Study and Reference Guide

for written examinations for the

Airline Transport Pilot Licence

Aeroplane

Twentieth Edition
October 2006
# TABLE OF CONTENTS

**GENERAL**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>KNOWLEDGE REQUIREMENTS</td>
<td>1</td>
</tr>
<tr>
<td>EXAMINATION RULES</td>
<td>1</td>
</tr>
<tr>
<td>TIME LIMIT</td>
<td>1</td>
</tr>
<tr>
<td>REWRITING OF EXAMINATIONS</td>
<td>1</td>
</tr>
<tr>
<td>EXAMINATION FEEDBACK</td>
<td>1</td>
</tr>
</tbody>
</table>

**EXAMINATIONS**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONVERSION EXAMINATION – FAA AIRLINE TRANSPORT PILOT CERTIFICATE – AEROPLANE</td>
<td>2</td>
</tr>
<tr>
<td>SECTION 1: AIR LAW AND PROCEDURES</td>
<td>3</td>
</tr>
<tr>
<td>SECTION 2: AIRFRAMES, ENGINES, PROPELLERS AND AIRCRAFT SYSTEMS</td>
<td>16</td>
</tr>
<tr>
<td>SECTION 3: METEOROLOGY</td>
<td>17</td>
</tr>
<tr>
<td>SECTION 4: INSTRUMENTS</td>
<td>20</td>
</tr>
<tr>
<td>SECTION 5: NAVIGATION – GENERAL</td>
<td>21</td>
</tr>
<tr>
<td>SECTION 6: RADIO COMMUNICATIONS AND AIDS TO NAVIGATION</td>
<td>22</td>
</tr>
<tr>
<td>SECTION 7: FLIGHT OPERATIONS</td>
<td>23</td>
</tr>
<tr>
<td>SECTION 8: THEORY OF FLIGHT</td>
<td>24</td>
</tr>
<tr>
<td>SECTION 9: HUMAN FACTORS</td>
<td>25</td>
</tr>
<tr>
<td>SECTION 10: TABLES AND CHARTS</td>
<td>26</td>
</tr>
</tbody>
</table>

**RECOMMENDED STUDY MATERIAL**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

**ENQUIRIES**

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>
GENERAL
Sections with sidebars indicate new topic areas.

KNOWLEDGE REQUIREMENTS
An applicant for an ATPL-A is expected to have mastered the various subjects included in this guide in addition to material required to obtain a Commercial Pilot Licence – Aeroplane (see TP 12881E).

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.

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) 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.

EXAMINATION FEEDBACK
Feedback statement on the results letter will inform the candidate where questions were answered incorrectly.

Example of Feedback Statement
Identify the atmospheric conditions favourable to thunderstorm formation.
## EXAMINATIONS

The examinations are as follows:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Questions</th>
<th>Time Limit</th>
<th>Pass Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aviation Regulations and Air Traffic Procedures, Aeroplane Operations and General Navigation – SARON</td>
<td>80</td>
<td>3½ hours</td>
<td>70%</td>
</tr>
<tr>
<td>Meteorology, Radio Aids to Navigation and Flight Planning – SAMRA</td>
<td>80</td>
<td>3½ hours</td>
<td>70%</td>
</tr>
</tbody>
</table>

The Instrument Rating (INRAT) examination must also be written and passed (70%) to obtain an Airline Transport Pilot Licence – Aeroplane (ATPL-A).

### CONVERSION EXAMINATION – FAA AIRLINE TRANSPORT PILOT CERTIFICATE – AEROPLANE

Pilots who hold an United States of America Airline Transport Pilot certificate – Aeroplane, which has not been “issued on the basis...” of another foreign licence, may demonstrate their knowledge by writing the following Transport Canada multiple choice examination:

<table>
<thead>
<tr>
<th>Examination</th>
<th>Questions</th>
<th>Time Limit</th>
<th>Pass Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Law and Procedures (FAAAAA)</td>
<td>25</td>
<td>1½ hour</td>
<td>70%</td>
</tr>
</tbody>
</table>

The FAAAAA examination is based on subjects contained in the Air Law and Procedures section of this Study and Reference Guide and the conversion examination topics in the Instrument Rating Study and Reference Guide (TP 691E).
SECTION 1: AIR LAW AND PROCEDURES

CANADIAN AVIATION REGULATIONS (CARs)

Some Canadian Aviation Regulations (CARs) refer to their associated standards. Questions from the CARs may test knowledge from the regulation or the standard.

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
103.12 Definition of “Principal”

106 – ACCOUNTABLE EXECUTIVE

106.01 Application
106.02 Appointment and acceptance
106.03 Accountability
106.04 More than one certificate

107 – SAFETY MANAGEMENT SYSTEM REQUIREMENTS

107.01 Application
107.02 Establishing a safety management system
107.03 Safety management system
107.04 Size

PART II – AIRCRAFT IDENTIFICATION AND REGISTRATION AND OPERATION OF A LEASED AIRCRAFT BY A NON-REGISTERED OWNER

203 – OPERATION OF A LEASED AIRCRAFT BY A NON-REGISTERED OWNER

203.02 Application
203.03 Leasing Operations – General
203.04 Leasing Operations – International
203.05 Registration of Leased Aircraft
203.06 Forwarding of Airworthiness Directives
203.07 Maximum Number of Leased Aircraft
203.08 Limits on Period of Operation under Authorization
203.09 Submission of Signed Lease
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, LICENSES 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
401.11 Airline Transport Licence Training Program
401.34 ATPL Privileges – Aeroplane
401.47 Instrument Rating Privileges
401.48 Instrument Rating Period of Validity
401.52 Second Officer Rating
401.53 Second Officer Privileges
401.61 Flight Instructor Rating

