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TP 13524E
(Revised 10/2014)

Study and Reference Guide

for written examination for the

Type Rating for Two Crew Aeroplane or Cruise Relief Pilot (IATRA)

Third edition
August 2006

Canada

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You may reproduce this guide as required and it can be found at
<http://www.tc.gc.ca/eng/civilaviation/opssvs/general-exams-guides-menu-2014.htm>

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GENERAL

The conditions of issue of all flight crew licences are stated in the *Canadian Aviation Regulations (CARs)*.

KNOWLEDGE REQUIREMENTS

Applicants for the Aeroplane Type Rating Two Crew Aeroplane or Two Crew Aeroplane Restricted to Cruise Relief shall demonstrate their knowledge by writing a Transport Canada 50 question multiple-choice examination on subjects contained in this guide. Applicants must also be able to read the examination in either English or French without assistance.

All subjects in this guide are considered to be important to applicants for the Aeroplane Type Rating.

EXAMINATION FEEDBACK

Feedback statements on the results letter will inform the candidate which questions were answered incorrectly.

Example of Feedback Statement: Recall the rules that apply to inoperative ELTs.

EXAMINATION

This examination contains questions concerning weight and balance graphs, human factors and aeronautics appropriate to two crew aeroplanes.

Examination	Questions	Time Limit	Pass Mark
Aircraft Type Rating	50	2 hours	70%

EXAMINATION RULES

CAR 400.02

- (1)** Except as authorized by an invigilator, no person shall, or shall attempt to, in respect of a written examination,
 - a) copy or remove from any place all or any portion of the text of the examination;
 - b) give to or accept from any person a copy of all or any portion of the text of the examination;
 - c) give help to or accept help from any person during the examination;
 - d) complete all or any portion of the examination on behalf of any other person; or
 - e) use any aid or written material during the examination.

- (2)** A person who commits an act prohibited under subsection (1) fails the examination and may not take any other examination for a period of one year.

MATERIALS REQUIRED

A pencil is required for rough work. Electronic calculators are useful and are permitted if their memory is cleared before and after the examination. Computers capable of storing text are not approved. A list of approved electronic navigation computers is available at:

<http://www.tc.gc.ca/eng/civilaviation/opssvs/general-exams-computers-2011.htm>

VALIDITY TIME LIMIT

Examinations, including all sections of a sectionalized examination, that are required for the issuance of a permit or licence or for the endorsement of a permit or licence with a rating shall be completed during the 24-month period immediately preceding the date of the application for the permit, licence or rating.

REWRITING OF EXAMINATIONS

CAR 400.04 (1)

Subject to subsections (2) and (6), a person who fails an examination or a section of a sectionalized examination required for the issuance of a flight crew permit, licence, rating or foreign licence validation certificate is ineligible to rewrite the examination or the failed section for a period of

- a) in the case of a first failure, 14 days;
- b) in the case of a second failure, 30 days; and
- c) in the case of a third or subsequent failure, 30 days plus an additional 30 days for each failure in excess of two failures, up to a maximum of 180 days.

AIR LAW AND PROCEDURES

CANADIAN AVIATION REGULATIONS (CARs)

Questions from the CARs may test knowledge of the Regulation or the Standard.

PART I - GENERAL PROVISIONS

101.01 Interpretation

PART IV - PERSONNEL LICENSING AND TRAINING

401 - FLIGHT CREW PERMITS, LICENCES AND RATINGS

401.03 Requirement to Hold a Flight Crew Permit, Licence or Rating or a Foreign Licence Validation Certificate.

401.05 Recency Requirements

PART VI – GENERAL OPERATING AND FLIGHT RULES

601-AIRSPACE

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

601.05 IFR Flight in Class A, B, C, D or E Airspace or Class F Special Use Restricted or Class F Special Use Advisory Controlled Airspace

602 – GENERAL OPERATING AND FLIGHT RULES

GENERAL

602.02 Fitness of Flight Crew Members

602.03 Alcohol or Drugs - Crew Members

602.05 Compliance with Instructions

602.07 Aircraft Operating Limitations

602.08 Portable Electronic Devices

602.09 Fuelling with Engines Running

602.10 Starting and Ground Running of Aircraft Engines

602.11 Aircraft Icing

602.31 Compliance with Air Traffic Control Instructions and Clearances

602.32 Airspeed Limitations

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

602.37 Altimeter-setting and Operating Procedures in Transition Between Regions

602.38 Flight over the High Seas

602.46 Refusal to Transport

FLIGHT PREPARATION, FLIGHT PLANS AND FLIGHT ITINERARIES

- 602.71 Pre-flight Information
- 602.72 Weather Information
- 602.73 Requirements to file a Flight Plan or a Flight Itinerary
- 602.74 Contents of a Flight Plan or Flight Itinerary
- 602.75 Filing of a Flight Plan or Flight Itinerary
- 602.76 Changes in the Flight Plan
- 602.77 Requirement to File an Arrival Report

