

COURSE OUTLINE

COURSE: **Metal Structural Repair**

PROGRAM: 280.C0 Aircraft Maintenance

DISCIPLINE: 280 Aeronautics

WEIGHTING: Theory: 2 Practical: 4 Personal Study: 1

Instructor(s)	Office	☎ extension	✉ e-mail or website
Joaquin Mora	C-186	4220	joaquin.mora@ena.ca

OFFICE HOURS

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
Morning					
Afternoon					

Dep. Coordinator(s)	Office	☎ Extension	✉ Email or Website
Joaquin Mora	C-160	4220	joaquin.mora@ena.ca
Serge Rancourt	C-160	4664	serge.rancourt@ena.ca

1 CONTEXT OF THIS COURSE IN THE PROGRAM

This course is offered during the third session of the program. By the end of the course, students will have developed:

- dexterity with the tools and equipment;
- research skills using technical manuals;
- familiarity with materials and hardware;
- the ability to propose a preliminary report of a major repair;
- the ability to make major repairs to an aircraft frame and skin

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 ENA website and in the student agenda under the heading « Privilèges accordés par Transports Canada ».

2 COMPETENCIES OF THE EXIT PROFILE (STUDENT SKILL PROFILES)

The student will perform maintenance on aircraft structural parts.

3 MINISTERIAL OBJECTIVE(S) AND COMPETENCIES

- | | |
|-------------|---|
| 025X | Conduct cleaning, inspection and protect aircraft materials (reinvestment only) |
| 025Z | Prepare and assemble sheet metal |
| 0261 | Maintain metal structures and structural components of an aircraft |

4 TERMINAL OBJECTIVE OF THE COURSE (FINAL COURSE OBJECTIVE)

At the end of this course, the student will know the nomenclature of an aluminum structure. He will be able to assess the severity of a damage, prepare a plan for its repair and finally, with the necessary tools, he will be able to perform the structural repair.

5 TEACHING AND LEARNING STRATEGIES

Theory

The theoretical part of the course "Metal Structural Repair" is composed of different themes:

Riveting - Bending of aluminum sheets - Introduction to aluminum structures - Construction of an aluminum structure - Inspection of an aluminum structure - Tools for working aluminum sheet - Repairing an aluminum structure - Special fasteners - Aircraft center of gravity - Control surface balancing - Alignment and structural symmetry

Exercises and discussions in class will be used as a strategy to allow students to develop the necessary skills to perform maintenance on aircraft. Research assignments in technical manuals and the use of multimedia tools will reinforce the learning process.

Practical Work

During the laboratory periods, the instructor will guide students with practical demonstrations of different tools and measuring instruments. Students will acquire manual dexterity and the competence necessary to be aircraft maintenance technicians through a variety of practical exercises that involve evaluating damage, treating corrosion and other observed defects. The different minor repair projects during the session will be assembled by riveting according to aeronautical standards. All activities will comply with the health and safety procedures applicable to the aeronautical industry.

6 COURSE PLAN

LEARNING OBJECTIVES

1. Assess the techniques, tools and equipment required, based on the objectives, and needs.
2. Shape and assemble sheet metal parts by riveting, while checking the quality of the work.
3. Assess a required repair following a thorough inspection.
4. Tidy up and clean the work area.

THEORY

Week	LEARNING OBJECTIVE	CONTENT	MODE OF OPERATION AND LEARNING ACTIVITIES	RESSOURCES, DOCUMENTS, OUTILS TECHNOLOGIQUES ET LIENS URL
1	1	- Presentation of the Course Outline - Tooling and Riveting Review	- Lecture - Note-taking - In-class exercises	- Riveting guide available on Léa - Study document (Léa)
2	1 and 2	- Sheet metal bending	- Lecture - Note-taking - In-class exercises	- Bending guide available on Léa - Study document (Léa)
3	1 and 2	- Corner bends – Doublers – Insertion	- Lecture - Note-taking - In-class exercises	- Bending guide available on Léa - Study document (Léa)
4	EXAM 1			
5	3	- ATA 100 – Repair Manuals – Corrosion Protection – Aircraft Structures	- Lecture - Note-taking	- Study document (Léa) - AC 43.13 - A&P Technician Airframe Textbook - AC 43-4A
6	1 and 3	- Basic principles of Structural Repairs – Structure Loads pt.1	- Lecture - Note-taking	- Study document (Léa) - AC 43.13 - A&P Technician Airframe Textbook - SRM