404 – MEDICAL REQUIREMENTS

404.03 Requirement to Hold a Medical Certificate
404.04 Issuance, Renewal and Validity Period of Medical Certificate
404.06 Prohibitions Regarding Exercise of Privileges
404.10 Medical Certificate Requirements for Personnel Licences
404.18 Permission to Continue to Exercise the Privileges of a Licence or Rating
PART V – AIRWORTHINESS
STANDARDS

AIR WORTHINESS MANUAL CHAPTER 525 – TRANSPORT CATEGORY AIRPLANES

SUB-CHAPTER D – DESIGN AND CONSTRUCTION

525.855 Cargo and Baggage Compartments
525.857 Cargo Compartment Classification

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
601.05 IFR Flight in Class A, B, C, D or E Airspace or Class F Special Use Restricted or Advisory Controlled Airspace
601.06 VFR Flight in Class A Airspace
601.07 VFR Flight in Class B Airspace
601.08 VFR Flight in Class C Airspace
601.09 VFR Flight in Class D Airspace
601.14 Interpretation
601.15 Forest Fire Aircraft Operating Restrictions
601.16 Issuance of NOTAM for Forest Fire Aircraft Operating Restrictions
601.17 Exceptions
601.18 Orders Prohibiting or Restricting Aircraft Operations
601.20 Projection of a Directed Bright Light Source at an Aircraft
601.21 Requirement for Notification
601.22 Requirement for Pilot-in-Command
602 – OPERATING AND FLIGHT RULES

602.01 Reckless or Negligent Operation of Aircraft
602.02 Fitness of Flight Crew Members
602.03 Alcohol or Drugs – Crew Members
602.04 Alcohol or Drugs – Passengers
602.06 Smoking
602.07 Aircraft Operating Limitations
602.08 Portable Electronic Devices
602.09 Fueling with Engines Running
602.10 Starting and Ground Running of Aircraft Engines
602.11 Aircraft Icing
602.12 Overflight of Built-up Areas or Open-Air Assemblies of Persons during Take-offs, Approaches and Landings
602.13 Take-offs, Approaches and Landings within Built-up Areas of Cities and Towns
602.14 Minimum Altitudes and Distances
602.15 Permissible Low Altitude Flight
602.17 Carriage of Persons during Low Altitude Flight
602.19 Right-of-Way – General
602.20 Right-of-Way – Aircraft Maneuvering on Water
602.21 Avoidance of Collision
602.22 Towing
602.23 Dropping of Objects
602.24 Formation Flight
602.25 Entering or Leaving an Aircraft in Flight
602.26 Parachute Descents
602.27 Aerobatic Maneuvers – Prohibited Areas and Flight Conditions
602.28 Aerobatic Maneuvers with Passengers
602.30 Fuel Dumping
602.31 Compliance with Air Traffic Control Instructions and Clearances
602.32 Airspeed Limitations
602.33 Supersonic Flight
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
602.39 Transoceanic Flight
602.40 Landing at or Take-off from an Aerodrome at Night

OPERATIONAL AND EMERGENCY EQUIPMENT REQUIREMENTS

602.58 Prohibition
602.59 Equipment Standards
602.60 Requirements for Power-driven Aircraft
602.61 Survival Equipment – Flights Over Land
602.62 Life Preservers and Flotation Devices
602.63 Life Rafts and Survival Equipment – Flights over Water
FLIGHT PREPARATION, FLIGHT PLANS AND FLIGHT ITINERARIES

602.70 Interpretation
602.71 Pre-flight Information
602.72 Weather Information
602.73 Requirement 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
602.78 Contents of an Arrival Report
602.79 Overdue Aircraft Report
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 Requirements
602.99 MF Reporting Procedures before Entering Maneuvering Area
602.100 MF Reporting Procedures on Departure
602.101 MF Reporting Procedures on Arrival
602.102 MF Reporting Procedures When Flying Continuous Circuits
602.103 Reporting Procedures When Flying Through an MF Area
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

VISUAL FLIGHT RULES

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
602.117 Special VFR Flight

INSTRUMENT FLIGHT RULES

602.121 General Requirements
602.122 Alternate Aerodrome Requirements
602.123 Alternate Aerodrome Weather
602.124 Minimum Altitudes to Ensure Obstacle Clearance
602.125 Enroute IFR Position Reports
602.126 Take-off Minima
602.127 Instrument Approaches
602.128 Landing Minima
602.129 Approach Ban – General
602.130 Approach Ban – Cat III
RADIOCOMMUNICATIONS

602.136 Continuous Listening Watch
602.137 Two-way Radio communication Failure in IFR Flight
602.138 Two-way Radio communication Failure in VFR Flight

EMERGENCY COMMUNICATION AND SECURITY

602.143 Emergency Radio Frequency Capability
602.144 Interception Signals, Interception of Aircraft and Instructions to Land
602.145 ADIZ
602.146 ESCAT Plan

604 – PRIVATE OPERATOR PASSENGER TRANSPORTATION

GENERAL

604.01 Interpretation
604.02 Application
604.03 Certificate
604.04 Management System
604.05 Contents of a Certificate
604.06 Issuance of Authorizations
604.07 Ministerial Orders if Safety Compromised

FLIGHT OPERATIONS AND TRAINING

604.21 VFR Flight Minimum Flight Visibility – Uncontrolled Airspace
604.22 No Alternate Aerodrome – IFR Flight
604.23 Take-off Minima
604.24 Instrument Approach Procedures
604.25 Navigation System
604.26 Training Program
604.27 Aircraft Operating Manual

605 – AIRCRAFT REQUIREMENTS

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
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

