 1 Formation
- 2 Types of Ice
- 3 Reporting Criteria
- 4 Cloud Types and Icing
- 5 Freezing Rain and Drizzle
- 6 Icing in Clear Air (Hoar Frost)
- 7 Collection Efficiency
- 8 Aerodynamic Heating

THUNDERSTORMS

- 1 Requirements for Development
- 2 Life Cycle
- 3 Classification – Air mass, Frontal, Squall Line, Convective, Orographic and Nocturnal
- 4 Tornadoes and Hurricanes
- 5 Hazards – Turbulence, Hail, Rain, Icing, Altimetry, Lightning, Gust Fronts, Downbursts and Microbursts

SURFACE BASED LAYERS

- 1 Fog Formation
- 2 Fog Types (including mist)
- 3 Haze and Smoke
- 4 Blowing Obstructions to Vision

METEOROLOGICAL SERVICES AVAILABLE TO PILOTS

- 1 Aviation Weather Briefing Service (AWBS)
- 2 Aviation Weather Information Service (AWIS)
- 3 Flight Service Stations (FSS)
- 4 Weather Broadcasts by FSS
- 5 Atmospheric Environment Service Weather Briefing
- 6 Transcribed Weather Broadcasts (TWB)
- 7 DUATS – Commercial Weather Service
- 8 Automatic Terminal Information Service (ATIS)
- 9 VOLMET (HF) Broadcast
- 10 Pilots Automatic Telephone Weather Answering Service (PATWAS)

AVIATION WEATHER REPORTS

- 1 Aviation Routine Weather Report (METAR)
- 2 SPECI
- 3 Decoding
- 4 AWOS
- 5 Pilot Reports (PIREP/AIREP)

AVIATION FORECASTS

- 1 Times Issued and Validity Periods
- 2 Decoding
- 3 Graphical Area Forecasts (GFA) and AIRMET
- 4 Aerodrome Forecasts (TAF)
- 5 Upper Level Winds and Temperature Forecasts (FD)
- 6 Significant In-flight Weather Warning Messages (SIGMET)

WEATHER MAPS AND PROGNOSTIC CHARTS

- 1 Times Issued and Validity Periods
- 2 Symbols and Decoding
- 3 Surface Weather Map
- 4 Prognostic Surface Chart
- 5 Upper Level Chart – ANAL (850 – 700 mb)
- 6 Significant Weather Prognostic Chart FL100 – 250 (700 – 400 mb)

SECTION 5: INSTRUMENTS

FLIGHT INSTRUMENTS – PRINCIPLES AND OPERATIONAL USE

- 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 (HSI)
- 12 Flight Director

FLIGHT MANAGEMENT INSTRUMENTS

- 1 Flight Management System (FMS)
- 2 Electronic Flight Instrument System (EFIS)

ENGINE AND TRANSMISSION INSTRUMENTS – PRINCIPLES AND USE

- 1 N1 / N2 / Rotor Tachometer
- 2 Torquemeter or Degrees of Pitch
- 3 Transmission
- 4 Oil Temperatures and Pressures
- 5 Turbine Temperature
- 6 Fuel Pressure
- 7 Fuel Flow

AIRCRAFT COMPASS SYSTEMS

- 1 Construction
- 2 Use
- 3 Limitations and Faults
- 4 Gyromagnetic Remote Indicating Compass

SECTION 6: NAVIGATION – GENERAL

NAVIGATION TERMS

- 1 Air Position
- 2 Great Circle
- 3 Rhumb Line
- 4 Greenwich Hour Angle

MAPS AND CHARTS

- 1 Lambert Conformal
- 2 Transverse Mercator
- 3 Enroute Low Altitude Charts

TIME AND LONGITUDE

- 1 Time Zones and Relation to Longitude

FLIGHT PLANNING CALCULATIONS

- 1 Heading and True Airspeed
- 2 Wind and Wind Speed
- 3 IAS – CAS – EAS – TAS
- 4 Track and Groundspeed
- 5 Time
- 6 Weight and Balance
- 7 Fuel Load / Zero Fuel Weight
- 8 Pay Load / Weight Shift
- 9 Critical Point (CP)
- 10 Point of No Return (PNR) / Radius of Action

FLIGHT PLAN FORMS

- 1 Flight Plan
- 2 Flight Itinerary

EN ROUTE NAVIGATION

- 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

LONG RANGE AREA NAVIGATION (LORAN C)

- 1 Principals of Operation
- 2 Inaccuracies and Reception 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)
- 7 Very Low Frequency (VLF)
Navigation Systems – Basic
Principle only

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 (V_y)
- 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 – V_y , V_{ne}

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.P. 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 (CO₂)

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)
- AWARE (Aviation Weather... Playing by the Rules) Aeronautical Information Publication (A.I.P. Canada) (TP 2300E)
- *Canadian Aviation Regulations* (CARs)
- Flying the Weather VFR (TP 3115E)

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>