Course outline 280-3A6-EM: Metal Structural Repair

Week	LEARNING OBJECTIVE	CONTENT	MODE OF OPERATION AND LEARNING ACTIVITIES	RESSOURCES, DOCUMENTS, OUTILS TECHNOLOGIQUES ET LIENS URL
7	1 and 3	- Structure Loads pt.2 – Load Factor – Fatigue	- Lecture - Note-taking - In-class exercises	- Study document (Léa)
8	1 and 3	- Preliminary report for a typical repair	- Lecture - Note-taking - In-class exercises	- Study document (Léa) - SRM
9	EXAM 2			
10	1	- Special Fasteners	- Lecture - Note-taking - In-class exercises	- Study document (Léa) - AC 43.13
11	1 and 3	- Weight and balance- Center of Gravity (CG)	- Lecture - Note-taking - In-class exercises	- Study document (Léa) - AC 43.13 - SRM - AMM
12	1 and 3	- Flight Controls Balancing	- Lecture - Note-taking - In-class exercises	- Study document (Léa) - SRM - AMM
13 and 14	3	- Structure symmetry and alignment	- Lecture - Note-taking - In-class exercises	- Study document (Léa) - SRM - AMM
15	EXAM 3			

LABORATORY

Week	LEARNING OBJECTIVE	CONTENT	MODE OF OPERATION AND LEARNING ACTIVITIES	RESSOURCES, DOCUMENTS, OUTILS TECHNOLOGIQUES ET LIENS URL
1	1, 2 and 4	- Course Outline and familiarisation with sheet metal tools by making a paper plane out of metal.	- Teacher demonstration - Manual work in the lab	- Lab document - Riveting and Bending Guide available on Léa
2	1, 2 and 4	- Familiarising yourself with sheet metal tools, calculating developments and carrying out bending exercises.	- Teacher demonstration - Manual work in the lab and/or on the Q400 fuselage	- Lab document - Riveting and Bending Guide available on Léa
3 4	1,2 and 4	- EVALUATION #1, - Bending C-Stringer and riveting it to the Skin	- Manual work in the lab and/or on the Q400 fuselage	- Lab document - Riveting and Bending Guide available on Léa
5 6	1, 2, 3 and 4	- Repair of fuselage Skin with round reinforcement (patch) and sealant.	- Teacher demonstration - Manual work in the lab and/or on the Q400 fuselage	- Lab document - Riveting and Bending Guide available on Léa
7 8 9	1, 2, 3 and 4	- EVALUATION #2, - Repair of a C-Stringer on the fuselage with inserted reinforcement. Calculation, cleaning, bending, corrosion protection, assembly.	- Teacher demonstration - Manual work in the lab and/or on the Q400 fuselage	- Lab document - Riveting and Bending Guide available on Léa

Course outline 280-3A6-EM: Metal Structural Repair

Week	LEARNING OBJECTIVE	CONTENT	MODE OF OPERATION AND LEARNING ACTIVITIES	RESSOURCES, DOCUMENTS, OUTILS TECHNOLOGIQUES ET LIENS URL
10 11	1, 2 and 4	– Fabrication of biplane.	– Manual work in the lab and/or on the Q400 fuselage	– Lab document – Riveting and Bending Guide available on Léa
12 13 14 15	1, 2 and 4	– EVALUATION #3, – Fabrication of an Access Panel on the fuselage skin.	– Teacher demonstration – Manual work in the lab and/or on the Q400 fuselage	– Lab document – Riveting and Bending Guide available on Léa