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>605.14</td>
<td>Power-driven Aircraft – Day VFR</td>
</tr>
<tr>
<td>605.15</td>
<td>Power-driven Aircraft – VFR OTT</td>
</tr>
<tr>
<td>605.16</td>
<td>Power-driven Aircraft – Night VFR</td>
</tr>
<tr>
<td>605.17</td>
<td>Use of Position and Anti-collision Lights</td>
</tr>
<tr>
<td>605.22</td>
<td>Seat and Safety-Belt Requirements</td>
</tr>
<tr>
<td>605.23</td>
<td>Restraint System Requirements</td>
</tr>
<tr>
<td>605.24</td>
<td>Shoulder Harness Requirements</td>
</tr>
<tr>
<td>605.25</td>
<td>General Use of Safety Belts and Restraints System</td>
</tr>
<tr>
<td>605.26</td>
<td>Use of Passenger Safety Belts and Restraint Systems</td>
</tr>
<tr>
<td>605.27</td>
<td>Use of Crew Member Safety Belts</td>
</tr>
<tr>
<td>605.28</td>
<td>Child Restraint System</td>
</tr>
<tr>
<td>605.29</td>
<td>Flight Control Locks</td>
</tr>
<tr>
<td>605.30</td>
<td>De-icing or Anti-icing Equipment</td>
</tr>
<tr>
<td>605.31</td>
<td>Oxygen Equipment and Supply</td>
</tr>
<tr>
<td>605.32</td>
<td>Use of Oxygen</td>
</tr>
<tr>
<td>605.33</td>
<td>Flight Data Recorder and Cockpit Voice Recorder Requirements</td>
</tr>
<tr>
<td>605.34</td>
<td>Use of Flight Data Recorders and Cockpit Voice Recorders</td>
</tr>
<tr>
<td>605.35</td>
<td>Transponder and Automatic Pressure-Altitude Reporting Equipment</td>
</tr>
<tr>
<td>605.36</td>
<td>Altitude Alerting System or Device</td>
</tr>
<tr>
<td>605.37</td>
<td>Ground Proximity Warning System</td>
</tr>
<tr>
<td>605.38</td>
<td>ELT</td>
</tr>
<tr>
<td>605.39</td>
<td>Use of ELTs</td>
</tr>
<tr>
<td>605.40</td>
<td>ELT Activation</td>
</tr>
<tr>
<td>605.41</td>
<td>Standby Attitude Indicator</td>
</tr>
<tr>
<td>605.84</td>
<td>Aircraft Maintenance – General</td>
</tr>
<tr>
<td>605.85</td>
<td>Maintenance Release and Elementary Work</td>
</tr>
<tr>
<td>605.86</td>
<td>Maintenance Schedule</td>
</tr>
<tr>
<td>605.87</td>
<td>Transfer of Aeronautical Products Between Maintenance Schedules</td>
</tr>
<tr>
<td>605.88</td>
<td>Inspection after Abnormal Occurrences</td>
</tr>
</tbody>
</table>

TECHNICAL RECORD

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>605.93</td>
<td>Technical Records – General</td>
</tr>
<tr>
<td>605.94</td>
<td>Journey Log Requirements</td>
</tr>
<tr>
<td>605.95</td>
<td>Journey Log – Carrying on Board</td>
</tr>
<tr>
<td>605.96</td>
<td>Requirements for Technical Records Other Than the Journey Log</td>
</tr>
<tr>
<td>605.97</td>
<td>Transfer of Records</td>
</tr>
</tbody>
</table>

606 – MISCELLANEOUS

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>606.01</td>
<td>Munitions of War</td>
</tr>
<tr>
<td>606.02</td>
<td>Liability Insurance</td>
</tr>
<tr>
<td>606.03</td>
<td>Synthetic Flight Training Equipment</td>
</tr>
</tbody>
</table>
PART VII – COMMERCIAL AIR SERVICES

700 – COMMERCIAL AIR SERVICES

700.01 Interpretation
700.02 Requirements for Air Operator Certificate
700.03 Authorization to Operate Specialty Air Service under NAFTA
700.04 Eligibility for Air Operator Certificate
700.05 Aircraft Requirements
700.06 Extended Charter
700.07 Management Agreement
700.08 Operations between Points Abroad
700.09 Duties of Certificate Holder

FLIGHT TIME AND FLIGHT DUTY TIME LIMITATIONS AND REST PERIODS

700.14 Monitoring System
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

704 – COMMUTER OPERATIONS

704.01 Application

FLIGHT OPERATIONS

704.12 Operating Instructions
704.13 General Operational Information
704.15 Operational Control System
704.16 Flight Authorization
704.17 Operational Flight Plan
704.19 Checklist
704.20 Fuel Requirements
704.21 Admission to Flight Deck
704.22 Simulations of Emergency Situations
704.23 VFR Flight Obstacle Clearance Requirements
704.24 VFR Flight Minimum Flight Visibility – Uncontrolled Airspace
704.25 VFR Flight Weather Conditions
704.26 Take-off Minima
704.27 No Alternate Aerodrome – IFR Flight
704.29 Routes in Uncontrolled Airspace
704.30 Instrument Approach Procedures
704.32 Weight and Balance Control
704.33 Apron and Cabin Safety Procedures
704.34 Briefing of Passengers
704.35 Safety Features Card

AIRCRAFT PERFORMANCE OPERATION LIMITATIONS

704.46 Take-off Weight Limitations
704.47 Net Take-Off Flight Path
704.48 Enroute Limitations with One Engine Inoperative
704.49 Dispatch Limitations: Landing at Destination and Alternate Aerodromes
704.50 Dispatch Limitations: Wet Runway – Turbo-jet-powered Aeroplanes

