Study and Reference Guide
for written examination for the
Type Rating for
Two Crew Aeroplane or
Cruise Relief Pilot
(IATRA)
Third edition
August 2006
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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.

<table>
<thead>
<tr>
<th>Examination</th>
<th>Questions</th>
<th>Time Limit</th>
<th>Pass Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aircraft Type Rating</td>
<td>50</td>
<td>2 hours</td>
<td>70%</td>
</tr>
</tbody>
</table>

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.
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- 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

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

CHARTS AND GRAPHS
- Weight and Balance
- Take-off
- Climb
- Cruise
- Descent
- Landing
- Crosswind

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)
- Aeronautical Information Manual (TC AIM) (TP 14371E)
- 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: