

COURSE OUTLINE

COURSE: **Aircraft Systems Operation**

PROGRAM: 280.C0 Aircraft Maintenance

DISCIPLINE: 280 Aeronautics

WEIGHTING: Theory: 2 Practical Work: 2 Personal Study : 2

Instructor(s)	Office	☎ Extension	✉ Email or Website
Stéphane Caron	C-182	4687	stephane.caron@cegepmontpetit.ca

OFFICE HOURS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					

Coordinator(s)	Office	☎ Extension	✉ Email or Website
Dany Charette	B-125	4661	dany.charette@cegepmontpetit.ca
Louis Guimont	B-125	4703	louis.guimont@cegepmontpetit.ca

1 CONTEXT OF THIS COURSE IN THE PROGRAM

The course *Aircraft Systems Operation* (280-5A4) is offered during the 5th session of the Aircraft Maintenance Program (280.C0). All students enrolled in this program are called upon in one manner or another to analyze, do work and inspect the integrity and operation of aircraft systems.

In the workshops, students review the condition of components and check their operation on the test benches. On the aircraft, they perform necessary maintenance work on the systems to assure the airworthiness of the aircraft. Troubleshooting is characterized by first analyzing, understanding and testing the operation of the systems. Next the reasons for the system failure must be identified, justified and confirmed. In order to correct the problem, students need to then be able to replace the defective component, check the settings and make the adjustments as determined by the designer of the aircraft and approved by the civil aviation authority. Students must find this information in the appropriate maintenance manuals. The final step involves checking the integrity of the system by testing its operation and then signing the maintenance release, in the appropriate technical files.

In short, to carry out all of the responsibilities related to the position, an aircraft maintenance technician must be able to explain and analyze the operation of systems as well as their components, use appropriate vocabulary, gather the necessary documentation for the job and apply all required security measures to maintain the airworthiness of the aircraft.

Students must keep this course outline for the duration of their studies as it will be useful for the comprehensive assessment at the end of the program.

Transport Canada

This course outline meets the requirements of Training Organisation Certification Manual (MCF) of Transport Canada.

The Department applies Transport Canada standard which allows a maximum absence of 5% for the course (theory and laboratory). The department compiles absences of all students enrolled in Aircraft Maintenance (280.C0) and Avionics (280.D0) according to Transport Canada requirements. The application of Transport Canada policies regarding absences is available on the college website and in the student agenda under the heading « Privilèges accordés par Transports Canada ».

2 COMPETENCIES OF THE EXIT PROFILE (STUDENT SKILL PROFILES)

Perform maintenance on aircraft systems.

3 MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

026C Perform activities related to maintaining aircraft systems.
0269 Perform the maintenance of landing gear.

4 TERMINAL OBJECTIVE(S) AND COMPETENCIES

Identify and compare the different parts of similar system, should also be able to inspect and verify those different parts and determine the cause of any anomalies. Finally, should be able to identify and describe the different types of flotation's and emergency evacuation devices.

5 TEACHING STRATEGY

The course is structured using formal lectures and computer projections. Demonstrations using parts that are available in the room enhance the theoretical explanations. The physical principles used in the operation of the systems will be explained during these periods, supported by questions and discussions to develop a detailed analysis of the operation of the systems.

6 COURSE PLAN

WEEK	LEARNING OBJECTIVE	CONTENT	PERSONAL STUDIES ACTIVITIES
1 to 5	<u>ATA 21</u>		
	1- Define the objectives of cooling, air conditioning, ventilation and pressurization.	- Introduction to the effects of pressure change on human abilities.	On a weekly basis, students must:
	2- Describe the elements that make up an air conditioning system on a jet or turbo prop engine powered aircraft.	- Definition of comfort conditions related to crew and passenger activities.	- Review course and personal notes.
	3- Explain the role and operation of a cooling system.	- Air treatment in terms of temperature, cleanliness, humidity and pressure.	- Read the specific chapter in one of the suggested books in the Mediagraphy.
	4- Explain the role and operation of each element of a pressurization system.	- Various means used for cooling, air conditioning and pressurization of the cabin.	- Analyze the operation of the systems and components.
	5- Explain the pressure schedule inside the aircraft cabin depending on the flight altitude.	- Study of various systems used on aircraft.	- Take advantage of the hours available to prepare the presentation and task given by the teacher.
	6- Interpret information from the dashboard.	- Study of various controls, alarms and protection systems.	- Take advantage of the hours available for further explanations.
	7- Implement safety procedures when working on an air conditioning and pressurization system.		
	<u>ATA 36</u>		
	1- Identify various sources that can provide an aircraft with pneumatic energy.	- Power sources: engine, APU, GPU, external cylinders.	
	2- Explain the purpose of the pneumatic system on an aircraft.	- Compressors, bleed valves, pressure and flow regulation valves, heat exchange, protection elements against overheating, various electric or electro-pneumatic valves and filters.	
	3- Describe all the elements of a pneumatic distribution system.		
	4- Explain the role and operation of each component of the pneumatic system.	- Mechanical controls and electro-pneumatic controls.	
	5- Identify various controls used to operate a pneumatic system.	- Different user systems of a pneumatic system: starting, air conditioning, pressurization, anti-icing and reverse thrust systems.	
6- Interpret the various indications related to the pneumatic system.			

