

I. COURSE DESCRIPTION:

AVT257 provides the background knowledge required to successfully write the General Knowledge section of the Commercial Pilot Aeroplane written exam. The broad subject areas included are theory of flight, flight instruments and flight operations.

II. LEARNING OUTCOMES AND ELEMENTS OF THE PERFORMANCE:

Upon successful completion of this course, the student will demonstrate the ability to:

1. Explain how each of the forces acting on an aircraft contribute to its performance.

Potential Elements of the Performance:

- Understand and be able to explain Bernoulli's theorem and Newton's laws of motion.
- How Bernoulli's theorem and Newton's 3rd law of motion contribute to the production of lift on an airfoil.
- The relationship of lift to relative airflow.
- The effect of changes in angle of attack on lift, drag and movement of centre of pressure.
- Types of drag.
- The relationship between speed and drag
- Where weight acts and some weight definitions.
- The principles of propulsion.

2. Understand how an airfoil reacts to its movement through the air.

Potential Elements of the Performance:

- The pressure distribution around an airfoil.
- Types of boundary layers.
- Why there is an adverse pressure gradient.
- The turning moment this pressure distribution causes
- Why wing tip vortices are produced and their effect on lift and drag.
- Methods of avoiding wing tip vortices (wake turbulence).

3. Describe design considerations, which can be incorporated, to improve the efficiency of the wing.

Potential Elements of the Performance:

- Flight characteristics of various wing planforms.
- The calculation of aspect ratio and its effect on induced drag
- Features which improve stability such as sweepback, dihedral, anhedral, wash in and washout.
- Design characteristics which improve lift or reduce drag such as slots, slats, wing fences, stall strips, flaps, vortex generators, winglets.
- Features to aid in controlling an aircraft's approach to landing such as spoilers and flaps.

- What is a canard and how does it work?
4. Explain how load factor affects your aircraft's performance and structural integrity.

Potential Elements of the Performance:

 - Why does the load change with various flight manoeuvres?
 - The flight envelope and how it protects the aircraft's structure.
 - The relationship of load factor to stall speeds.
 - Why manoeuvring speed is your protection against gust loads?
 - What effect does weight have on your manoeuvring speed?
 5. Understand the need to design a stable aircraft.

Potential Elements of the Performance:

 - Know which movements revolve around which axis.
 - Define static, dynamic and inherent stability.
 - Methods of achieving stability.
 - The affect of various centre of gravity locations on flight characteristics and the reason why.
 6. Explain the relationship between the aircraft's axis, planes of movement and the controls required for movement.

Potential Elements of the Performance:

 - Aeroplane axis and planes of movement.
 - Controls required for movements, including trimming devices.
 - The coupling effect between movements in two planes.
 - Types and need to balance controls.
 7. Describe how we are able to transfer the energy from an engine via a propeller into thrust.

Potential Elements of the Performance:

 - How a propeller works.
 - Means of improving propeller efficiency.
 - Forces resulting from the turning of the engine and propeller.
 - Keeping your propeller in good condition.
 8. Explain the function and operation of the pitot static instruments

Potential Elements of the Performance:

 - How the pitot static system works including errors, icing and alternate source.
 - Principles of operation of the pitot static instruments, errors and malfunctions.
 - Airspeed indicator markings and definitions
 9. Explain the function and operation of the gyro instruments

Potential Elements of the Performance:

 - Principles of operation, errors and malfunctions.
 - Instrument limitations and sources of power.
 - Gyroscopic inertia and gyroscopic precession
 10. Explain the function and operation of the direct reading magnetic compass

Potential Elements of the Performance:

- Principles of operation.
 - Compensating for variation and deviation.
 - Turning and acceleration errors.
 - Compass serviceability checks.
11. Effectively utilize the flight instruments to fly without visual references.

Potential Elements of the Performance:

- How to deal with the loss of visual references.
 - Using the control and performance instruments to get the desired performance.
 - Getting an effective instrument scan.
 - Emergencies due to the loss of flight instruments.
 - Recovery from inadvertently entered unusual attitudes.
12. Incorporate all relevant flight information into your decision making process.

Potential Elements of the Performance:

- What is density altitude and how it effects your performance.
 - Performance requires a combination of attitude and power.
 - Types of take off and landings.
 - Calculation and significance of V speeds.
 - Flight for range and endurance.
 - Why an airfoil stalls.
 - The stall progression.
 - Affect of altitude on stall speed.
 - The relationship between speed, angle of bank and radius of turn.
13. Calculate all relevant flight information from the pilot operating handbook (aircraft flight manual).

Potential Elements of the Performance:

- Calculate take off distance, landing distance, crosswind component, fuel burn and cruise performance.
 - Calculation of all V speeds and the affect atmospheric conditions have on achieving them.
 - Effect of slope and surface condition on take off and landing performance.
14. Determine if the aircraft is within the required weight and balance limitations.

Potential Elements of the Performance:

- Calculate an aircraft's weight and balance.
 - The importance of weight and balance and centre of gravity position and limitations.
 - How to adjust loads to comply with the flight envelope.
 - Significance of normal, utility and aerobatic categories.
15. Deal with aircraft critical surface contamination.

Potential Elements of the Performance:

- What constitutes a clean aircraft.
 - What is the cold soaking phenomenon and when might it occur.
 - Who is responsible to ensure your aircraft is clean prior to take off?
 - What effect does critical surface contamination have on aircraft performance?
16. Deal with an emergency survival situation and how the search and rescue services can work in your favour.

Potential Elements of the Performance:

- Basic survival techniques, including signalling for assistance.
- How to monitor and help people in distress.
- ELT's – their function and serviceability.

