

*Corrected  
Model*

#159

SAULT COLLEGE OF APPLIED ARTS AND TECHNOLOGY

SAULT STE. MARIE, ON

COURSE OUTLINE

COURSE TITLE: AERONAUTICS

CODE NO.: AVT100-5

SEMESTER: 2

PROGRAM: AVIATION TECHNOLOGY

AUTHOR: BILL GOVETT

DATE: September 1990

PREVIOUS OUTLINE DATED: JAN. 1981

APPROVED: *Bill Govett*  
DEAN

*9/10/90*  
DATE

AERONAUTICS

AVT100-5

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COURSE NAME

\_\_\_\_\_  
CODE NO.

TOTAL CREDIT HOURS \_\_\_\_\_

PREREQUISITE(S): Completion of Semester 1 Introduction to Flight  
\_\_\_\_\_

**I. PHILOSOPHY/GOALS:**

See following pages

**II. STUDENT PERFORMANCE OBJECTIVES:**

Upon successful completion of this course the student will:

1) be admitted to Semester 3, Flight Training (3.0 GPA)

2) \_\_\_\_\_

3) \_\_\_\_\_

4) \_\_\_\_\_

**III. TOPICS TO BE COVERED:**

- 21 Navigation
- 20 Meteorology
- 11 Theory of Flight
- 16 Air Regulations
- 8 Airframes and Engines
- 4 Radio Aids

80

AVT100 - 5 /

TOPIC - NAVIGATION

**TEXT:**

From the Ground Up - A. F. MacDonald - Aviation Publishers  
Charts - Aeronautical Edition Scale 1:500,000  
    - Sault Ste. Marie - VNC AIR5001  
Charts - World Aeronautical Charts (W.A.C.) F-21  
Flying Training Manual - Transport Canada  
Canada Flight Supplement - Transport Canada  
Aeronautical Information Publication - AIP - Transport Canada  
Navigation Booklet - Sault College

**STUDY AND REFERENCE GUIDE:**

Sault College Curriculum Directives  
Transport Canada Study and Reference Guide for Private Pilots  
    Licence  
Exam Guide for Private Pilots

**GENERAL OBJECTIVE:**

To teach the theory and practice of Aviation Technology, with emphasis in study toward the Private Pilot Licence Standard, as required by Transport Canada.

**LEARNING ACTIVITIES**

Definitions  
Form of the Earth  
Problem Work Sheet

Direction Relative to the Earth  
True and Magnetic  
Problem Work Sheet

Magnetism of Earth

Magnetic Compass and Errors  
Problem Work Sheet

Airspeed and Attitude  
Problem Work Sheet

**REFERENCES**

FGU - Air Navigation  
SC Precis

FGU - Air Navigation

FGU - Air Navigation

FGU - Air Navigation

FGU - Air Navigation  
SC Precis

**T E S T - REVIEW OF WORK TO DATE**

Maps and Charts

FGU - Air Navigation  
SC Precis

Topographical Maps and  
Map Reading

FGU - Air Navigation  
SC Precis

Triangle of Velocities

FGU - Air Navigation  
SC Precis

apr CR 3 Flight Computer  
Problem Work Sheet

CR Computer Operations  
Manual

Flight Planning

FGU - Air Navigation

**TEST - MID TERM EXAM**

Navigation Review  
Cross Country Flight Planning  
and Navigation General

Study Guide for  
Private Pilots - MOT

Radio Aids to Navigation

FGU - Radio

**TEST - FINAL NAVIGATION EXAM**

**TEST - MOT PRIVATE PILOTS WRITTEN EXAMINATION**

**SPECIFIC OBJECTIVES:**

**1. DEFINITION:**

The student is required to know the following definitions -- Great Circle, meridians, prime meridian, equator, parallel of latitude, rhumb line, track, ground speed, heading, airspeed, air position, ground position, drift, wind velocity, isogonal lines, agonic lines, deviation and bearings.

**2. FORM OF THE EARTH:**

The student is required to know:

- a) Shape of the Earth, the gradical (meridians and parallels) and the nomenclature of specific meridians and parallels;
- b) Latitude and Lonitude in degrees, minutes and seconds, and distance and position associations.
- c) The arc of time, apparent and mean, with reference to time zones, local and greenwich, and their boundaries in Canada specifically, and the world generally.
- d) Practical problems.

