

Course outline

COURS : **Avionic Maintenance**

PROGRAMME : 280.C0 Aircraft Maintenance Technology

DISCIPLINE : 280 Aéronautique

WEIGHTING: Theory : 0 Practical : 3 Personal study : 1

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Office hours

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					

Coordinator(s)	Office	☎ extension	✉ email
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CONTEXT OF THIS COURSE IN THE PROGRAM

This course is offered in the program's fifth semester. It is assumed that students who enroll in the course have passed the courses in their preceding semesters, 280-3D4-EM « DC avionics systems » AC Avionics (280-4A4) and 280-5B3-EM « Radio systems ». Students who do not meet these conditions may still enroll in the course, however the Avionics Department believes that these students will find it more difficult to pass the course.

In addition, students should have acquired the restricted radio operator certificate to be able to test onboard radio systems. Students not having the restricted radio operator license will not be able to perform some of the activities thereby resulting in a penalty in the assessment.

At the end of this course, the student will have developed:

- The ability to perform installation and repair on aircraft AC and DC electric distribution and generation systems.
- The ability to diagnose and fix basic problems on aircraft AC and DC power distribution and generation systems.

This lesson plan must be kept by the student throughout his studies, because it will be useful at the time of the integration activity.

TRANSPORTS CANADA : This lesson plan meets the requirements of Transport Canada referred to in the control training manual (MCF). The Department applies the standard of Transport Canada which sets the tolerated absences (theory and practice) to 5%. The Department compiles the absences of students registered to programs (280.C0) aircraft maintenance technique according to the requirements of Transport Canada. The application of the Transport Canada policy on absences control is available on the College website of the College under the heading « Privilèges accordés par Transports Canada ».

COMPETENCIES OF THE EXIT PROFILE (STUDENT SKILL PROFILES)

Check the operation, perform the maintenance and repair of electrical systems.

MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

025T Perform maintenance of DC circuits on an aircraft.

(duration of training: 100 periods)

Distribution of competence 025T in the program :

3 rd semester	280-3D4-EM : DC avionics systems	55 periods /100
4 th semester	280-404-EM : AC avionics systems	30 periods / 100
▶ 6 th semester	280-533-EM : Avionics maintenance	15 periods / 100
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Total :		100 periods

0263 Check the operation of simple AC circuits on an aircraft.

(duration of training: 70 periods)

Distribution of competence 0263 in the program :

3 rd semester	280-354-EM : Systèmes avioniques to courant continu	5 periods over 70
4 th semester	280-404-EM : Systèmes avioniques to courant alternatif	30 periods over 70
4 th semester	280-605-EM : Instrumentation d'aéronefs	5 periods over 70
▶ 6 th semester	280-533-EM : Maintenance avionique	30 periods over 70
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Total :		70 periods

TERMINAL OBJECTIVE OF THE COURSE (FINAL COURSE OBJECTIVES)

The student will be able to make a judgment on aircraft's airworthiness on AC and DC circuits.

This course outline is the translation of "Plan de cours – 280-533-EM – Maintenance avionique". In case of any contradictions, the French version, which is the original, prevails.

TEACHING AND LEARNING STRATEGIES

Divided into 15 Laboratory sessions, the acquisition of know-how will be facilitated by a series of exercises to better reflect the real conditions of a manufacturer operating under CARS 561 and MRO's operating under CARS 573. The exercises are designed to integrate the concepts of a quality assurance system that meets the criteria of the regulations mentioned above.

A special emphasis will be placed over the techniques to be implemented in order to avoid the 12 human factors usually recognized in aircraft maintenance. Students will pay attention to health and safety measures so that they acquire the reflexes to avoid accidents as much as possible.

COURSE OUTLINE

025T Perform maintenance on aircraft's DC circuits.

Competency elements	Learning objectives	Transports Canada's reference
4. Diagnose and rectify anomalies.	1. Collect data on circuits and systems	
	2. Perform adjustments.	
	3. Perform tests.	
	4. Analyze the collected data.	
	5. Rectify the anomalies while respecting safety procedures.	
	6. Write reports.	
6. Repair and replace wires and terminals.	1. Choose the tools, equipment and the necessary accessories in compliance with standards, procedures, and specifications.	
	2. Determine the sequence of execution.	
	3. Perform crimping.	
	4. Proceed to the final assembly.	
	5. Verify work performed.	
	6. Storing the equipment and workplace cleaning.	
	7. Write reports.	