WEEK	LEARNING OBJECTIVE	CONTENT	PERSONAL STUDIES ACTIVITIES
1 to 5 (cont's)	<p><u>ATA 35</u></p> <p>1- Define the objectives of cooling, air conditioning, ventilation and pressurization.</p> <p>2- Describe the elements that make up an air conditioning system on a jet or turbo prop engine powered aircraft.</p> <p>3- Explain the role and operation of a cooling system.</p> <p>4- Explain the role and operation of each element of a pressurization system.</p> <p>5- Explain the pressure schedule inside the aircraft cabin depending on the flight altitude.</p> <p>6- Interpret information from the dashboard.</p> <p>7- Implement safety procedures when working on an air conditioning and pressurization system.</p>	<ul style="list-style-type: none"> - Introduction to the effects of pressure change on human abilities. - Definition of comfort conditions related to crew and passenger activities. - Air treatment in terms of temperature, cleanliness, humidity and pressure. - Various means used for cooling, air conditioning and pressurization of the cabin. - Study of various systems used on aircraft. - Study of various controls, alarms and protection systems. 	<p>On a weekly basis, students must:</p> <ul style="list-style-type: none"> - Review course and personal notes. - Read the specific chapter in one of the suggested books in the Mediagraphy. - Analyze the operation of the systems and components. - Take advantage of the hours available to prepare the presentation and task given by the teacher. - Take advantage of the hours available for further explanations.
6 to 10	<p><u>ATA 28</u></p> <p>1- Identify different types of fuel used in aviation and the cause of any contamination.</p> <p>2- Define and describe the different functions that a fuel system must ensure.</p> <p>3- Describe the composition of a fuel system by locating various components on an aircraft.</p> <p>4- Explain the role and operation of each element that makes up a fuel system.</p> <p>5- Identify the controls and instruments of a fuel system.</p> <p>6- Describe the precautions and security measures to take during maintenance or when checking a fuel system.</p>	<ul style="list-style-type: none"> - Different types of fuel systems used in aviation. - Different methods of engine fuel feeding. - Comparison of various fuel systems used on aircraft. - Operational analysis of various fuel supply systems. - Introduction to various dangers related to the maintenance and upkeep of a fuel system. 	<p>On a weekly basis, students must:</p> <ul style="list-style-type: none"> - Review course and personal notes. - Read the specific chapter in one of the suggested books in the Mediagraphy. - Analyze the operation of the systems and components. - Take advantage of the hours available to prepare the presentation and task given by the teacher. - Take advantage of the hours available for further explanations.