**3. DIRECTIONS RELATIVE TO THE EARTH, TRUE AND MAGNETIC:**

The student is required to know:

- a) The compass rose 360 points/degrees;
- b) Directions on the map, the practical use of the Douglas Protractor and reciprocals;
- c) The measurement of distance and track angle on Aeronautical Charts;
- d) The usage of the terms Heading, Track and Bearing;
- e) The measurement in angle of bearings True or Magnetic and relative True or Magnetic;
- f) The reference to a great circle, small circle and a rhumb line to current aeronautical charts with reference to straight or curved lines;
- g) Practical problems.

**4. MAGNETISM ON EARTH:**

The student is required to know:

- a) The approximate location of magnetic North and the reference to the North and South seeking poles;
- b) The magnetic meridians resolved vectorally to demonstrate dip;
- c) The reference to Variation and the magnetic mmeridian and the true meridian;
- d) The term "isogonal" and "agonic" lines;
- e) The reference to residual magnetic error and the term "deviation";
- f) The aircraft deviation card;
- g) Practical problems.

## 5. MAGNETIC COMPASS AND ERRORS:

The student is required to know:

- a) The magnetic compass and construction with reference to friction and vibration;
- b) As a result of a practical classroom demonstration, why northerly turning error and acceleration and deceleration error exist;
- c) How and when to read the magnetic compass, the setting of the directional gyro;
- d) The effect of metallic objects and electrical current on the magnetic compass;
- e) Know the make up of the directional gyro, the principal of gyroscopic action and methods of motoring the gyro;
- f) What is meant by real and apparent precession and its application to flight.

## 6. AIRSPEED AND ALTITUDE INDICATORS:

The student is required to know:

- a) The construction and theory of pressure measuring devices with reference to the airspeed and altitude indicators;
- b) What dynamic or pitot and static pressure the vents their position and the relation to aircraft instruments;
- c) Standard atmosphere conditions, the temperature and altitude consideration;
- d) The airspeed indicator and errors aligned with the terms indicated, calibrated, rectified, true and equivalent;
- e) The altitude indicator and errors aligned with the terms indicated, calibrated, pressure, density, true and absolute;
- f) The computer solution to airspeed and altitude computations;
- g) Practical problems.

## 7. MAPS AND CHARTS:

The student is required to know:

- a) A simple introduction to maps and scaled reproductions.
- b) The basic requirements for maps and charts.
- c) The three basic kinds of charts, cylindrical, conical and azimuthal.
- d) Lines on a chart - great circle and rhumb lines.
- e) Various types of charts, example Mercator, Lambert Conformal, Transverse Mercator, and Oblique Mercator.
- f) Map scales.

## 8. TOPOGRAPHICAL MAPS AND MAP READINGS:

The student is required to know:

- a) The type of charts used in Canada.
- b) What characteristics a chart should display.
- c) The meaning of aeronautical symbols, Emergency Code and Traffic Control lights - signals.
- d) The location of up-to-date information applicable to aeronautic charts and aeronautical chart symbols.
- e) The usage of the VFR Supplement as well as exposure to the radio facility charts and the IFR Supplement.

**9. TRIANGLE OF VELOCITIES:**

The student is required to know:

- a) The theory and practical application of vectors and definitions.
- b) The conventional symbols - Heading, Track and Wind Direction.
- c) The practical application of Heading, Track and Wind Direction graphically using both the Magnetic and True Compass.
- d) The time and Distance formula as used for DR Navigation.
- e) The Max drift formula as used for DR Navigation.
- f) The one in sixty rule as used for DR Navigation.
- g) And be familiar with the term ground and air position.
- h) What is meant by (WCA) wind correction angle and drift.

**10) INTRODUCTION AND USAGE OF THE JEPPESEN CR5 FLIGHT COMPUTER**

The student is required to know:

- a) The capability and practical usage of the circular slide rule side of the flight computer including conversions and proportion as applying to formula solved flight problems;
- b) The capability and practical usage of the wind-computing side of the flight computer including all variations variables to information supplied and required;
- c) Practical problems.

**11) FLIGHT PLANNING:**

The student is required to know:

- a) The usage of topographical maps and vectors as applies to pre flight planning;
- b) The practical application of types of charts to flight planning including the drawing of the track, distance marks, flaylines, and pinpoints;
- c) The practical application of cruise performance information to flight planning;
- d) The practical application of meterological information to flight planning;
- e) The purpose and reasons for a flight plan/flight notification properly filled out and filed with ATC.

**12. NAVIGATION REVIEW - CROSS COUNTRY FLIGHT PLANNING AND NAVIGATION GENERAL FROM THE STUDY GUIDE FOR PRIVATE PILOT-: TRANSPORT CANADA**

The student is required to know:

- a) Cross country flight planning as a review and requisite to the MOT Private Pilots written examination;
- b) Navigation General as a review and requisite to the Transport Canada Private Pilots written examination.