PRE-FLIGHT AND FUEL REQUIREMENTS

- 602.86 Carry-on Baggage, Equipment and Cargo
- 602.87 Crew Member Instructions
- 602.88 Fuel Requirements
- 602.89 Passenger Briefings

OPERATIONS AT OR IN THE VICINITY OF AN AERODROME

- 602.96 General
- 602.97 VFR and IFR Aircraft Operations at Uncontrolled Aerodromes within an MF Area
- 602.98 General MF Reporting Procedures
- 602.104 Reporting Procedures for IFR Aircraft When Approaching or Landing at an Uncontrolled Aerodrome
- 602.105 Noise Operating Criteria
- 602.106 Noise-Restricted Runways

EMERGENCY COMMUNICATIONS AND SECURITY

- 602.145 ADIZ
- 602.146 ESCAT Plans

604 – PRIVATE OPERATOR PASSENGER TRANSPORTATION

GENERAL PROVISIONS

- 604.01 Interpretation
- 604.02 Application
- 604.03 Prohibition

FLIGHT OPERATIONS

- 604.25 Operational Control System
- 604.26 Designation of Pilot-in command and Second-in-command
- 604.28 Instrument Approaches - Landing

FLIGHT OPERATIONS - DOCUMENTS

- 604.36 Checklist
- 604.37 Aircraft Operating Manual
- 604.38 Operational Flight Data Sheet

FLIGHT OPERATIONS - PASSENGERS

- 604.81 Flight Attendants
- 604.82 Cabin Safety
- 604.83 Fuelling with Passengers on Board
- 604.84 Fuelling with Passengers on Board and an Engine Running
- 604.85 Briefing of Passengers
- 604.86 Safety Features Card

FLIGHT TIME AND FLIGHT DUTY TIME

- 604.98 Flight Time Limits
- 604.99 Flight Duty Time and Rest Periods
- 604.100 Split Flight Duty Time
- 604.102 Unforeseen Operational Circumstances
- 604.103 Delayed Reporting Time
- 604.104 Time with no Assigned Duties
- 604.105 Rest Period – Flight Crew Member Positioning
- 604.106 Controlled Rest on the Flight Deck

MAINTENANCE

- 604.128 Maintenance, Elementary Work and Servicing

PERSONNEL REQUIREMENTS

- 604.139 Validity Periods
- 604.143 Flight Crew Member qualifications and Training

OPERATIONS MANUAL

- 604.198 Distribution

SAFETY MANAGEMENT SYSTEM

- 604.205 Duties of Personnel

605 - AIRCRAFT REQUIREMENTS

AIRCRAFT REQUIREMENTS - GENERAL

- 605.04 Availability of Aircraft Flight Manual
- 605.06 Aircraft Equipment Standards and Serviceability
- 605.08 Unserviceable and Removed Equipment - General
- 605.09 Unserviceable and Removed Equipment - Aircraft with a Minimum Equipment List
- 605.10 Unserviceable and Removed Equipment - Aircraft without a Minimum Equipment List

AIRCRAFT EQUIPMENT REQUIREMENTS

- 605.30 De-icing or Anti-icing Equipment
- 605.32 Use of Oxygen
- 605.33 Use of Flight Data Recorder and Cockpit Voice Recorder

- 605.36 Altitude Alerting System or Device
- 605.37 GPWS
- 605.40 ELT Activation
- 605.41 Third Attitude Indicator

TECHNICAL RECORDS

- 605.94 Journey Log Requirements
- 605.95 Journey Log - Carrying on Board

PART VII – COMMERCIAL AIR SERVICES

700 - GENERAL

FLIGHT TIME AND FLIGHT DUTY TIME LIMITATIONS AND REST PERIODS

- 700.15 Flight Time Limitations
- 700.16 Flight Duty Time Limitations and Rest Periods
- 700.17 Unforeseen Operational Circumstances
- 700.18 Delayed Reporting time
- 700.19 Requirements for Time Free from Duty
- 700.20 Flight Crew Positioning
- 700.21 Flight Crew Members on Reserve
- 700.22 Long-range Flights
- 700.23 Controlled Rest on the Flight Deck

AIR TRANSPORT SERVICES

AIRCRAFT EQUIPMENT REQUIREMENTS

- 703.65, 704.64 and 705.70 Airborne Thunderstorm Detection and Weather Radar Equipment
- 703.67, 704.66 and 705.71 Protective Breathing Equipment
- 703.69, 704.68 and 705.75 Shoulder Harnesses