AIRCRAFT EQUIPMENT REQUIREMENTS

704.62 General Requirements
704.63 Operation of Aircraft in Icing Conditions
704.64 Airborne Thunderstorm Detection and Weather Radar Equipment
704.65 Additional Equipment for Single-Pilot Operations
704.66 Protective Breathing Equipment
704.67 First Aid Oxygen
704.68 Shoulder Harness

EMERGENCY EQUIPMENT

704.83 Hand-Held Fire Extinguisher
704.84 Equipment Standards and Inspection

PERSONNEL REQUIREMENTS

704.106 Minimum Crew
704.107 Designation of Pilot-in-command and Second-in-command
704.108 Flight Crew Member Qualifications
704.109 Qualifications of Operational Control Personnel
704.110 Check Authority
704.111 Validity Period

TRAINING

704.115 Training Program
704.116 Conditional Approval of Training Program
704.117 Training and Qualification Records

MANUALS

704.122 Distribution of Company Operations Manual
704.123 Aircraft Operating Manual
704.124 Standard Operating Procedures

705 – AIRLINE OPERATION

705.01 Application
FLIGHT OPERATIONS

705.16 Exceptions
705.20 Operational Control System
705.21 Flight Authorization
705.22 Operational Flight Plan
705.23 Maintenance of Aircraft
705.24 Checklist
705.25 Fuel Requirements
705.26 Extended Range Twin-engined Operations
705.27 Admission to the Flight Deck
705.28 Seats for Cabin Safety Inspectors
705.29 Flight Crew Members at Controls
705.30 Simulation of Emergency Situations
705.31 Crew Member Briefing
705.32 VFR Flight Obstacle Clearance Requirements
705.33 VFR Flight Weather Conditions
705.34 Take-off Minima
705.35 No Alternate Aerodrome – IFR Flight
705.37 Routes in Uncontrolled Airspace
705.38 Instrument Approach Procedures
705.39 Weight and Balance Control
705.40 Passenger and Cabin Safety Procedures
705.42 Carry-on Baggage
705.43 Briefing of Passengers
705.44 Safety Features Card
705.45 Closing and Locking of Flight Deck Door
705.46 Night VFR Flight – Aeroplane

AIRCRAFT PERFORMANCE OPERATING LIMITATIONS

705.55 General Requirements
705.56 Take-off Weight Requirements
705.57 Net Take-off Flight Path
705.58 Enroute Limitations with One Engine Operative
705.59 Enroute Limitations with Two Engines Inoperative
705.60 Dispatch Limitations: Landing at Destination and Alternate Aerodromes
705.61 Dispatch Limitations: Wet Runway – Turbo-jet-powered Aeroplanes

AIRCRAFT EQUIPMENT REQUIREMENTS

705.67 General Requirements
705.68 Landing Lights
705.69 Operation of Aircraft in Icing Conditions
705.70 Weather Radar Equipment
705.71 Protective Breathing Equipment
705.72 First Aid Oxygen
705.73 Interphone System
705.74 Public Address System
705.75 Crew Member Shoulder Harness
705.76 Lavatory Fire Protection
705.78 Floor Proximity Emergency Escape Path Markings
705.79 Flashlight Stowage
705.80 Doors and Locks
705.81 Cargo and Baggage Compartment Fire Protection

EMERGENCY EQUIPMENT

705.89 Megaphones
705.90 First Aid Kits
705.91 Emergency Medical Kit
705.92 Crash Axe
705.93 Hand-held Fire Extinguishers
705.94 Portable Oxygen
705.95 Survival Equipment
705.96 Inspection Requirements
705.97 Flashlights

PERSONNEL REQUIREMENTS

705.103 Designation of Pilot-in-Command and Second-in-Command
705.104 Flight Attendant Requirements
705.106 Pilot Qualifications
705.107 Flight Engineer and Second Officer Qualifications
705.108 Crew Pairing
705.111 Route and Aerodrome Qualifications
705.113 Validity Period

TRAINING

705.124 Training Program
705.125 Conditional Approval of Training Program
705.126 Cabin Emergency Evacuation Trainer
705.127 Training and Qualification Records

MANUALS

705.136 Distribution of Company Operations Manual
705.137 Aircraft Operating Manual
705.138 Standard Operating Procedures

SAFETY MANAGEMENT SYSTEM

705.151 Requirements
705.152 Components of the Safety Management System
705.753 Person Managing the Safety Management System
705.154 Holder of More Than One Certificate
NOTAM
TC AIM
TRANSPORTATION SAFETY BOARD OF CANADA (TSB) – TC AIM 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 ESCAT Plan
7 Wake Turbulence Separation
8 Airport/Aerodrome Operations – Uncontrolled
9 Airport/Aerodrome Operations – Controlled
10 Mandatory and Aerodrome Traffic Frequencies
11 VFR En Route Procedures
12 VFR Holding Procedures
13 Land and Hold Short Operations (LAHSO)
OPERATIONS IN HIGH LEVEL DOMESTIC AIRSPACE
1 Altimeter Setting Procedures
2 Cruising Altitudes
3 Mach Number/TAS Changes
4 High Level Holding Procedures
5 Profile Descent
6 Leaving or Entering Uncontrolled Airspace
7 Uncontrolled Airspace Procedures

CANADIAN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (CMNPS) AIRSPACE
1 General
2 Partial or Complete Loss of Navigation Capability
3 Position Reporting

CANADIAN MINIMUM NAVIGATION PERFORMANCE SPECIFICATIONS (CMNPS) CERTIFICATION
1 General
2 Certification
3 Navigation System Requirements
4 Transition Between CMNPS Airspace and the Canadian Domestic Airway Structure
5 Separation Minima