**13. RADIO AIDS TO NAVIGATION:**

The student is required to know:

- a) Basic theory of radio and frequency range;
- b) The propogation of radio waves;
- c) Types of transceivers in use - Collins King Narco Bendix Cessna;

- d) Types of services available in Canada;
- e) Introduction to the Morse Code and "Q" Code;
- f) Introduction to types of equipment and use:
  - i) ADF
  - ii) LORAN
  - iii) VOR
  - iv) TTACAN VORTAC
  - v) RADAR

AVT100 - 5 /

TOPIC - METEOROLOGY

**TESTS AND REFERENCE GUIDES:**

FROM THE GROUND UP - SANDY A. F. MacDonald - Aviation  
Publishers Co. Ltd.  
Aeronautical Information Publication (A.I.P.) - Canada  
Exam Guide For Private Pilot - Jetliner Publications  
Canadian Private Pilot Answer Guide - Acfield Publishing  
Study and Reference Guide Private Pilot Licence - Transport  
Canada

**GENERAL OBJECTIVES:**

The objective of this course is to provide aviation students with a basic knowledge of the science of weather (meteorology) to enable them to make intelligent use of the weather information provided by the meteorological service in planning and conducting aircraft operation to the Private Pilot student.

**LEARNING ACTIVITIES**

**REFERENCES**

Met Orgaization & Services  
Atmosphere  
Clouds

A.I.P. Canada - Met  
From the Ground Up

Pressure

From the Ground Up

Wind

From the Ground Up

**TEST - PROGRESS TEST ON MATERIAL COVERED**

Moisture and Temperature

From the Ground Up

Stability and Instability  
Air Masses

From the Ground UP

Fronts

From the Ground Up

The Cold Fron  
The Warm Front  
Trowals and Upper Fronts

From the Ground Up

**TEST - MID TERM EXAM**

Clouds, Precipitation, Fog  
Visibility

From the Ground Up

Ice Accretion

From the Ground UP

Thunderstorms

From the Ground Up

Turbulence  
Preccipitation Static  
Mountain Waves

From the Ground Up

**TEST - PROGRESS TEST ON MATERIAL COVERED**

Weather Maps

A.I.P. Canada - Met

Aviation Weather Reports  
Terminal For

From the Ground Up  
A.I.P. Canada - Met

Area Forecasts  
Upper Wind Forecasts

From the Ground Up  
A.I.P. Canada - Met

Review Major Points of  
All Material Covered

From the Ground Up  
A.I.P. Canada - Met

**F I N A L E X A M**

**SPECIFIC OBJECTIVES:**

**1. METEOROLOGICAL ORGANIZATION AND SERVICES IN CANADA**

The student is expected to know:

- a) the organization of the meteorological service
- b) the services provided to aviators

**2. ATMOSPHERE**

The student is required to know:

- a) the composition of the atmosphere
- b) the properties of the atmosphere
- c) divisions and characteristics of the atmosphere
- d) ICAO standard atmosphere

**3. CLOUDS**

The student is required to know:

- a) the classification and description of clouds

**4. PRESSURE**

The student is required to know:

- a) the nature of atmospheric pressure
- b) the units in which it is expressed
- c) the vertical and horizontal variations under different conditions
- d) how altimeters are set
- e) how wind and weather are related to pressure distribution as displayed on a weather map

**5. WIND**

The student is required to know:

- a) the forces which cause and influence air motion both at the surface and in the upper levels of the atmosphere

**6. MOISTURE AND TEMPERATURE**

The student is required to know:

- a) the scales used to express temperature
- b) how the moisture content of the air affects weather
- c) how the atmosphere is heated
- d) how the atmosphere is cooled

**7. STABILITY AND INSTABILITY (VERTICAL MOTION)**

The student is required to know:

- a) the meaning and significance of the term "stability"
- b) the relationship between lapse rate and stability
- c) modification of stability
- d) characteristics of weather in stable and unstable air
- e) agencies which give rise to vertical motion

## 8. AIR MASSES

The student is required to know:

- a) the meaning of the term "Air Mass"
- b) the formation and classification of Air Masses
- c) factors determining the weather in an air mass
- d) modification of air masses
- e) air mass weather in Canada

## 9. FRONTS

The student is required to know:

- a) the symbols for fronts on weather charts
- b) the structure of fronts
- c) types of fronts
- d) Norwegian Theory of Cyclones (Stages I-VI)