WEEK	LEARNING OBJECTIVE	CONTENT	PERSONAL STUDIES ACTIVITIES
6 to10 (cont's)	<p><u>ATA 30</u></p> <p>1- Identify different types of frost/ice and identify the conditions that favor them including their danger.</p> <p>2- Identify the areas that are protected against the formation of frost and the elimination of ice.</p> <p>3- Identify elements that protect against overheating in an anti-icing system.</p> <p>4- Explain the operation of different types of frost sensors and Interpret information available on the dashboard.</p> <p>5- Describe types of de-icing and anti-icing systems on aircraft.</p> <p>6- Explain the role and operation of de-icing and anti-icing systems.</p> <p>7- Explain the operation of a windshield washer and rain repellent systems including the operation of a wiper.</p> <p><u>ATA 26</u></p> <p>1- Classify different types of fire.</p> <p>2- Locate the different areas where there is a greater risk of overheating or fire.</p> <p>3- Explain the operation principle of different types of sensors (overheating, fire, smoke).</p> <p>4- Describe different types of fire extinguishers and determine the various actions to take during a fire..</p> <p>5- Analyse the operation of electrical systems for detection, extinguishing and alarm.</p> <p>6- Analyse the operation of different fire prevention systems.</p>	<ul style="list-style-type: none"> - Various ways to prevent and eliminate icing: electric, pneumatic and liquid. - Study of types of circuits. - Nose cowl anti-icing system of jet and turbo prop engines. - Propeller blades protection circuit. - Leading edges protection circuit. - Protection circuit for windshields, Pitot tubes, temperature sensors and external drains. - Finding the necessary documentation for testing and checking an anti-icing protection system. - Applying safety instructions during interventions on the de-icing or anti-icing system. - Different classes of fires. - Different causes of overheating or fire: hot air leaks, sparks, hydrocarbon volatility, overheated brakes and electrical problems. - Different controlled areas: engines, landing gear well, APU compartment, various cargo and hot air systems. - Different types of sensors: bimetal, thermocouple, continuous elements, pneumatic. - Smoke detectors: ionisation, photoelectric cell. - Fire extinguishers and extinguishing agents. - Procedure, extinguishing and alarm systems in case of fire. 	<p>On a weekly basis, students must:</p> <ul style="list-style-type: none"> - Review course and personal notes. - Read the specific chapter in one of the suggested books in the Mediagraphy. - Analyze the operation of the systems and components. - Take advantage of the hours available to prepare the presentation and task given by the teacher. - Take advantage of the hours available for further explanations.

WEEK	LEARNING OBJECTIVE	CONTENT	PERSONAL STUDIES ACTIVITIES
11 to15	<p><u>ATA 32</u></p> <p>1- Describe the various types of landing gear.</p> <p>2- Explain the role and operation of each component of the landing gear.</p> <p>3- Determine the order and the logical link between the various components of a landing gear.</p> <p>4- Determine various back-up methods used to operate landing gear and locking indications.</p> <p>5- Analyze the general operation of a landing gear system.</p> <p>6- Explain the normal and emergency retraction and extension operation of the system.</p> <p>7- Explain the operation of the braking systems in normal, automatic and emergency mode.</p> <p><u>ATA 38</u></p> <p>1- Identify the means used to store and distribute drinking water on board an aircraft.</p> <p>2- Describe the composition and operation of a drinking water system.</p> <p>3- Describe the composition and operation of a waste system.</p> <p>4- Describe the dangers related to the maintenance and upkeep of systems for drinking and waste water.</p> <p>5- Implement safety measures to take during maintenance or when checking systems for drinking and waste water.</p>	<ul style="list-style-type: none"> - Fixed and retractable landing gear; characteristics and configurations of landing gear. - Struts, actuators, valves and sequence valves, hydraulic fuses, relief valves, inspection panels, locking mechanisms, shock absorbers, indications, electrical contactors, brakes, valves, antiskid valves, servo valve, antiskid control box, wheel speed sensors, distributors, braking mode, wheel orientation. - Control action and location of the different controls used to operate landing gear. - Various power sources used to operate landing gear braking system. - Examples of operation systems on various aircraft and list of safety measures. - Failure simulation and analysis of possible causes. - Study of a drinking water system on a wide-bodied aircraft. - Study of waste system used on a wide-bodied aircraft. - Introduction to the dangers related to the maintenance and upkeep of systems for drinking and waste water. 	<p>On a weekly basis, students must:</p> <ul style="list-style-type: none"> - Review course and personal notes. - Read the specific chapter in one of the suggested books in the Mediagraphy. - Analyze the operation of the systems and components. - Take advantage of the hours available to prepare the presentation and task given by the teacher. - Take advantage of the hours available for further explanations.