ATC SPECIAL PROCEDURES
1 Adherence to Mach Number
2 Parallel and Offset Procedures
3 Structured Airspace
4 Required Navigation Performance Capability Airspace (RNPC)
5 Canadian Minimum Navigation Performance Specifications Airspace (CMNPS)
6 Canadian Domestic Routes
7 Canadian Track Structures
8 Traffic Alert and Collision Avoidance Systems (TCAS)

NORTH ATLANTIC OPERATIONS
1 General Aviation Aircraft
2 North American Routes (NAR)
3 NAT Organized Track System
4 Flight Rules and Flight Planning Procedures
5 Clearances, Position Reports, Communications Failure
6 Transponder Operation
REDUCED VERTICAL SEPARATION MINIMA (RVSM)
1 General
2 RVSM Airspace
3 RVSM Transition Airspace
4 Air Traffic Control (ATC) Procedures
5 Aircraft Requirements

INTERNATIONAL FLIGHT PROCEDURES
1 Entry, Transit and Departure of Aircraft (TC AIM – FAL 2.0)

OTHER LEGISLATION
1 Canada Transportation Act, Part II – Air Transportation Licences, Prohibitions (section 57); Air Transportation Regulations (sections 3 and 7)
2 Canada Labour Code Part II – Occupational Safety & Health, Employee Rights & Duties (sections 126, 127 and 128)
3 Transportation of Dangerous Goods by Air (TC AIM – RAC Annex 3.0)
### SECTION 2: AIRFRAMES, ENGINES, PROPELLERS AND AIRCRAFT SYSTEMS

#### AIRFRAMES
1. Flight Controls
2. Flaps
3. Slots/Slats/Leading Edge Devices
4. Spoilers
5. Wing Fences
6. Winglets
7. Canards
8. Vortex Generators
9. Trimming Devices

#### ENGINES
1. Principles of Reciprocating Engines
2. Handling Procedures for Reciprocating Engines
3. Principles of Turbo-prop Engines
4. Handling Procedures for Turbo-prop Engines
5. Principles of Turbo-jet Engines
6. Handling and Procedures for Turbo-jet Engines
7. Engine Controls
8. Full Authority Digital Engine Control (FADEC)

#### PROPELLERS
1. Propeller Thrust and Torque
2. Geometric and Effective Pitch
3. Slipstream, Gyroscopic Effect and Asymmetric Thrust
4. Controls
5. Ground and Flight Range
6. Constant Speed
7. Feathering
8. Reversing

#### AIRCRAFT SYSTEMS
1. Fuel
2. Oil
3. Electrical
4. Hydraulic
5. Pneumatic
6. Warning (e.g. Ice, Fire, GPWS and Altitude Alert)
7. Fire Protection
8. Heating
9. De-icing and Anti-icing
10. Oxygen
11. Air Conditioning
12. Pressurization
13. Landing Gear and Brakes
14. Autopilot
15. Avionics
16. Flight Controls
## SECTION 3: 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 Setting
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/Condensation
3. Cloud Formation
4. Precipitation
5. Saturated/Dry Adiabatic Lapse Rates

### STABILITY AND INSTABILITY
1. Lapse Rate and Stability
2. Modification of Stability
3. Characteristics of Stable/Unstable Air
4. Surface Heating and Cooling
5. Lifting Process
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
JET STREAMS
1 Frontal Jet Streams
2 Wind Distribution / Location
3 Temperature Distribution
4 Seasonal Variations in Latitude and Speed
5 Arctic Stratospheric Jets
6 Subtropical Jet Streams
7 Turbulence

AIR MASSES
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 Type 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
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 Flight Service Stations
5 Atmospheric Environment Service Weather Briefing
6 Transcribed Weather Broadcasts (TWB)
7 DUATS – Commercial Weather Service
8 Automatic Terminal Information Service (ATS)
9 VOLMET (HF) Broadcast
10 Pilots Automatic Telephone Reporting Criteria, Cloud Types and Icing 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 / Validity Periods
2. Decoding
3. Graphical Area Forecasts (GFA) /AIRMET
4. Terminal Area Forecasts (TAF)
5. Upper Level Winds and Temperature Forecasts (FD)
6. Significant In-flight Weather Warning Message (SIGMET)

### WEATHER MAPS AND PROGNOSTIC CHARTS
1. Times Issued / Validity Periods
2. Symbols/Decoding
3. Surface Weather Map
4. Prognostic Surface Chart
5. Upper Level Charts – ANAL (850mb, 700mb, 500mb & 250mb)
6. Upper Level Charts – PROG (FL240, FL340, FL450)
7. Significant Weather Prognostic Chart FL100-250 (700-400mb) & FL250-600 (400-100mb)
### SECTION 4: INSTRUMENTS

#### FLIGHT INSTRUMENTS – PRINCIPLES AND OPERATIONAL USE

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

#### FLIGHT MANAGEMENT INSTRUMENTS

1. Flight Management System (FMS)
2. Electronic Flight Instrument System (EFIS)
3. Electronic Centralized Aircraft Monitoring (ECAM)

#### ENGINE INSTRUMENTS – PRINCIPLES AND USE

1. Tachometer
2. Manifold Pressure
3. Oil Pressure
4. Oil Temperature
5. Exhaust Gas Temperature
6. Cylinder Head Temperature
7. Carburetor Air Temperature
8. Intake Air Temperature
9. Fuel Pressure
10. Fuel Flow
11. Torquemeter
12. Engine Pressure Ratio (EPR)
13. Turbine Temperature (ITT/TIT)

#### AIRCRAFT COMPASS SYSTEMS

1. Construction
2. Use
3. Limitations and Faults
4. Gyromagnetic Remote Indicating Compass
SECTION 5: 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 and High Altitude Charts