## 10. THE COLD FRONT

The student is required to know:

- a) the structure of a cold front
- b) surface weather changes
- c) flight problems associated with the cold front

## 11. THE WARM FRONT

The student is required to know:

- a) the structure of the warm front
- b) surface weather changes
- c) flight problems associated with the warm front

## 12. TROWALS AND UPPER FRONTS

The student is required to know:

- a) weather associated with trowals and upper fronts

## 13. CLOUDS, PRECIPITATION AND FOG

The student is required to know:

- a) physical processes of cloud formation
- b) physical process of precipitation formation
- c) physical process of fog formation

## 14. VISIBILITY

The student is required to know:

- a) the meaning of the term "visibility"
- b) restrictions to visibility

## 15. ICE ACCRETION

The student is required to know:

- a) the effects of ice on aircraft performance
- b) how ice forms
- c) types of icing
- d) icing protection techniques

**16. THUNDERSTORMS**

The student is required to know:

- a) the main features of thunderstorms
- b) effects on flight operations

**17. TURBULENCE**

The student is required to know:

- a) the cause of turbulence

**18. PRECIPITATION STATIC**

The student is required to know:

- a) weather conditions which favour precipitation static

**19. MOUNTAIN WAVES**

The student is required to know:

- a) the features of mountain waves
- b) effects on flight operations

**20. WEATHER MAPS**

The student is required to know:

- a) how to identify and interpret the significant features of surface and upper level weather charts

**21. AVIATION WEATHER REPORTS (SA)**

The student is required to know:

- a) how to decode and interpret all information provided on hourly reports

**22. TERMINAL FORECASTS (FT)**

The student is required to know:

- a) how to decode and interpret all information provided in terminal forecasts

**23. AREA FORECASTS (FA)**

The student is required to know:

- a) how to decode and interpret all information provided in area forecasts

**24. UPPER WIND FORECASTS (FD)**

The student is required to know:

- a) how to decode upper wind forecasts
- b) how to interpolate forecast winds to apply to flight operations

AVT100 - 5 /

TOPIC - THEORY OF FLIGHT

**TEXTS AND STUDY AND REFERENCE GUIDES:**

From the Ground Up - A. F. MacDonald - Aviation Publishers  
Sault College Curriculum Directives  
Private Pilot's Licence  
Exam Guide for Private Pilots - Jetliner Publication

**GENERAL OBJECTIVES:**

To teach the theory of flight with emphasis on student toward the Private Pilot's Licence standard, as required by Transport Canada.

**LEARNING ACTIVITIES**

Atmosphere, Pressure  
and Airfoils

Lift, Drag, Thrust  
and Weight

The Centre of Gravity  
and Weight and Balance

Part 1 and 2 - Forces  
acting on an Airplane  
During Flight

Airspeed, Limitations  
Including Associated  
Wing Tip Vortices

Propellers and the  
Wing  
Theory of Flight  
Question Sheet

**REFERENCES**

FGU - Theory of Flight

**TEST**

**MID TERM EXAM**

Theory of Flight Review

Study Guide for Private  
Pilots - TC

**TEST**

**FINAL THEORY OF FLIGHT  
EXAM**

**TEST**

**MOT PRIVATE PILOTS WRITTEN  
EXAMINATION**

**SPECIFIC OBJECTIVES:**

**1. ATMOSPHERE, PRESSURE AND AIRFOILS**

The student is required to know:

- a) the makeup of the atmosphere, the standard atmosphere with discussion on pressure, density and temperature relationship
- b) the association of pressure, surface and altitude and the viscous properties of air relating to these phenomena of flight
- c) the theory of a wing and flight
- d) airfoils, their suitability, with relationship to camber and the resolution of forces, lift and drag
- e) airflow around airfoils, including Bernoulli's Theorem angle of attack and the centre of pressure

**2. LIFT, DRAG, THRUST AND WEIGHT**

The student is required to know:

- a) the lift drag relationship to the angle of attack and the formula for airfoil shape, area, airspeed and air density

$$\text{LIFT} = C_L \cdot \frac{1}{2} \rho V^2 S$$

$$\text{DRAG} = C_D \cdot \frac{1}{2} \rho V^2 S$$

- b) the types of drag, profile, parasitic and induced
- c) the forces acting on an airplane in flight
- d) couples and the effect of couples to flight
- e) the function of the tailplane and dihedral to flight and stability

**3. THE CENTRE OF GRAVITY AND WEIGHT AND BALANCE**

The student is required to know:

- a) the three axes with relation to the centre of gravity
- b) the principles of weight and balance, the applicable definitions and be able to in practice, develop weight and balance problems as they apply to light aircraft

**4. PART 1 - FORCES ACTING ON AN AIRPLANE DURING FLIGHT**

The student is required to know:

- a) the effect of slipstream and the reaction of airflow on an aircraft as a result of the rotation of a propeller
- b) the effect of asymmetric thrust as a result of the rotation of a propeller
- c) the effect of torque, and the laws of motion, the resistance and effect on an airplane
- d) the effects of gyroscopic action and the tendency of a body to resist and the reaction of forces
- e) the effect of controls dynamic and static balance and aerodynamic pressures
- f) the effect of ailerons, aileron drag, types of ailerons
- g) the effect of slots and slats
- h) the effect of flaps, lift and drag relationship, types of flaps

## PART 2 - FORCES ACTING ON AN AIRPLANE DURING FLIGHT

- i) the effects of dihedral anhedral to stability
- j) the theory and reasons for autorotation
- k) the application to flight of the stall insipient and full spin
- l) the forces in a turn, lift and weight, thrust and drag, centrifugal and centripetal forces to give balanced flight or equilibrium
- m) the relation of speed to turn and bank
- n) the relation of wing loading to the stall speed straight and level and in a turn

### 5. AIRCRAFT AIRSPEED LIMITATION INCLUDING ASSOCIATED WING TIP VORTICES

The student is required to know:

- a) the effect of turbulent conditions to wing loading and aircraft speeds
- b) the relationship between the manoeuvring speed and the stall to establishment of structural cruise, and never exceed speed
- c) reasons of restricted flap speeds
- d) the relation of lift to thrust and the best angle, best rate and normal rate of climb speeds
- e) the reasons for wing tip vortices, speed association and large heavy aircraft and small heavy aircraft. Caution areas to light aircraft

### 6. PROPELLERS AND THE WING

The student is required to know:

- a) the aerodynamics of a propellor and its association to an aircraft wing
- b) definitions and terms relating to propellers
- c) types of propellers fixed and variable pitch

AVT100 - 5 / TOPIC - AIR REGULATIONS, AIR TRAFFIC RULES AND PROCEDURES

**TEXTS:**

Aeronautical Information Publication (A.I.P.) - Canada -  
Transport Canada  
Air Regulations and Aeronautics Act - Transport Canada  
Air Navigation Orders - Transport Canada

**STUDY AND REFERENCE GUIDES:**

Air Regulations and Aeronautics Act - Transport Canada  
Air Navigation Orders - Transport Canada  
Class II NOTAMS - Transport Canada  
Flight Training Manual - Transport Canada  
Study Questions for Private Pilots - Transport Canada  
Canada Flight Supplement - Transport Canada  
Sample Examination for Private Pilots Licence -  
Transport Canada  
Examination Guide for Private Pilots

**GENERAL OBJECTIVES:**

The objectives of this course are to ensure the aviation student is fully familiar with the regulations, procedures and aeronautical information contained in the texts so that he/she may:

- a) successfully complete the Ministry of Transport examinations
- b) apply this knowledge intelligently to flight operations

**LEARNING ACTIVITIES**

**REFERENCES**

Air Regulations

Air Regulations and  
Aeronautics Act  
Part 1, through 8  
A.I.P. Canada

Air Navigation Orders

Air Navigation Orders  
Series 1,2,3,4,5  
A.I.P. Canada

General, Aerodromes

A.I.P. Canada - Gen  
VRF Chart Supplement

Communications

A.I.P. Canada - COM

Rules of the Air  
and Air Traffic Services

A.I.P. Canada - RAC

Search and Rescue

A.I.P. Canada - SAR

Licensing, Registration  
and Airworthiness

A.I.P. Canada - LRA  
-Transport Canada  
letter re: A/C  
serviceability and  
documentation  
-sample documents

Airmanship

A.I.P. Canada - AIR

Notams  
Aeronautical Information  
Circulars

A.I.P. Canada - Map  
- Notam - AIC

**EXAMINATION (SPCR)**

**PRIVATE PILOT EXAMINATION**

AVT100 - 5 / TOPIC - AIR REGULATIONS, AIR TRAFFIC RULES AND PROCEDURES

SPECIFIC OBJECTIVES

1. AIR REGULATIONS

The student is required to be fully familiar with:

- a) the definitions and terminology described in Part 1
- b) aircraft registration, certification and markings
- c) aerodrome regulations
- d) personnel licencing regulations
- e) rules of the air - general
  - VFR
  - IFR
  - lights and visual signals
- f) air traffic control regulations
- g) miscellaneous provisions including certificates, licences, manuals, logs and records, aircraft accident investigation and transitional procedures
- h) aeronautics act

2. AIR NAVIGATION ORDERS

The student is required to be fully familiar with:

- a) ANO Series 1 - Communications Standards and Procedures
- b) ANO Series 2 - Registration, Certification and Marking
- c) ANO Series 3 - Aerodromes
- d) ANO Series 4 - Personnel Licencing
- e) ANO Series 5 - Rules of the Air

3. GENERAL, AERODROMES

The student is required to be fully familiar with:

- a) general - aeronautical terms
  - abbreviations
  - time zones
  - units of measurement
  - conversions
  - Nationality and registration marks
- b) aerodromes - aerodrome administration
  - design criteria
  - Visual aids
  - lighting
  - military arrestor cables
  - Emergency services

\*URGENT\* message from user BISSWEN and control 09:01:14

- Regulatory information

System is shutting down immediately due to a potentially catastrophic event.

4. COMMUNICATIONS  
- maintenance

The student is required to be fully familiar with:

- a) Areas of responsibility
- b) Radio Navigation Aids
- c) Mobile Service - language
  - phonetic alphabet and morse code
  - numbers
  - call signs
  - Emergency communications

## 5. RULES OF THE AIR AND AIR TRAFFIC SERVICES

The student is required to be fully familiar with:

- a) General rules and services
- b) Airspace - requirement and procedures
- c) Flight planning
- d) Airport operations
- e) VFR enroute procedures

## 6. SEARCH AND RESCUE

The student is required to be fully familiar with:

- a) Responsible authority
- b) Flight planning as it affects S & R
- c) Emergency locator transmitter (ELT)
- d) Emergency assistance
- e) Safety promotion and investigation

## 7. LICENSING, REGISTRATION AND AIRWORTHINESS

The student is required to be fully familiar with:

- a) Aircraft licensing and registration procedures and documentation
- b) Aircraft airworthiness requirements and documentation
- c) Pilot licensing procedures and privileges

## 8. AIRMANSHIP

The student is required to be fully familiar with:

- a) flight operations
- b) flight preparation and ground operations including medical factors

## 9. NOTAMS, AERONAUTICAL INFORMATION CIRCULARS

The student is required to be fully familiar with:

- a) NOTAM - distribution
  - criteria for issue
  - summaries
  - format
- b) Aeronautical Information Circulars - purpose
  - distribution

AVT100 - 5 / TOPIC - AIRFRAME AND ENGINES

**TEXT**

From the Ground Up - A. F. MacDonald

**STUDY AND REFERENCE GUIDE**

Sault College Curriculum Directives  
Transport Canada Study and Reference Guide for Private Pilots  
Exam Guide - Private Pilot - Jetliner Publications

**GENERAL OBJECTIVE**

To teach in theory and in practice Aviation Technology, with emphasis on study toward the Private Pilot Licence Standard, as required by Transport Canada.

**LEARNING ACTIVITIES**

Airframe Design  
Airframe Construction  
  
Aero Engine Introduction  
and Principles  
Aero Engines Carburation  
  
Airframe Eletrical System  
Aero Engines Electrical System  
  
The Aero Engine Propeller  
Aero Engine Operation  
Question Sheet

**REFERENCES**

FGU - Airframe  
FGU - Airframe  
  
FGU - Aero Engines  
  
FGU - Aero Engines  
FGU - Aero Engines  
  
FGU - Aero Engines  
FGU - Aero Engines

**MID TERM EXAM**

Airframes and Engines

Study Guide for  
Private Pilots - TC

**FINAL AIRFRAMES AND ENGINES EXAM**

AVT100 - 5 / TOPIC - AIRFRAME AND ENGINES

**SPECIFIC OBJECTIVES:**

**1. AIRFRAME DESIGN**

The student is required to know:

- a) airframe nomenclature
- b) design factors relating to streamlining and speed
- c) the relation of lift/drag to streamlining
- d) methods of reducing drag by the use of curved surfaces, fairings, etc.
- e) airframe design to withstand loads and stresses
- f) the types of fuselage construction

**2. AIRFRAME CONSTRUCTION**

The student is required to know:

- a) the type of airframe construction used in modern airplanes
- b) airframe construction nomenclature
- c) the position of aircraft control - their location and method of movement
- d) the function of the landing gear and types - fixed and retractable
- e) the purpose of shock struts and types