WEEK	LEARNING OBJECTIVE	CONTENT	PERSONAL STUDIES ACTIVITIES
11 to15 (cont's)	<p>ATA 25</p> <p>1- Identify the methods used for rapid evacuation.</p> <p>2- Explain the locking and unlocking mechanisms operation of the emergency exits.</p> <p>3- Explain the deployment and inflation of the operation of evacuation slides.</p> <p>4- Explain the announcement and instruction system operation during a rapid evacuation.</p> <p>5- Locate the various components intended for an emergency situation.</p>	<ul style="list-style-type: none"> - Introduction to examples of a rapid evacuation. - Describing examples of opening and closing the emergency exits. - Describing examples of inflating evacuation ramps. - Study of the lighting system and rapid evacuation. - Introduction to the dangers related to the maintenance and upkeep of the emergency devices. 	<p>On a weekly basis, students must:</p> <ul style="list-style-type: none"> - Review course and personal notes. - Read the specific chapter in one of the suggested books in the Mediagraphy. - Analyze the operation of the systems and components. - Take advantage of the hours available to prepare the presentation and task given by the teacher. - Take advantage of the hours available for further explanations.

7 SYNTHESIS OF SUMMATIVE EVALUATION METHODS

Description of Evaluation Activity	Context	Learning objective(s)	Evaluation Criteria ¹	Due Date (approximate date assignment due or exam given)	Weighting (%)
1 st summative evaluation	Short-answer and multiple choice type exam. Lasts approximately 2 periods and is done individually.	Content from the first 5 weeks	*	Third and fourth periods of Week 5	20%
2 nd summative evaluation	Short-answer and multiple choice type exam. Lasts approximately 2 periods and is done individually.	Content from Weeks 6 to 9	*	Third and fourth periods of Week 10	20%
3 rd summative evaluation	Short-answer and multiple choice type exam. Lasts approximately 2 periods and is done individually.	Content from Weeks 10 to 15	*	Third and fourth periods of Week 15	20%
1 st summative presentation/task	Presentation in class and in hangar, plus task to be accomplished on a system given by the teacher. Lasts approximately 1 period and is done by team	Content from the first 5 weeks	As per evaluation grid	First and second periods of week 5	10%
2 nd summative presentation/task	Presentation in class and in hangar, plus task to be accomplished on a system given by the teacher. Lasts approximately 1 period and is done by team	Content from Weeks 6 to 9	As per evaluation grid	First and second periods of week 10	10%
3 rd summative presentation/task	Presentation in class and in hangar, plus task to be accomplished on a system given by the teacher. Lasts approximately 1 period and is done by team	Content from Weeks 10 to 15	As per evaluation grid	First and second periods of week 15	10%
Snags sheets reports	Acknowledging all possible fault that can cause the anomaly touching the system presentation given by the teacher	Content from the three systems given by the teacher	As per evaluation grid	Prior the three presentation/task beginning	10%
				TOTAL	100%

* As per lessons, materials, information's and discussions given in all classes.

1. The task will be to accomplish an inspection as per the maintenance manual on a part belonging to the presentation system.

¹ From the curriculum (critères de performance) and adapted to the level of students (exigences évolutives) from one session to another. The evaluation criteria should be explicit and allow observation of results (processes, products, purpose).
The evaluation criteria will be presented in writing to students at least one week before the summative evaluation activities (Article 5.1j PIEA)

8 REQUIRED MATERIAL

Proper safety clothing, safety glass and protective foot wear as per college safety regulation in regards to Laboratory classes.

9 MEDIAGRAPHY

JAP Inc. « A&P Technician Airframe Test guide », édition 2002, ATP series. 629.134C891aS (Hydraulique. Trains. Carburant. Oxygène. Sécurité. Dégivrage. Pressurisation).

JAP Inc. « A&P Technician Airframe Workbook », édition 2000-2001, ATP series. 629.134353A296 1992 S (Hydraulique. Trains. Carburant. Oxygène. Sécurité. Dégivrage. Pressurisation).

Kroes/Watkins/Delp. « Aircraft Maintenance & Repair », 6e édition, Mac Millan/McGraw-Hill, 1993. A629.1346M158m (Hydraulique. Trains. Carburant. Oxygène. Sécurité. Dégivrage. Pressurisation).

USA, Dep. of Transportation. « Advisory circular DOT FAA », EA-AC 43.13-1B.

USA, Dep. of Transportation. «Airframe and powerplant; airframe handbook », AC 65-ISA, FAA 1976. D 629.1343 E 83a (Hydraulique. Trains. Carburant. Oxygène. Sécurité. Dégivrage. Pressurisation).

USA, Dep. of Transportation. « Maintenance d'aéronefs, Méthodes, techniques et pratiques reconnues » Circulaire d'information, EA-AC 43.13-1A et 2A ISBN2-89113-114-2.