FLIGHT OPERATIONS

- 703.26, 704.22 and 705.30 Simulation of Emergency Situations
- 704.20 and 705.25 Fuel Requirements
- 704.26 and 705.34 Take-Off Minima
- 704.27 and 705.35 No Alternate Aerodrome-IFR Flight

COMMUTER and AIRLINE OPERATIONS

AIRCRAFT PERFORMANCE OPERATING LIMITATIONS

- 704.46 and 705.56 Take-off Weight Limitations
- 704.47 and 705.57 Net Take-off Flight Path
- 704.48 and 705.58 Enroute Limitations with One Engine Inoperative

705 – AIRLINE OPERATIONS

- 705.26 Extended Range Twin-engined Operations
- 705.29 Flight Crew Members at Controls
- 705.31 Crew Member Briefing

PROCEDURES

AERONAUTICAL INFORMATION MANUAL (TC AIM)

- Aviation safety investigation
- Definitions
- Reporting an aviation occurrence
- Protection of occurrence sites,
aircraft and documentation
- NOTAMs

OPERATIONS IN HIGH LEVEL DOMESTIC AIRSPACE

- Altimeter setting procedures
- Cruising altitudes
- Mach number/TAS Changes

AIR TRAFFIC SERVICES AND PROCEDURES

- Air Traffic and advisory services
- Communications procedures
- Radar service
- ATC clearances and instructions
- Wake turbulence separation
- Airport/aerodrome operations –
Controlled/uncontrolled
- Mandatory and aerodrome traffic
frequencies
- VFR en route procedures
- VFR holding procedures
- Land and Hold Short Operations
(LAHSO)

AIRFRAMES, ENGINES, PROPELLERS AND AIRCRAFT SYSTEMS

ENGINES

- Principles of turbo-prop engines
- Handling procedures for turbo-prop engines
- Principles of turbo-jet engines
- Handling procedures for turbo-jet engines

PROPELLERS

- Controls
- Ground and flight range
- Feathering
- Reversing

AIRCRAFT SYSTEMS

- Hydraulics
- Warnings (ice, fire, GPWS, TCAS, altitude alert)
- De-icing and anti-icing
- Oxygen
- Pressurization
- Landing gear/brakes
- Pneumatics
- Electrical

METEOROLOGY

TURBULENCE

- Clear Air Turbulence
- VIRGA

THUNDERSTORMS

- **Hazards:** turbulence, hail, rain, icing, altimetry, lightning, gust fronts, downbursts, microbursts, windshear

WEATHER MAPS AND PROGNOSTIC CHARTS

- Times issued/ validity periods
- Symbols/ decoding
- Surface Weather Analysis
- Upper Level Charts - ANAL (850mb, 700mb, 500mb & 250mb)
- Upper Level Charts - PROG (FL240, FL340, FL450)
- Significant Weather Prognostic Chart FL100-250 (700-400mb) & FL250-600 (400 -100 mb)
- Satellite Images
- Radar Images

AVIATION FORECASTS

- Times issued/ validity periods
- Decoding
- Graphical Area Forecasts (GFA/AIRMET)
- Terminal Area Forecasts (TAF)
- Upper Level Winds and Temperature Forecasts (FD)
- Significant In-flight Weather Warning Message (SIGMET)

AIRCRAFT ICING

- Type of ice formation - rime, clear
- Reporting criteria
- Cloud types and icing
- Freezing rain and drizzle
- Icing in clear air/hoar frost
- Collection efficiency

METEOROLOGICAL SERVICES AVAILABLE TO PILOTS

- Flight Information Centres (FIC)
- Aviation Weather Web Site
- Pilot's Automatic Telephone Weather Answering Service (PATWAS)
- Automatic Terminal Information Service (ATIS)
- VOLMET (HF) Broadcast

AVIATION WEATHER REPORTS

- Aviation Routine Weather Report (METAR)
- SPECI
- Decoding
- AWOS
- Pilot Reports (PIREP/AIREP)

FLIGHT INSTRUMENTS

PRINCIPLES AND OPERATIONAL USE

- Machmeter
- Altimeter and encoding
- Radio/Radar Altimeter
- Attitude Indicator (AI)
- Flight Director
- Radio Magnetic Indicator (RMI)
- Horizontal Situation Indicator (HSI)
- Angle of attack indicator

ENGINE INSTRUMENTS - PRINCIPLES AND USE

- Engine Pressure Ratio (EPR)
- Turbine Temperature (ITT/TIT)

AIRCRAFT COMPASS SYSTEMS

- Magnetic compass
- Gyromagnetic Remote Indicating Compass

NAVIGATION

FLIGHT PLANNING CALCULATIONS

- Heading and true airspeed
- Wind and wind speed
- IAS-CAS-EAS-TAS
- Track and groundspeed
- Mach
- Weight and Balance/load adjustment
- Flight planned fuel requirements, fuel load, zero fuel weight
- Critical Point (CP)