**NOTE:** A viewgraph discussion on the various parts of a Cessna 152 is to take place during this period.

**3. AEROENGINE INTRODUCTION AND PRINCIPLES**

The student is required to know:

- a) the principle operation and care of the internal combustion engine
- b) the four stroke principle of the internal combustion engine
- c) the types of piston engines advantages and disadvantages
- d) construction detail of the internal combustion engine
- e) the methods of cooling
- f) the methods and functions of lubrication
- g) oil requirements
- h) lubrication methods wet and dry sump

**4. AEROENGINE CARBURATION**

The student is required to know:

- a) the purpose of carburation
- b) the theory and operation of the basic carburator
- c) the reasons for carburator icing and how carburator ice is recognized
- d) the method of preventing carburator icing
- e) the theory and purpose of turbo-chargers and super-charges

## 5. AIRFRAME ELECTRICAL SYSTEMS

The student is required to know:

- a) the following parts of an aircraft electrical system:
  - i) battery
  - ii) generator
  - iii) voltage regulator
  - iv) bus bar
  - v) circuit breaker
  - vi) ammeter
  - vii) voltmeter
  - viii) generator warning lights
- b) by item, describe the function and reason of each part mentioned in "a"

## 6. AEROENGINE ELECTRICAL SYSTEM

The student is required to know:

- a) the difference between the airframe and aeroengine electrical system
- b) the principles of the magneto as applicable to the aeroengine ignition system
- c) the parts of a magneto
- d) the purpose of dual ignition
- e) the requirement for shielding

## 7. THE AEROENGINE PROPELLER

The student is required to know:

- a) purpose of the propeller
- b) the relation of the propeller to an airfoil and efficiency
- c) the definitions associated with pitch

**NOTE:** This is also covered in theory of flight and should be treated as a review under the heading of Airframes and Engines.

## 8. AEROENGINE OPERATION

The student is required to know in theory:

- a) handling procedure
- b) starting procedures
- c) safety precautions
- d) taxiing procedures

**NOTE:** The practical aspect of this class will be covered by the Flight Instructor using the TC "Flight Instructors Guide".

AVT100 - 5 /

TOPIC - RADIO AIDS

**TEXT**

From the Ground Up - A.F. MacDonald - Aviation Publishers Co.  
Ltd.

Aeronautical Information Publication - Transport Canada  
Canada Flight Supplement - Dept. of Energy Mines & Resources  
(Transport Canada)

**STUDY AND REFERENCE GUIDE**

Transport Canada Study and Reference Guide for Private  
Pilots' Licence  
Radiotelephone Operator Handbook - Land/Sea/Air - Minister  
of Supply and Services Canada

**GENERAL OBJECTIVE**

To give an appreciation of the system of airways in Canada  
and to teach in theory, every basic principle of radio with  
and understanding toward VHF and UHF Navigation Aids, Two-way  
Communications Procedures and Air Traffic Control Procedures.

**LEARNING ACTIVITIES**

Airways Definitions  
Canadian Airway System  
General Flight Provision

Publications and Charts  
for VFR Flight  
Radio Definitions and Principles  
of Radio

Radio Navigation Aids

**MID TERM EXAM**

Radio Aids Review

**FINAL RADIO EXAM**

**PRIVATE PILOTS WRITTEN EXAMINATION**

**REFERENCES**

AIP - Transport Canada

Aeronautical Charts  
World Aeronautical  
Charts  
Canada Flight Supplement  
FGU - Radio

FGU - Radio

Study Guide for Private  
Pilots - Transport Canada

AVT100 - 5 / TOPIC - RADIO AIDS

**SPECIFIC OBJECTIVES**

**1. AIRWAYS DEFINITIONS**

The student is to know the meaning of the following terms:

- a) Northern Domestic Airspace
- b) Southern Domestic Airspace
- c) Southern Control Area
- d) Northern Control Area
- e) Arctic Control Area

**2. CANADIAN AIRWAY SYSTEM**

The student is required to have:

- a) a basic understanding of the Canadian Airway system
- b) know the vertical dimension and airspace divisions of the Canadian Domestic Airspace area

**NOTE:** Viewgraph presentation of the Canadian Domestic Airspace given during this lesson.

**3. GENERAL FLIGHT PROVISIONS**

The student is required to know:

- a) the IFR and VFR requirements in the High level airspace structure
- b) the IFR and VFR requirements in the Low level airway structure
- c) the VFR and IFR requirements
- d) cruising altitudes above 3000'AGL
- e) cruising altitudes below 3000'AGL
- f) direction of flight magnetic and true