7 SYNTHESIS OF SUMMATIVE EVALUATION METHODS

THEORY

Description of Evaluation Activity	Context of realization and mode of evaluation	Learning Objective(s)	Due Date (Approximate date assignment due or exam given)	Weighting (%)
Exam # 1, on the notions activity periods 1 to 4	Individual, written exam, (Without notes)	025Z (1) 0261 (1, 2, 3, 5)	Week 4	10
Exam # 2, on the notions activity periods 6 to 9	Individual, written exam, (Without notes)	All objectives of the skills 025Z and 0261	Week 9	10
Exam # 3, on the notions activity periods 11 to 13	Individual, written exam, (Without notes)	All objectives of the skills 025Z and 0261	Week 15	20

Total: 40 points

PRACTICAL WORK

Description of the evaluation activity	Context and evaluation method	Learning objective(s)	Week(s)	Weighting (points)
Evaluation #1 Calculation of developed, fabrication of C-Stringer, corrosion protection and installation of C-Stringer on Skin.	Individual, Practical work	025Z (3,4,5)	Week 4	15
Evaluation criteria: Accuracy of calculations, accuracy of the drawing, dimensional accuracy of the manufactured part, accuracy and cleanliness of the rivets, assembly corresponding to the drawing, cleanliness of the assembly.				
Evaluation #2 Repair on C-Stringer	Individual, Practical work	025Z (3,4,5) 0261 ((4,5,6,7)	Week 9	15
Evaluation criteria: Dimensional accuracy of the repair, accuracy and cleanliness of the rivets used, assembly corresponding to the drawing, cleanliness of the assembly.				
Evaluation #3 Fabrication and installation of an inspection (access) door on Skin.	Individual, Practical work	All learning objectives 025Z and 0261	Week 15	30
Evaluation criteria: Dimensional accuracy of the parts, accuracy and cleanliness of the rivets, assembly corresponding to the drawing, cleanliness of the assembly.				

Total : 60 points

8 REQUIRED MATERIAL

In the laboratory, safety glasses, safety shoes are mandatory. ÉNA students are required to wear ÉNA-branded clothing in the laboratories and hangars. Pants authorized are work pants or jeans in good condition (no decoration: nails, metal parts, etc.).

Hoodies with drawstrings are not permitted, as there is an OHS risk with equipment or machinery.

9 MEDIAGRAPHY

ACCEPTABLE METHODS, TECHNIQUES AND PRACTICES; V. 1 : AIRCRAFT INSPECTION AND REPAIR, AC 4313-1A, V. 2 : AIRCRAFT ALTERATIONS, AC 4313-2A, *Department of Transportation. Federal Aviation Administration*. Washington D.C., U.S. Government Printing Office, 1977, 2 volumes.

AIRCRAFT STRUCTURAL TECHNICIAN, *Dale Hurst*, Avotek Publishing, Harrisonburg, Virginia, 2001, 272 pages.

STANDARD AIRCRAFT HANDBOOK, *Leavell, Stuart et Stanley BUNGAY*, 3^e éd., Fallbrook, Calif., Aero, 1980, 159 pages.

AIRCRAFT SHEET METAL, *Nick Bonaci*, International Aviation Publisher, EA-SM, Casper (Wyoming), 1987, 134 pages.

UNDERSTANDING AIRCRAFT STRUCTURE, *John Cutler*, Granada Publishing Ltd, Frogmore (England), 1981, 170 pages.

CELLULES ET SYSTÈMES D'AÉRONEFS, *Didier Féminier*, Modulo Éditeur, Mont-Royal, 1982, 315 pages, chapitres 1 à 4, pages 1 à 69.

A & P TECHNICAL AIRFRAME TEXTBOOK, Jeppesen, EA-ITP-A², Englewood, Colorado, 1992, 794 pages, chapitres 3, 5 et 6.