FLIGHT PLAN FORMS

- Flight plan
- Flight itinerary

EN ROUTE NAVIGATION

- Use of aeronautical charts
- Determining wind velocity

RADIO COMMUNICATIONS AND AIDS TO NAVIGATION

EMERGENCY LOCATOR TRANSMITTER (ELT)

- Testing
- Downed aircraft procedures

RADAR

- Weather radar

NAVIGATION SYSTEMS/APPROACH AIDS

- Global Navigation Satellite System (GNSS)/GPS
- Automatic Direction Find (ADF)
- VHF Omnidirectional Range (VOR)
- Distance Measuring Equipment (DME)
- Area Navigation System (RNAV)
- Inertial Navigation System (INS)
- Inertial Reference System (IRS)
- VHF/DF
- Instrument Landing System (ILS)
- VASIS/PAPI

FLIGHT OPERATIONS

PERFORMANCE

- Cruising for range/endurance
- Flight performance “V” speeds
- Effect of changes in weight and load distribution
- Hydroplaning
- Wind shear-effects/avoidance
- Landing techniques

CHARTS AND GRAPHS

- Weight and Balance
- Take-off
- Climb
- Cruise
- Descent
- Landing
- Crosswind

CRITICAL SURFACE CONTAMINATION

- Clean aircraft concept/practices/techniques
- Cold-Soaking phenomenon
- De-icing and anti-icing/fluids procedures
- Holdover time
- Critical surface inspections
- Pre-take-off inspection
- Health effects of deice fluids
- Application guideline tables

WAKE TURBULENCE

- Causes/effects
- Avoidance procedures
- Separation criteria and waiver

THEORY OF FLIGHT

WING DESIGN

- Wing tip vortices
- Sweepback
- Leading and trailing edge devices
- Vortex generators
- Spoilers

HUMAN FACTORS

AVIATION PHYSIOLOGY

- Hypoxia/hyperventilation
- Gas expansion effects
- Hearing
- Orientation/disorientation visual and vestibular illusions
- Positive/negative “G”
- Circadian rhythms/jet lag
- Sleep/fatigue

THE OPERATING ENVIRONMENT

- Medications/prescribed, over the counter
- Substance abuse/alcohol, drugs
- Pregnancy
- Heat/cold
- Noise/vibration
- Toxic hazards/carbon monoxide

AVIATION PSYCHOLOGY

- Decision - making/factors/process
- Situational awareness
- Stress
- Managing risk

PILOT - EQUIPMENT

- Standard Operating Procedures (SOPs)
- Correct use of charts, checklists, manuals
- Cockpit visibility/eye reference position/ seat

INTERPERSONAL RELATIONS

- Cockpit Resource Management
- Communication with company/flight/ cabin
- crew/passengers
- Safety Management Systems (SMS)
- Risk management

TABLES AND CHARTS

Pilots are expected to be able to correct aircraft imbalance. Below is a formula for shifting weights.

WEIGHT SHIFT FORMULA

$\frac{\text{WEIGHT OF CARGO MOVED}}{\text{WEIGHT OF AEROPLANE}} = \frac{\text{DISTANCE CG MOVED}}{\text{DISTANCE BETWEEN ARM LOCATION}}$

Pilots of two-crew aircraft are expected to use and interpret loading and performance charts and tables applicable to two-crew aeroplanes. Applicants should review charts such as takeoff performance charts, cruise performance charts, buffet boundary charts, descent charts, landing performance charts and aircraft loading charts. Pilots must understand how weight, altitude, configuration and environmental factors affect aircraft performance.

RECOMMENDED STUDY MATERIAL

- *Canadian Aviation Regulations (CARs)*
<http://laws-lois.justice.gc.ca/eng/regulations/SOR-96-433/index.html>
- *Aeronautical Information Manual (TC AIM) (TP 14371E)*
<https://www.tc.gc.ca/eng/civilaviation/publications/tp14371-menu-3092.htm>
- *Air Command Weather Manual (TP 9352E)*
- *Air Command Weather Manual (Supplement) (TP 9353E)*
- *When in Doubt... Small and Large Aircraft - Aircraft Critical Surface Contamination Training (TP 10643E)*
- *Human Factors for Aviation - Advanced Handbook (TP 12864E)*
- *The Pilot's Guide to Medical Human Factors*
- *Canada Flight Supplement (CFS)*
- *Canada Air Pilot (CAP)/CAP General*

Additional references produced by commercial publishers can be obtained through local flying training organizations and bookstores.

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/eng/civilaviation/opssvs/general-exams-centres-2010.htm>