III. TOPICS:

1. Principles of flight
2. Forces Acting on an Aeroplane
3. Airfoils
4. Propellers
5. Design of the wing
6. Load Factor
7. Stability
8. Flight Controls
9. Pitot Static System
10. Airspeed Indicator
11. Vertical Speed Indicator
12. Altimeters – encoding, radio/radar
13. Magnetic Compass
14. Gyroscope
15. Heading Indicator
16. Attitude Indicator
17. Turn and Bank Indicator/Turn Coordinator
18. Instrument Flying
19. Flight Operations – general
20. Aircraft Performance
21. Weight and Balance
22. Search and Rescue
23. Critical Surface Contamination.

IV. SUGGESTED RESOURCES/TEXTS/MATERIALS:

- 1) The Illustrated Guide To Aerodynamics – H.C.Smith, 2nd edition
- 2) The Advanced Pilot's Flight Manual – William Kershner, 6th edition
- 3) Aerodynamics for Naval Aviators – H.H.Hurt, Jr.

V. EVALUATION PROCESS/GRADING SYSTEM:

The student will be assessed by a combination of attendance and deportment, quizzes, tests and a final exam. Weighting of each will be as follows: 30% for quizzes, 30% for all tests prior to the final exam and 40% for the final exam. A minimum mark of 70% is required to pass the course. Make-up tests are not permitted except in accordance with section VI of this outline.

- Unexcused absences will result in 2% deduction of the final mark for each occurrence, arriving for class late will result in a 1% deduction of the final mark for each occurrence, and violations of the dress code will result in a 1% deduction of the final mark for each occurrence. Refer to the SOP GEN 1.3 for dress code policies and SOP GEN 1.6.7 for policy regarding absence from classes
- Quizzes will be given without prior notice.
- If it is necessary to write a second final exam in order to pass the course, the highest grade achievable will be a "C". (See make-up policy in section VI)
- Students may request a deferment of a test for compassionate reasons. Compassionate Grounds for deferment will include but not be limited to death of an immediate family member, personal illness, or recent diagnosis of a serious illness of a family member. **Make-ups will not be permitted after the fact for compassionate reasons.**
- **"F" grades in any subject at the end of a semester will result in termination from the Aviation program.**
- Although attitude, co-operation, etc., are not graded, students may be terminated based on their performance in this area (see section VI). These attributes are also considered in the selection of the Air Canada Award and other scholarships.
- Dates of tests will be announced at least 1 week in advance.
- A classroom code of conduct can be found in the SOP General section, and will be adhered to.

The following semester grades will be assigned to students in this course:

<u>Grade</u>	<u>Definition</u>	<u>Grade Point Equivalent</u>
A+	90 -100%	4.00
A	80 - 89%	3.00
B	70 - 79%	2.00
C	assigned if a make-up exam was required to complete the course	0.00
F (Fail)	below 70%	
X	A temporary grade limited to situations with extenuating circumstances giving a student additional time to complete the requirements for a course.	
NR	Grade not reported to Registrar's office.	

W Student has withdrawn from the course without academic penalty.

VI. SPECIAL NOTES:

Attitude and Conduct

Attitude plays an important role in your ability to exercise good judgement. Although attitude is not being graded, it affects your ability to learn as well as your safety as a student and future as a professional pilot. Students who display a strong tendency towards any of the five hazardous attitudes pose a grave risk to themselves and others. For this reason, students exhibiting one or several hazardous attitudes will be counseled and if necessary, will be sanctioned and given a letter of probation. If this is ineffective in modifying unacceptable behaviour, then the student will be withdrawn from the program.

The five hazardous attitudes are identified as Anti-authority, Impulsivity, Invulnerability, Machismo, and Resignation. These hazardous attitudes are described in "Human Factors for Aviation – Basic Handbook" on pages 151 and 152.

Make-up Policy

- No make-ups on tests occurring prior to final exams.
- No make-ups on quizzes.
- If the final grade achieved for this course is less than 70%, a second final exam may be written at the discretion of the professor for this course. The second exam will be averaged with the first exam to determine the resulting exam mark, and the final grade will then be calculated.
- In the event that a second final exam is required, the highest achievable overall grade for this course will be a C
- Any student that requires 100% or greater on a make-up exam to pass the course will not be allowed to write a make-up exam.

Special Needs:

If you are a student with special needs (e.g. physical limitations, visual impairments, hearing impairments, or learning disabilities), you are encouraged to discuss required accommodations with your instructor and/or the Special Needs office. Visit Room E1101 or call Extension 2703, so that support services can be arranged for you.

Retention of course outlines:

It is the responsibility of the student to retain all course outlines for possible future use in acquiring advanced standing at other postsecondary institutions.

Plagiarism:

Students should refer to the definition of “academic dishonesty” in the *Sault College Code of Conduct*. Students who engage in “academic dishonesty” will receive an automatic failure for that submission and/or such other penalty, up to and including expulsion from the course/program, as may be decided by the professor/dean. In order to protect students from inadvertent plagiarism, to protect the copyright of the material referenced, and to credit the author of the material, it is the policy of the department to employ a documentation format for referencing source material.

Course outline amendments:

The Professor reserves the right to change the information contained in this course outline depending on the needs of the learner and the availability of resources.

Substitute course information is available in the Registrar's office.

VII. PRIOR LEARNING ASSESSMENT:

Students who wish to apply for advanced credit in the course should consult the professor. Credit for prior learning will be given upon successful completion of a challenge exam or portfolio.

VIII. DIRECT CREDIT TRANSFERS:

Students who wish to apply for direct credit transfer (advanced standing) should obtain a direct credit transfer form from the Dean's secretary. Students will be required to provide a transcript and course outline related to the course in question.