TIME AND LONGITUDE
1 Time Zones and Relation to Longitude

FLIGHT PLANNING CALCULATIONS AND FORMS
1 Heading and True Airspeed
2 Wind and Windspeed
3 IAS-CAS-EAS-TAS
4 Track and Groundspeed
5 Mach
6 Time
7 Weight and Balance
8 Flight Planned Fuel Requirements
9 Fuel Load/Zero Fuel Weight
10 Pay Load/Weight Shift
11 Critical Point (CP)
12 Equal Time Point (ETP)
13 Flight Plans
14 Flight Itinerary

COMPUTERIZED FLIGHT PLANS
1 Decode
2 Analysis and Interpolation

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 Flight Log (Air Position)
6 Determination of Wind Velocity
SECTION 6: RADIO COMMUNICATIONS AND AIDS TO NAVIGATION
BASIC PRINCIPLES AND USE

RADIO
1 Elementary Theory
2 Wave Length and Frequency
3 Frequency Bands Used in Communication and Navigation
4 Characteristics of Low, High and Very High Frequency Radio Waves
5 Ground Waves and Sky Waves
6 Skip Distance
7 Reflection and Refraction
8 Night Effect

AIRCRAFT RADIO TRANSCEIVERS
1 VHF
2 HF
3 DATALINK

SELECTIVE CALL SYSTEM (SELCAL)
1 VHF
2 HF

EMERGENCY LOCATOR TRANSMITTER (ELT)
1 Requirements
2 Testing
3 Flight Planning
4 Accidental Transmission
5 Pilot Response to Signals
6 Downed Aircraft Procedures

RADAR
1 Elementary Theory
2 Primary Returns
3 Secondary Returns
4 Weather Radar

NAVIGATION SYSTEMS
1 Automatic Direction Finder (ADF)
2 VHF Omnidirectional Range (VOR)
3 Distance Measuring Equipment (DME)
4 Co-located VOR and TACAN (VORTAC)
5 Long Range Area Navigation (LORAN C)
6 Global Navigation Satellite System (GNSS – GPS)
7 Very High Frequency Direction Finding (VHF – DF)
8 Area Navigation System (RNAV)
9 Inertial Navigation System (INS)
10 Inertial Reference System (IRS)

APPROACH AIDS
1 Instrument Landing System (ILS)
2 Global Navigation Satellite System (GNSS – GPS)
3 Surveillance Radar (ASR & AASR)
4 Precision Approach Radar (PAR)
5 Secondary Surveillance Radar (SSR)
6 VASIS/PAPI

TRANSPONDERS
ACAS/TCAS
1 General
2 Use of TCAS/ACAS
3 Pilot Immunity from Enforcement Action
4 Pilot/Controller Actions
5 Pilot and Controller Interchange
SECTION 7: FLIGHT OPERATIONS

ATMOSPHERIC EFFECTS IN FLIGHT
1 ICAO Standard Atmosphere
2 Temperature and Pressure / Air Density
3 Humidity/Rain
4 Cold Temperature Corrections

PERFORMANCE
1 Indicated and True Stalling Speeds
2 Slow Speed Flight Characteristics
   – Turbo-prop
   – Turbo-jet
3 High Speed Flight Characteristic
   – Turbo-prop
   – Turbo-jet
4 Relationship of Speed to Angle of Attack
5 Cruising for Range/Endurance
6 Flight Performance “V” Speeds – Definition and Use
7 Weight and Balance – Load Adjustment
8 Effect of Changes in Weight and Load Distribution
9 Hydroplaning
10 Wind Shear – Effects and Avoidance
11 Landing Techniques

CHARTS AND GRAPHS
1 Weight and Balance
2 Take-off
3 Climb
4 Cruise
5 Buffet Boundary
6 Descent
7 Landing
8 Crosswind
9 Weight, Altitude, Temperature (WAT), Takeoff/Landing Performance Charts

CRITICAL SURFACE CONTAMINATION
1 Clean Aircraft Concept – Practices and Techniques
2 Frozen Contaminants Including Cold-Soaking Phenomenon
3 De-icing and Anti-icing Fluids
4 De-icing and Anti-icing Procedures
5 Variables that Can Influence Holdover Time
6 Critical Surface Inspections
7 Pre-take-off Inspection
8 Health Affects
9 Application Guideline Tables

WAKE TURBULENCE
1 Causes and Effects
2 Avoidance Procedures
3 Separation Criteria and Waiver

FLIGHT MANUAL
1 Approved Information

VOLCANIC ASH
1 Hazards

AIRMANSHIP/RULES OF THUMB
1 General
SECTION 8: THEORY OF FLIGHT

FORCES ACTING ON AN AEROPLANE

1. Load Factor
2. Relationship of Weight and Load Factor to Stalling
3. Gust Loads
4. Stability
5. Lift/Weight/Thrust/Drag

WING DESIGN

1. Wing Tip Vortices
2. Sweepback
3. Leading and Trailing Edge Flaps
4. Winglets
5. Canards
6. Vortex Generators
7. Wing Fences
8. Spoilers
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

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/Vibration
8 Effects of Smoking
9 Toxic Hazards (Including Carbon Monoxide)

AVIATION PSYCHOLOGY
1 The Decision-Making Process
2 Factors That Influence Decision-Making
3 Situational 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: e.g. “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
5 Cockpit Visibility and Eye Reference Position/Seat Position
6 Automation and Complacency

INTERPERSONAL RELATIONS
1 Communications with Flight 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

CREW RESOURCE MANAGEMENT (CRM)

CONTROLLED FLIGHT INTO TERRAIN (CFIT)
SECTION 10: TABLES AND CHARTS

The following section contains examples of different tables and charts, which may be used on ATPL-A examinations.