10 REQUIREMENTS TO PASS THE COURSE

1. Passing Mark

The passing mark for this course is 60% by adding the marks for the theory and practical work for the course.

2. Tardiness

Students who arrive late after the beginning of the first period of a course are considered absent for this period.

3. Attendance for Summative Evaluations

Students must be present for summative evaluations and must comply with the instructions given by the instructor to carry out the evaluation activity and written in the course outline. Unexcused tardiness for a summative evaluation could result in being excluded from the activity. Any absence from a summative evaluation that is not due to serious reasons (illness, death in the family, etc.) could result in a mark of zero (0) for the activity.

Students are responsible for meeting with the instructor before an evaluation activity is held or immediately upon returning to ENA to explain the reason for an absence. Proper documentation, such as a medical certificate, a death certificate, legal papers, etc., must be shown if the reason for absence is serious and recognized as such by the instructor(s), arrangements will be made between the instructor(s) and the student to make up the activity.

4. Submitting Assignments

All assignments must be submitted by the date, hour and location designated by the instructor(s). Late assignments will be penalized 10% per day that they are late and will receive a mark of zero (0) after one week.

5. Presentation of Written Work

The instructor(s) will provide students with information and guidelines regarding the presentation of written work. When the presentation of an assignment is unacceptable, the work will be penalized as a late assignment until an acceptable version is submitted. In this case, the penalties for late work will be applied.

Students must follow the standards adopted by the Cégep for written work (« Normes de présentation matérielle des travaux écrits »). These can be found in the documentation center on the Cégep web site www.cegepmontpetit.ca/normes under the heading **Liens éclair, Bibliothèques, « Méthodologie »**.

11 METHODS OF COURSE PARTICIPATION

Students are expected to follow the rules taught in class regarding the use of equipment and to comply with safety rules related to the operation of aircraft systems and models. Improper use or an improper attitude is dangerous and will lead to a suspension from class.

12 OTHER DEPARTMENTAL REGULATIONS

Students are encouraged to consult the website for specific regulations related to this course:
<http://guideena-en.cegepmontpetit.ca/departement-rules/>

1. Course Attendance

It is the student's responsibility to attend all classes and participate actively.

As soon as a student has missed 10% of the hours of the practical part of the course, the student will receive a warning message regarding the absences; when the student has missed over 20% of the hours of the practical part of the course, the student will receive a warning that he or she is excluded from the course.

An absence that is excused for serious reasons that cannot be made up will not receive a penalty. Students who believe they have received an unfair penalty can appeal to the appropriate member of the department.

2. Tardiness

Students who arrive more than 10 minutes after the beginning of the first period of the course are considered absent for this period. Students who arrive late to the other periods of the same course will not be admitted.

3. Absence of the Instructor

Students must wait ten minutes before considering that a teacher is absent for the course period and must be present for the second hour of the course unless an absence has been announced.

4. Safety and Use of Department Rooms and Services

See the Pre-Flight rules on the college website under the heading for rules and policies at ÉNA (*Règles et politiques*): <http://ena.cegepmontpetit.ca/etudiants-actuels/documents-et-consignes/regles-de-securite>.

5. Mark Revisions

See Article 6.6.2 of the policies regarding evaluations in the *Politique institutionnelle d'évaluation des apprentissages*.
NOTE: This Course Outline is a translation of the *Plan de cours* for 280-514-EM: *Fonctionnement des systèmes*. If there is a discrepancy, then the original French version will be considered the official version for legal purposes.

13 INSTITUTIONAL POLICIES AND REGULATIONS

All students enrolled at Cégep Édouard-Montpetit must become familiar with and comply with the institutional policies and regulations. In particular, these policies address learning evaluations, maintaining admission status, French language policies, maintaining a violence-free and harassment-free environment, and procedures regarding student complaints. The French titles for the policies are: *Politique institutionnelle d'évaluation des apprentissages* (PIEA), la *Politique institutionnelle de la langue française* (PILF), la *Politique pour un milieu d'études et de travail exempt de harcèlement et de violence* (PPMÉTEHV), les *Conditions d'admission et cheminement scolaire*, la *Procédure concernant le traitement des plaintes étudiantes dans le cadre des relations pédagogiques*.

The full text of these policies and regulations is accessible on the Cégep web site at the following address: <http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. If there is a disparity between shortened versions of the text and the full text, the full text will be applied and will be considered the official version for legal purposes.

14 ANNEXE