0263 Check the operation of simple aircraft AC circuits.

Competency elements	Learning objectives	Transports Canada's reference
3. Check the AC generation and distribution on an aircraft.	1. Check aircraft primary AC generation.	
	2. Check aircraft primary DC generation and distribution system and aircraft AC secondary generation.	
	3. Check the aircraft primary AC generation distribution and secondary DC generation.	
	4. Diagnose the anomalies of the aircraft AC generation and distribution systems and aircraft DC primary generation.	
	5. Diagnose the anomalies of aircraft AC generation and power distribution.	
	6. Perform tests on auxiliary generation systems.	
	7. Perform tests on the emergency power system.	
4. The maintenance of an electric motor.	1. Follow the procedures for a common inspection.	
	2. The procedures for general overhaul.	
5. Diagnose and rectify anomalies.	1. Collect data on circuits and systems.	
	2. Perform adjustments.	
	3. Perform system tests.	
	4. Analyze the collected data.	
	5. Rectify anomalies.	

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Course outline 280-6A3-EM: Avionics Maintenance

Competency elements	Learning objectives	Transports Canada's reference
	6. write reports.	
7 Replace units.	1. Plan work.	
	2. Perform installation activities.	
	3. Check the conformity of the installation.	
	4. Perform operation tests.	
	5. Analyze the collected data	
	6. Record information in work orders.	

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Semester calendar

Periods		Content	Personal study	Objectives
Week 1	3	<p>Course introduction</p> <ul style="list-style-type: none"> • Presentation of the course outline. • Reminder of health and safety in Laboratories and hangars. • Reminder of the 12 human factors in aviation. • Use of manuals from the manufacturer. • Drafting of the work cards. • Reminder on AC and DC GPU's connection. • Introduction to the realization of the different types of crimping and harness. 		<p>025T : 4.1., 6.6.</p> <p>0263 : 5.3.</p>
Weeks 2 to 5	12	<p>Harness building, crimping and inspection.</p> <ul style="list-style-type: none"> • Description of wire identification, use of wire marking, stripping and crimping tools. • Using the documentation provided by the tools and connectors manufacturers. • Respect of the required regulatory. • Calibration of tools verification. • Wire marking and identification in accordance with the applicable standards. • Realization of a harness with connectors and lugs following an installation document. • Installation of shielded wire using solder sleeves. • Secure wires to the harness by lacing techniques using plastic ties and lacing cord. • Inspection of harness connectors crimping. • Explanations on contacts common problems. • Harness installation in an aircraft and use of appropriate fasteners. • Final inspection of the harness on the structure. 	<p>H&S regulation. Fabrication process. AC 21-99 (CASA). AC.43-13 (FAA). AWB 02-9 (CASA).</p>	<p>025T : 6.1., 6.2., 6.3., 6.4., 6.5, 6.6., 6.7.</p>
		<p>Coaxial cable.</p> <ul style="list-style-type: none"> • Identification of the appropriate coaxial cable. • Identification of the coaxial connectors. • Identification of the required tooling. • Realization of a coaxial cable with BNC connectors. • Respect of the required regulations. • Inspection of the completed cable and electrical compliance. 	<p>H&S regulation. Antenna and radio frequencies theory. AC 21-99 (CASA). AC.43-13 (FAA).</p>	<p>025T : 6.1., 6.2., 6.3., 6.5., 6.6.</p>
Week 6	3	<p>Check the aircraft's AC secondary generation on a primary DC generation system. (King Air)</p>	<p>H&S regulations.</p>	<p>0263 : 3.1., 3.2., 3.4.</p>

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Course outline 280-6A3-EM: Avionics Maintenance