WEIGHT SHIFT FORMULA

\[
\frac{\text{WEIGHT OF CARGO MOVED}}{\text{WEIGHT OF AEROPLANE}} = \frac{\text{DISTANCE CG MOVED}}{\text{DISTANCE BETWEEN ARM LOCATION}}
\]
### Fuel Loading Chart

Fuel Taken as 7.807 lb per Imp. Gal. / Moments are in in.-lb

<table>
<thead>
<tr>
<th>Fuselage and Wing Tanks</th>
<th>Fuselage and Wing Tanks (Cont.)</th>
<th>Fuselage and Wing Tanks (Cont.)</th>
<th>Fuselage and Wing Tanks (Cont.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>76</td>
<td>23</td>
<td>300</td>
</tr>
<tr>
<td>20</td>
<td>156</td>
<td>46</td>
<td>310</td>
</tr>
<tr>
<td>30</td>
<td>234</td>
<td>68</td>
<td>320</td>
</tr>
<tr>
<td>40</td>
<td>312</td>
<td>91</td>
<td>330</td>
</tr>
<tr>
<td>50</td>
<td>390</td>
<td>115</td>
<td>340</td>
</tr>
<tr>
<td>60</td>
<td>468</td>
<td>137</td>
<td>350</td>
</tr>
<tr>
<td>70</td>
<td>548</td>
<td>160</td>
<td>360</td>
</tr>
<tr>
<td>80</td>
<td>625</td>
<td>183</td>
<td>370</td>
</tr>
<tr>
<td>90</td>
<td>703</td>
<td>205</td>
<td>380</td>
</tr>
<tr>
<td>100</td>
<td>781</td>
<td>229</td>
<td>390</td>
</tr>
<tr>
<td>150</td>
<td>859</td>
<td>252</td>
<td>400</td>
</tr>
<tr>
<td>120</td>
<td>937</td>
<td>275</td>
<td>410</td>
</tr>
<tr>
<td>130</td>
<td>1,015</td>
<td>298</td>
<td>420</td>
</tr>
<tr>
<td>140</td>
<td>1,093</td>
<td>321</td>
<td>430</td>
</tr>
<tr>
<td>150</td>
<td>1,171</td>
<td>343</td>
<td>440</td>
</tr>
<tr>
<td>160</td>
<td>1,249</td>
<td>366</td>
<td>450</td>
</tr>
<tr>
<td>170</td>
<td>1,327</td>
<td>389</td>
<td>460</td>
</tr>
<tr>
<td>180</td>
<td>1,405</td>
<td>412</td>
<td>470</td>
</tr>
<tr>
<td>190</td>
<td>1,483</td>
<td>435</td>
<td>480</td>
</tr>
<tr>
<td>200</td>
<td>1,561</td>
<td>458</td>
<td>490</td>
</tr>
<tr>
<td>210</td>
<td>1,639</td>
<td>480</td>
<td>500</td>
</tr>
<tr>
<td>220</td>
<td>1,718</td>
<td>503</td>
<td>510</td>
</tr>
<tr>
<td>230</td>
<td>1,796</td>
<td>525</td>
<td>520</td>
</tr>
<tr>
<td>240</td>
<td>1,874</td>
<td>548</td>
<td>530</td>
</tr>
<tr>
<td>250</td>
<td>1,952</td>
<td>570</td>
<td>540</td>
</tr>
<tr>
<td>260</td>
<td>2,030</td>
<td>593</td>
<td>550</td>
</tr>
<tr>
<td>270</td>
<td>2,108</td>
<td>615</td>
<td>560</td>
</tr>
<tr>
<td>280</td>
<td>2,186</td>
<td>638</td>
<td>570</td>
</tr>
<tr>
<td>290</td>
<td>2,264</td>
<td>661</td>
<td>580</td>
</tr>
</tbody>
</table>

**Wing Tip Tanks**

- Imp. Gallons: 4.10
- Wt. (lb): 284
- Mom. / 1000: 788

**Aircraft Seating Diagram**

- Crew: 152.6
- Crew: 172.8
- Toilet: 204.6
- Bar: 231.3
- Table: 257.6
- Table: 361.5
- Baggage: 8
Centre of Gravity Envelope

MAC is 90.197 inches
L.E. of MAC is 253.964 in. aft of reference datum.

Conversion Formula - Arm to %MAC:

\[
\%MAC = \frac{ARM \text{ (in.)} - 253.964}{90.197} \times 100
\]

Zone 1 If the Zero Fuel Weight falls within this zone - fuel can be loaded up to Max Ramp Wt. without exceeding CG limits.

Zone 2 If the Zero Fuel Weight falls within this zone - the fuel quantity that may be added must be restricted such that at take-off the aft CG limit is not exceeded.

Conversion Chart - Arm to %MAC
NOTE:
Refer to weight limitations of this manual for Maximum gross weight limitations.

$V_1$ speed is established on the basis of employing anti-skid and lift dumpers for the aborted takeoff.

EXAMPLE:
- A: Airport Air Temperature 30°C
- B: Airport Pressure Altitude - Sea Level
- C: Gross Weight at Brake Release 19,000 lb
- D: Anti Ice Off
- E: Wind Component 0 kt
- F: Average Runway Slope 1 Percent Uphill
- G: $V_1$ Speed, Anti Ice Off 118 kt
- H: Anti Ice On
- J: $V_1$ Speed, Anti Ice On 120.5 kt
- K: $V_2$ Speed 122.5 kt
- L: $V_2$ Speed 135 kt
**Accelerate-Go - Flaps 0%**

**Associated Conditions:**
- **Power:** Take-off power set before brake release.
- **Flaps:** 0%
- **AutoFeather:** Armed
- **Landing Gear:** Retract after lift-off
- **Runway:** Paved, level, dry surface