**4. PUBLICATIONS AND CHARTS FOR VFR FLIGHTS**

The student is required to know which charts and publications are available and usage:

- a) VNC charts 1:500,000
- b) WAC (World Aeronautical Chart) 1:1,000,000
- c) Canada Flight Supplement

**5. RADIO DEFINITIONS AND PRINCIPLES OF RADIO**

The student is required to know the following subject matter and their application to radio:

- a) wave length
- b) frequency and frequency bands
- c) Hertz
- d) frequency utilization
- e) ground/sky waves and line of sight transmissions
- f) phonetic alphabet

## 6. RADIO NAVIGATION AIDS

The student is required to know:

- a) radio navigation aids and usage
  - non directional radio beacon
  - radio range
  - Visual Aural Range (VAR)
  - Visual Omni Range (VOR)
  - Area Navigation (RNAV)
  - Omega
  - Loran
- b) VOR tuning
- c) Mechanics of VOR
  - to - from - off
  - aircraft position

**NOTE:** A discussion of the mechanics of VOR to take place this period.

- d) reading assignment
  - VOR TAC
  - TACAN
  - ILS
  - LORAN
  - CONSOL
  - INERTIAL NAV SYSTEM
  - DOPPLER NAVIGATION
  - RADAR - ASR - PAR
  - TRANSPONDER
  - ELT - Emergency Locator Transmitter

COURSE NAME: Aeronautics

CODE NO. AVT 100-5

V. **EVALUATION METHODS:** (INCLUDES ASSIGNMENTS, ATTENDANCE REQUIREMENTS, ETC.)

The student will be assessed by test following a block of subject matter, with a mid-term final examination and a semester final. Credit for block tests and mid-term will be weighted and applied to the final semester grade.

These tests will be in addition to the Transport Canada Commercial Examination (minimum 70%).

**FLYING:**

- assessment is continuous, based on instructor evaluation and documented by progress books
- periodic progress checks with faculty to determine suitability to continue
- private or commercial pilot flight test or progress check at the end of the semester

**ACADEMIC:**

- all AVT 100 subjects are grouped together. Test results are totalled and reduced to a percentage for mid-term and final marks. Each subject is weighted with the greatest emphasis placed on navigation and meteorology and air regulations. Tests are normally conducted periodically at the end of each block of instruction with approximately 50% of the grade based on tests and 50% on final. 50% of the value of the end of semester total will be derived from mid-term grades.

**MID-TERM:**

- NAV100, MET100, Radio Aids 50, T of F 50, Air Regs 100, A/C systems 50 = 450 marks reduced to a percentage

**GRADE:**

- A+ - 93 - 100%
- A - 87 - 92%
- B - 80 - 86%
- C - 70 - 79%
- U - Below 70 (Mid-Term Only)
- X - Below 70 (final extenuating circumstances only)
- R - Below 70%

- In the event of a failure in one AVT subject, the highest grade achievable will be a "C". Failure of two or more AVT subjects will result in an "R" Grade.
- A 3.0 G.P.A. is ~~considered minimum acceptable and student progress will be reviewed if below that grade.~~ <sup>REQUIRED TO PROGRESS TO THE THIRD SEMESTER</sup>
- D.O.T. exams are not included in college grades although minimum of 70% as well as a pass of all segments is required to continue on course. An "R" grade will be awarded for AVT in the event of a failure.
- "R" grades in any subject at the end of a semester will result in termination from the program.
- Attendance is mandatory for all Aviation classes.
- Although attitude, co-operation, etc., are not graded, students may be terminated based on their performance in this area. These attributes are also considered in the selection of the Air Canada Award and other scholarships.
- Firm dates have not been established for tests because a good deal of instruction takes place on bad weather days.

**VI. REQUIRED STUDENT RESOURCES**

As per book list.

**VII. ADDITIONAL RESOURCE MATERIALS AVAILABLE IN THE COLLEGE LIBRARY:**

Book Section (TITLE, PUBLISHER, EDITION, DATE, LIBRARY CALL NUMBER IF APPLICABLE - SEE ATTACHED EXAMPLE)  
Periodical Section (MAGAZINES, ARTICLES)

Audiovisual Section (FILMS, FILMSTRIPS, TRANSPARENCIES)

**VIII. SPECIAL NOTES**

Students with special needs (eg. physical limitations, visual impairments, hearing impairments, learning disabilities) are encouraged to discuss required accommodations confidentially with the instructor.

Your instructor reserves the right to modify the course as he/she deems necessary to meet the needs of students.