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. 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 ÉNA 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.

3. 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.

4. 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 at : <http://rmsh.cegepmontpetit.ca/normes-de-presentation-materielle-des-travaux-ecrits-du-cegep/>.

5. Plagiarism and other breaches of academic integrity

a) Plagiarism consists of copying, translating, paraphrasing, in whole or in part, the work of another person and wrongfully attributing it to oneself, with or without their consent, and constitutes a breach of academic integrity.

b) The use of works generated entirely or partially by artificial intelligence, if not authorized by the professor, is also considered a breach of academic integrity.

c) Acts of fraud, such as impersonating another student during a summative assessment, deceiving, cheating, or falsifying documents or results, also constitute breaches of academic integrity.

d) Any collaboration in such acts or any attempt to commit them is also considered a breach of intellectual ethics.

Any violation of intellectual honesty, as well as any attempt at or collaboration in such an action will result in a mark of "0" for the exam, the assignment or the evaluation activity in question. In this case, the teacher will make a written report to departmental coordination which will be transmitted to the Dean of Studies in accordance with Article 5.6.1 IPESA).

11 METHODS OF COURSE PARTICIPATION

Safety Regulations for Workshop Personal

1. Running is prohibited.
2. Loose clothing and hair must be pulled back, tightened or tucked in when using rotational equipment (e.g. ties, sleeves, long hair).
3. Hand tools and workshop equipment are to be used only after a demonstration.
4. No work may be done in the workshop without the supervision of an instructor.
5. Small metal parts to be drilled (manually or with a drill press) must be held in place with clamps.
6. All dangerous products should be used in a ventilated area (paint shop).
7. Sitting on the workbenches or machines is prohibited.
8. Visual and auditory instructions in case of a fire must be followed by everyone.
9. Any accident must be reported to authorized staff; the guard must be notified if first aid is not sufficient.

Safety Regulations for Workshop Equipment

1. Clean the workshop after each course (tables, workbenches, floor, etc.)
2. Clean workshop equipment after each use (drill press, sandblaster, grinder, etc.)
3. No aluminum material or non-ferrous material may be used on the grinders.
4. Respect directives regarding materials when using the bandsaw.
5. Return all workshop equipment to its appropriate place after use.
6. Report any defective or damaged equipment or tools.
7. Correctly maintain the classification of rivets or bolts.

12 OTHER DEPARTEMENTAL REGULATIONS

Students are encouraged to consult the website for the specific regulations for this course:

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

13 INSTITUTIONAL POLICIES AND REGULATIONS

All students enrolled in the École Nationale d'aérotechnique of Édouard-Montpetit CEGEP must be aware of and comply with the contents of institutional policies and regulations. In particular, the *Politique institutionnelle de la langue française (PILF)*, the *Politique pour un milieu d'études et de travail exempt de harcèlement et de violence (PPMÉTEHV)*, the *conditions of admission and academic progress*, the *procedure dealing with student complaints within educational relations*.

The complete version of these policies and regulations is available on the CEGEP website at the following address: <http://www.cegepmontpetit.ca/ena/a-propos-de-l-ecole/reglements-et-politiques>. In case of discrepancy between the version appearing elsewhere and the complete version, the complete version will be applied and will be considered the official version for legal purposes.

14 STUDENT ACCESSIBILITY CENTER - FOR STUDENTS WITH DISABILITIES

Students having received a professional diagnosis of impairment (motor skills, neurological, organic, sensory, learning difficulties, mental health, autism spectrum disorder or other) or suffering from a temporary medical condition may request special accommodations.

Students seeking these accommodations must forward their diagnosis to the CSA by either MIO to "Service, CSA-ENA" or email to "servicesadaptesena@cegepmontpetit.ca".

Students already registered with the CSA must communicate with their teachers at the beginning of the semester to discuss those accommodations they have been awarded by the CSA.

15 ANNEX

None