**Example:**
- **OAT:** 28°C
- **Pressure Altitude:** 5,430 Feet
- **Headwind Component:** 9.5 Knots

**Take-Off Weight - Pounds**

<table>
<thead>
<tr>
<th>Weight - Pounds</th>
<th>$V_R$</th>
<th>$V_{LOF}$</th>
<th>$V_2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>12,500</td>
<td>95</td>
<td>101</td>
<td>121</td>
</tr>
<tr>
<td>12,000</td>
<td>95</td>
<td>101</td>
<td>119</td>
</tr>
<tr>
<td>11,000</td>
<td>95</td>
<td>101</td>
<td>115</td>
</tr>
<tr>
<td>10,000</td>
<td>95</td>
<td>101</td>
<td>111</td>
</tr>
<tr>
<td>9,000</td>
<td>95</td>
<td>101</td>
<td>108</td>
</tr>
</tbody>
</table>

**Take-Off Field Length - Feet**

- 12,500 Pounds: 10,950 Feet
- 10,650 Pounds: 6,786 Feet
- 10,470 Pounds: 6,370 Feet

**Speeds (10,470 Pounds):**
- $V_R$: 95 Kt.
- $V_{LOF}$: 101 Kt.
- $V_2$: 113 Kt.

**Notes:**
1. Air distance is 50% of take-off field length.
2. $V_1$ (engine failure speed) equals $V_R$ (rotation speed).
3. Usable clearway cannot exceed 25% of the runway length.
SAMPLE COMPUTER FLIGHT PLAN

PLAN 1510            CYAM TO CYOW CES2 HSC/F     IFR   08/24/00
NONSTOP COMPUTED 1209Z FOR ETD 1700Z  PROGS  2400ADF CFZZZ LBBS

<table>
<thead>
<tr>
<th></th>
<th>FUEL</th>
<th>TIME</th>
<th>DIST</th>
<th>ARRIVE</th>
<th>TAKEOFF</th>
<th>LAND</th>
<th>AV PLD</th>
<th>OPNLWT</th>
</tr>
</thead>
<tbody>
<tr>
<td>POA CYOW</td>
<td>001475</td>
<td>01/09</td>
<td>0386</td>
<td>1809Z</td>
<td>013703</td>
<td>012228</td>
<td>000457</td>
<td>008446</td>
</tr>
<tr>
<td>ALT CYND</td>
<td>000369</td>
<td>00/13</td>
<td>0013</td>
<td>1822Z</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HLD</td>
<td>000000</td>
<td>00/00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RES</td>
<td>002956</td>
<td>03/16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOT</td>
<td>004800</td>
<td>04/38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CYAM . . SSM . . YYB J513 SMARE YOW314 YOW . . CYOW

WIND P035   MXSH  1/SMARE
FL   330

WPT MTR TTR T TAS G/S DR ZD DREM ZT CTR ZF FREM AFR ETTA

SSM   125.5  118 ... ... ... 009  0377  /.../... ... ... ... ...
TOC   093.1  089 ... ... ... 069  0308  0/20  0/49  004  0043
YYB   093.1  089 -48  372  403 R05  134  0174  0/20  0/29  004  0039
SMARE 102.9  092 -48  373  410 R05  053  0121  0/07  0/22  001  0038
TOD   131.3  118 -48  374  423 R01  035  0086  0/05  0/17  001  0037
YOW   131.3  118 .. .. .. .. 074  0012  /../.. .. .. .. ..
CYOW  140.5  126 .. .. .. .. 012  0000  0/17  0/00  000  0033

CYAM N46291W084306 SSM N46247W084189 YYB N46218W0792622
SMARE N46196W078098 YOW N45265W075538 CYOW N45194W0754022

FIRS KZMP/0000  CZYZ/0004  CZUL/0103

(FPL-I
-C550/L
-CYAM1700
-N0372F330  DCT SSM DCT YYB J513 SMARE YOW314 YOW DCT
-CYOW0109  CYND
-EET/KZMP0000  CZYZ0004  CZUL0103
-SEL/
-E/0438  P/ R/ S/ J/ D/ C
A/ )

IN . . . . . . . . . . DOWN . . . . . . . . .
OUT . . . . . . . . . . . . . . . . . . R/FUEL . . . . . . . . .
FLT . . . . . . . . . . . . . . . . . . . . . T/O WT . . . . . . . . .
POA – Point of Arrival
ALT – Alternate
HLD – Holding
RES – Reserve
TOT – Total
AV PLD – Average Payload
OPNLWT – Operational Weight

NOTE: Weight and balance calculation computed separately take precedence over these weight calculations.
RECOMMENDED STUDY MATERIAL

- *Finding the Sun’s True Bearing* (TP 784E).
- *Air Command Weather Manual (Supplement)* (TP 9353E).
- *Human Factors for Aviation – Basic Handbook* (TP 12863E), and
  *Advanced Handbook* (TP 12864E).
- *When in Doubt ... Aircraft Critical Surface Contamination Training* (TP 10643E)
- *Aeronautical Information Manual (TC AIM)* (TP 14371E)
- *Canadian Aviation Regulations (CARs)*
- *VFR Navigation Charts (VNC) / VFR Terminal Area Charts (VTA) / World Aeronautical Charts (WAC)*
- *Canada Flight Supplement*
- *Enroute Low Altitude Charts*


Information on the Transportation of Dangerous Goods is available from Transport Canada.

Air Transportation Licence information is available from the Canadian Transportation Agency (internet address: http://www.cta-otc.gc.ca/index_e.html).

Customs Requirements is available from the Canada Customs and Revenue Agency (http://www.cbsa-asfc.gc.ca/menu-eng.html).

*Canada Labour Code* is available from Social Development Canada (http://www.sdc.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.


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