Periods		Content	Personal study	Objectives
		<ul style="list-style-type: none"> • Search for the proper procedure in the manufacturer's technical documentation. Check the operation of the aircraft's AC secondary circuits. • Experience the methodology of troubleshooting an aircraft system with Multisim. Write a technical report. 	Aircraft AC generation theory.	
Les Weeks 7 to 12 s'effectueront en rotation et en groupe de 2.				
Weeks 7 to 12	3	<p>Check the operation of the fire detection system. (Lab #7 in rotation)</p> <ul style="list-style-type: none"> • Search the appropriate circuits involved in the technical documentation. • Locate the components and circuits involved on the aircraft. • Verify the operation in accordance with the procedures in the maintenance manual • Open access panels or clear access to the components in question; If necessary, drafting of new work cards work. • Closure of the work cards open in relation to the work performed. 	H&S regulations. Review of work card writing methods. Use of the manufacturers technical documentation ATA100 System. AC.43-13.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.
Weeks 7 to 12	3	<p>Repair and/or installation of wires, terminals, connectors and bonding points on an aircraft. (Lab #8 in rotation)</p> <ul style="list-style-type: none"> • Identification of the work to be performed. • Opening a work card. • Determine the sequence of work. • Search for the appropriate technical documentation. • Perform tasks. • Visual inspection of the installation or repair. • Functional check of the circuits installed or repaired. • Closure of the work card. 	H&S regulation. Use of the manufacturers technical documentation ATA100 System. AC 21-99 (CASA). AC.43-13 (FAA). AWB 02-9 (CASA).	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6., 6.1., 6.2., 6.5., 6.6., 6.7.

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Periods		Content	Personal study	Objectives
Weeks 7 to 12	3	<p>Troubleshooting of DC power distribution and generation systems. (Lab #9 in rotation)</p> <ul style="list-style-type: none"> • Perform work card instructions related to the failure of the aircraft DC generation and distribution electric system. • Search for the appropriate technical documentation. • Locate the components and circuits involved on the aircraft. • Develop a measurement and troubleshooting strategy. • Open access panels or clear access to the components in question; If necessary, drafting of new work cards work • Perform the tests and measurements leading to the resolution of the problems. • Identify the cause of the problems. • Verification of the circuits in question by functional tests. • Closure of the work cards open in relation to the work performed. 	<p>H&S regulations. Review of work card writing methods. Use of the manufacturers technical documentation ATA100 System. AC.43-13.</p>	<p>025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.</p>
Weeks 7 to 12	3	<p>Maintenance of a DC Starter-generator. (Lab #10 in rotation)</p> <ul style="list-style-type: none"> • Research of the maintenance in the manufacturer's documentation (CMM-<i>Component Maintenance Manual, Falcon 20</i>). • Work card completion. • Inspection and maintenance in accordance with the manufacturer specifications. • Complete the work card as well as an authorized release certificate card « Form One ». 	<p>H&S regulation. Use of the manufacturers technical documentation ATA100 System.</p>	<p>0263 : 4.1, 4.2.</p>

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Periods		Content	Personal study	Objectives
Weeks 7 to 12	3	<p>Dépannage de systèmes de génération secondaire AC d'un aéronef to génération électrique primaire DC. (Lab #11 in rotation)</p> <ul style="list-style-type: none"> • Prise en charge d'une carte de travail (NRWC) relative to une panne over le système de génération et de distribution électrique AC d'un aéronef primaire DC. • Search for the appropriate technical documentation. • Locate the components and circuits involved on the aircraft. • A strategy of measurement and troubleshooting. • Open access panels or clear access to the components in question; If necessary, drafting of new work cards work • Perform the tests and measurements leading to the resolution of the problems. • Identify the cause of the problems. • Verification of the circuits in question by functional tests which may include a ground run. • Closure of the work cards open in relation to the work performed. 	<p>H&S regulation. Review of work card writing methods. Use of the manufacturers technical documentation ATA100 System. AC.43-13. Additional Falcon 20 schematic.</p>	<p>0263 : 3.1, 3.2, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6</p>
Weeks 7 to 12	3	<p>Perform verification of a complex aircraft electric system (Lab #12 in rotation)</p> <ul style="list-style-type: none"> • Perform work card instructions related to the failure of the test of an aircraft's anti-ice system. • Search for the appropriate technical documentation. • Identify the location of the LRU to test • Perform a functional test of the LRU. • Closure of the work cards open in relation to the work performed. 	<p>H&S regulation. Use of the manufacturers technical documentation ATA100 System. AC.43-13. Review about avionics systems and their location in the aircraft.</p>	<p>025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.</p> <p>0263 : 7.1., 7.2., 7.3., 7.4., 7.5., 7.6.</p>
Week 13	3	<p>Ground run and adjustment of regulators Aéronefs : King Air.</p> <ul style="list-style-type: none"> • Search for documentation for Piper Aztec and Cessna 337. <p>Half group work.</p>	<p>Questionnaire on verification procedures. Assessment of the application of the procedures</p>	

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Course outline 280-6A3-EM: Avionics Maintenance

Periods		Content	Personal study	Objectives
Week 14	3	<p>Practical exam: harness fabrication.</p> <ul style="list-style-type: none"> • Assemble a harness by following the instructions provided. • Find and meet the standards defined in the technical documentation. • Find and use appropriate tools provided. <p>Individual assessment.</p>	<p>Fabrication process. AC 21-99 (CASA). AC.43-13 (FAA). AWB 02-9 (CASA).</p>	<p>025T : all</p> <p>0263 : all</p>
Week 15	3	<p>Written exam.</p> <ul style="list-style-type: none"> • Understanding of the different avionics tools and their use. • Understanding of the various avionics components and their uses. • Understanding of the different tasks in industry. • Be able to make a diagnosis on systems. 	<p>Review from the beginning.</p>	<p>025T : all</p> <p>0263 : all</p>

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Lab rotation sequence (Weeks 7 to 12)

Week	Team 1	Team 2	Team 3	Team 4	Team 5	Team 6
7	Lab 7	Lab 8	Lab 9	Lab 10	Lab 11	Lab 12
8	Lab 8	Lab 9	Lab 10	Lab 11	Lab 12	Lab 7
9	Lab 9	Lab 10	Lab 11	Lab 12	Lab 7	Lab 8
10	Lab 10	Lab 11	Lab 12	Lab 7	Lab 8	Lab 9
11	Lab 11	Lab 12	Lab 7	Lab 8	Lab 9	Lab 10
12	Lab 12	Lab 7	Lab 8	Lab 9	Lab 10	Lab 11

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SYNTHESIS OF SUMMATIVE ASSESSMENT METHODS

DESCRIPTION OF THE EVALUATION ACTIVITY	ASSESSMENT CONDITIONS	LEARNING OBJECTIVE(S)	Evaluation criteria	DEADLINE (DATE OF DELIVERY OF A WORK OR EXAM PERIOD)	Weighting (%)
Fabrication, crimping and harness inspection.	Individual assessment of work performed: <ul style="list-style-type: none"> • Recognition and respect of the wire length. • Crimping. • Thermal sleeves. • Harness fabrication. • Antenna cable fabrication. • H&S. 	025T : 6.1., 6.2., 6.3., 6.4, 6.5, 6.6., 6.7.	Perform the crimps and different endings.	Labs 2 to 5	25
Functional check of the AC secondary generation and DC primary generation.	Individual assessment of work performed: <ul style="list-style-type: none"> • Functional check. • Procedure. • Report. • Attitude/H&S. 	0263 : 3.1., 3.2., 3.4.	Functional check	Lab 6	4
Checking the operation of the fire detection system	Work performed in team. Submission of an individual report. Individual assessment for radio communication.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.	Systems functional checks	Lab 7 (in rotation)	4
Repair and/or installation of wires, terminals, connectors and contacts of bonding points on an aircraft	Individual assessment of work performed.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6., 6.1., 6.2., 6.5., 6.6., 6.7.	Repairs on connections	Lab 8 (in rotation)	4
Troubleshooting of DC power distribution and generation systems	Troubleshooting assessment in teams	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.	Perform appropriate troubleshooting .	Lab 9 (in rotation)	4
Maintenance of a starter-generator	Individual assessment of work performed.	0263 : 4.1, 4.2.	Perform the removal and installation	Lab 10 (in rotation)	4
Troubleshooting of AC power distribution and generation systems	Troubleshooting assessment in teams.	0263 : 3.1, 3.2, 3.4, 5.1, 5.2, 5.3, 5.4, 5.5, 5.6	Perform the appropriate troubleshooting .	Lab 11 (in rotation)	4
Troubleshooting complex aircraft system	Assessment of the approach in teams.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6.	Perform the appropriate test procedure.	Lab 12 (in rotation)	4
Practical exam: harness fabrication	Individual assessment of work performed.	025T : 6.1., 6.2., 6.3., 6.4., 6.5, 6.6., 6.7.	Complete assembly procedures according to instructions.	Week 14	17
Written exam	Individual written exam.	025T : 4.1., 4.2., 4.3., 4.4., 4.5., 4.6. 0263 : 3.5., 5.1., 5.2., 5.3., 5.4., 5.5., 5.6.	Questions based on the whole semester	Week 15	30
				TOTAL :	100

