

#205

SAULT COLLEGE OF APPLIED ARTS & TECHNOLOGY  
SAULT STE. MARIE, ONTARIO

COURSE OUTLINE

Course Title: THEORY OF FLIGHT  
Code No.: AVT 100-6  
Program: AVIATION TECHNOLOGY  
Semester: ONE  
Date: June 1986  
Author: G.W. Govett

New: \_\_\_\_\_ Revision: xx

APPROVED: *L.P. Crozetta* \_\_\_\_\_  
Chairperson Date



THEORY OF FLIGHT

AVT 100-6

Course Name

Course Number

**PHILOSOPHY/GOALS:**

To teach the theory of flight with emphasis on study toward the Private Pilots Licence standard, as required by the Ministry of Transport.

**METHOD OF ASSESSMENT (GRADING METHOD):**

Topic No.	Periods	Topic Description	Reference
1	1	Atmosphere, Pressure and Airfoils	FGU-Theory of Flight
2	1	Lift, Drag, Thrust and Weight	FGU-Theory of Flight
3	1	The Centre of Gravity and Weight and Balance	FGU-Theory of Flight
4	2	Part 1 and 2 - Forces acting on an airplane during flight	FGU-Theory of Flight
5	1	Airspeed, limitations including associated wing tip vortices	FGU-Theory of Flight
6	1	Propellers and the wing Theory of Flight Question Sheet	FGU-Theory of Flight
7	3	Flight Instruments	FGU-Theory of Flight
Test	1	Mid Term Exam	
8	1	Theory of Flight Review	Study Guide for Private Pilots MOT
Test	1	Final Theory of Flight Exam	
Test		MOT Privat Pilots Written Examination	

**TEXTBOOK:**

From the Ground Up - A.F. MacDonald

**STUDY AND REFERENCE GUIDE:**

Sault College Curriculum Directives

Transport Canada - Study and Reference Guide  
- Sample Examination for Private Pilots  
- Study Question for Private Pilots



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 relationships.
- b) the association of pressure, surface and altitude and the viscous properties of air relating to the 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 Bernouilli'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  $CL = \frac{L}{\frac{1}{2}\rho V^2 S}$  and  $DRAG = CD \frac{1}{2}\rho V^2 S$
- b) the types of drag, profile, parasitic and induced
- c) the forces acting on an airplane in flight
- d) couples and the affect 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 and the associated planes.
- 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 assymetric 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 propeller and its association to an aircraft wing.
- b) definitions and terms relating to propellers
- c) types of propellers fixed and variable pitch.

7. Flight Instruments

The student is required to understand various flight instruments with a knowledge of how they work, their characteristics and limitations. They are required to know:

- a) the pitot static system
- b) the altimeter, errors and definitions
- c) the airspeed indicator, errors and definitions
- d) the vertical speed indicator and errors
- e) the principle of the gyro, gyroscopic inertia and precession, power sources
- f) the heading indicator
- g) the attitude indicator
- h) the turn and slip indicator (turn and bank indicator)
- i) the turn coordinator
- j) the gyrosign compass
- k) the angle of attack indicator
- l) the machine indicator