All reports are to submitted at the end of the period.

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The mark awarded to a lab session also takes account of the following criteria:

- Respect of schedule.
- Respect rules and regulations.
- Cleanliness including cleaning the workplace after work.

If a student is absent to an activity or to a part of an activity, he (she) will receive the grade of 0 for the report corresponding to this activity or to the part of the activity for which he (she) was absent. If the absence is due to a major reason, he (she) will not be penalized (e) for this activity or that part of the lab.

Deadlines :

All the work, work cards and reports will be given at the end of each period or group meeting else usual penalties will apply.

REQUIRED MATERIAL

- Clothing and safety equipment in accordance with the rules of ENA.
- Lab notebook of and presentations (available over the intranet).
- Additional documents of manufacturers (available over the intranet and over the Internet).
- The student must attend courses with required documents.

MEDIAGRAPHY

EISMIN, THOMAS K. – Aircraft Electricity & Electronics, Fifth Edition, Glencoe, 1997.

This list is not exhaustive.

CONDITIONS FOR SUCCESS IN THE COURSE

(1) Pass mark

The pass mark of this course is 60%.

(2) Presence in summative evaluations

The presence in the summative evaluation activities is mandatory.

(3) Work submission

The required work must be returned to the date, the place and the time set by the teacher. In case of delay, the penalties are a withdrawal by 10% per business day and a grade of zero (0) will be attributed to the sixth day of delay.

(4) Material presentation of the work

The student must meet the "Standards of physical presentation of written work" adopted by the College. Failure to comply with these standards may delay the acceptance of the work or affect the score. These standards are available in links under the heading 'Methodology' on the College website: www.cegepmontpetit.ca/normes.

Departmental penalties for failure to comply with the standards of material presentation of the work (IPESA, article 5.3.2) at : <http://guideena-en.cegepmontpetit.ca/department-rules/>

TERMS OF PARTICIPATION IN THE COURSE

Security at the Lab and use of space:

The occupation of the premises of lab and the use of their equipment by the students must be under the supervision of a teacher or a technician, unless otherwise stated.

Any student whose behaviour in the lab presents a risk to other people will be, after being warned by the Professor, excluded from the lab up to review of the case by the teacher and the Coordinator of the Avionics Department.

INSTITUTIONAL POLICIES AND REGULATIONS

Any student enrolled at the Édouard-Montpetit college must take knowledge of the content of some policies and institutional regulations and comply. Including, institutional learning evaluation policy, special conditions concerning the maintenance of the admission of a student, valorisation of French policy, the policy of studies and work free of harassment and violence, the procedures and rules on the treatment of student complaints.

The full text of these policies and regulations is accessible over the web site of the College to the following address : <http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. In case of discrepancy between texts found elsewhere and the full text, the latter is the only legal and applied version.

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OTHER DEPARTMENTAL RULES

The Department applies the standard of Transport Canada which fixes to 5% absences allowed in the course (theory and lab). The Department compiles the absences of students enrolled in the programs of maintenance of aircraft (280.C0) and Techniques of avionics (280.D0) according to the requirements of Transport Canada. The application of the policy of Transport Canada over control of absences is available over the site of the College and in the agenda student under the heading "Privileges granted by Transport Canada".

Students are invited to consult the website for specific rules to this course:

<http://guideena-en.cegepmontpetit.ca/departement-rules/>