

LEVEL 2

SHEETMETAL

Training



ACRATS

DETAILED COURSE OUTLINE ATS2132

AIRCRAFT METALLIC STRUCTURE: MANUFACTURING, ASSEMBLY, INSPECTION, DAMAGE ASSESSMENT AND REPAIR LEVEL 2



Course Title

Aircraft Metallic Structure: Manufacturing, Assembly, Inspection, Damage Assessment and Repair, Level 2



Course Tag

Sheetmetal Level 2



Course ID

ATS2132



Course Duration

15 Working Days



Prerequisites

ACRATS

Aircraft Metallic Structure:

Manufacturing, Assembly, Inspection, Damage Assessment and Repair Level 1 (or similar)



Learning Hours

Classroom: 30 Hours
Practical 90 Hours



Highest Standards

Meets EASA, FAA and OEM SRM Standards



Scope and Purpose

This course is designed to deepen participants' understanding of critical aspects of aircraft structures, ensuring they can perform complex tasks with precision and adhere to industry standards. Participants will learn advanced techniques for metal forming and machining operations. They will gain a thorough understanding of hole preparation, including drilling, reaming, and dimpling, and gain proficiency in assembling sheet metal repair parts. The course covers the use of special fasteners and fastening processes, comprehensive structural repair procedures, and detailed damage assessment and reporting methods. In addition, participants will enhance their skills in corrosion control, surface treatment, and protective coating techniques as well as effective sealant application, removal, and repair methods.



Course Module Overview

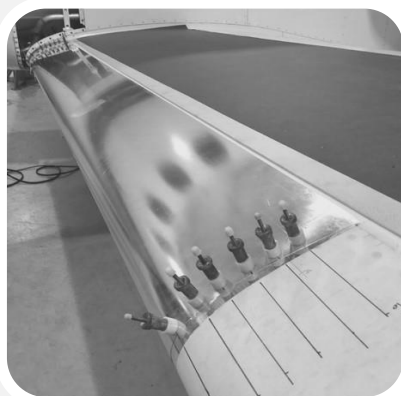
- Introduction
- Metal Forming and Machining Operations (Part 2)
- Hole Preparation (Drilling, Reaming, and Dimpling)
- Assembly of Sheet Metal Repair Parts
- Aircraft Special Fasteners and Fastening Processes
- Aircraft Metallic Structures
- Source Documentation (Part 2)
- Inspection and Damage Assessment
- Damage Reporting
- Structural Repair (Part 2)
- Corrosion Control of Aluminum Alloys: Prevention, Recognition, and Removal
- Surface Protective Treatment and Coatings
- Sealant Application, Removal, and Repair
- Traceability and Record Keeping



Selection of the Learning Goals

Upon successful completion of this training, the student will be able to:

- Perform advanced metal forming operations, including bending at various angles, using forming blocks and specialized tools, and applying techniques like shrinking, stretching, joggling, and creating lightning holes;
- Execute precise hole preparation techniques, including drilling, reaming, and dimpling, ensuring accurate hole tolerances and understanding criticality and safety precautions;
- Assemble sheet metal repair parts accurately by copying holes using various tools and ensuring precise hole placement and alignment;
- Select and install special aircraft fasteners, understand different types of solid rivets, interference fit fasteners, and fastening processes, and develop proficiency in their application and removal;
- Describe various types of aircraft structures, classify primary and secondary structures, understand stresses and loads, and interpret station and stringer diagrams for structural support and damage location;
- Navigate and interpret various aircraft maintenance manuals (AMM, CMM, IPC, SB, SRM), understand regulatory standards, and apply repair procedures effectively;
- Perform detailed inspections using common tools, assess different types of damage, measure accurately, and compare with allowable damage limits in source documentation;
- Accurately assess and report damages using effective mapping techniques, formulate comprehensive reports, and address the influence of human factors;
- Conduct comprehensive structural repairs, understand repair principles and categories, and apply appropriate repair strategies for different damage types, ensuring compliance with flight restrictions and inspection intervals;
- Implement advanced corrosion control measures, recognize and inspect for corrosion, and apply appropriate removal techniques to maintain aircraft integrity;
- Apply, remove, and repair sealant on aircraft, identify areas requiring sealing, clean repair areas thoroughly, and follow safety precautions;
- Manage traceability and record-keeping processes, maintain accurate maintenance records, ensure regulatory compliance, and utilize electronic systems for record-keeping and analysis.



Detailed Module Overview

Topic		Teaching Level	Classroom Hours	Practical Hours
1	Introduction	1	1	
2	Metal Forming- and Machining Operations (including Tooling and Equipment) Part 2	2	3	
3	Hole Preparation (Drilling, Reaming and Dimpling)	2	1	
4	Assembly of Sheet Metal Repair Parts	2	1	
5	Aircraft Special Fasteners and Fastening Processes	2	1	
6	Aircraft Metallic Structures	1	2	
7	Source Documentation Part 2	2	3	
8	Inspection and Damage Assessment	2	3	
9	Damage Reporting	2	3	
10	Structural Repair Part 2	1	3	
11	Corrosion Control of Aluminum Alloys: Prevention, Recognition and Removal	1	3	
12	Surface Protective Treatment and Coatings	2	1	
13	Sealant Application, Removal and Repair	2	2	
14	Traceability and Record Keeping	1	1	
15	Practical Exercises	3	-	90
16	Assessment Criteria	-	-	-
17	Written Test	-	2	
Total Hours		-	30	90
Course Length (Minimum)			120 Hours	

Teaching Level 1

Teaching level 1 includes the transferring of knowledge from the instructor to the student, through instruction, lecture, demonstration and by having topic-related discussions. Knowledge transfer can take place in a classroom (physical training) as well as through online learning (Computer Based Training (CBT)). The content of e-learning modules should be structured in such a way, keeping in mind that discussions are not possible (it is classified as passive learning), and the participant should be able to understand the material without the intervention of an instructor. Online classes or e-learning modules should be arranged in such a way that the participant has the opportunity to ask questions to the designated instructor or to provide (general) comments. Teaching level A does not include a practical application (hands-on) or the development of practical skills.

Teaching Level 2

Teaching level 2 includes the transferring of knowledge from the instructor to the student, through instruction, lecture, demonstration, topic-related discussions, and limited practical application, but does not include the development of sufficient manipulative skill to perform basic operations. Knowledge transfer can take place in a classroom (physical training) as well as through online learning (Computer Based Training (CBT)). The content of e-learning modules should be structured in such a way, keeping in mind that discussions are not possible (it being classified as passive learning), that the participant should be able to understand the material without the intervention of an instructor. Online classes or e-learning modules should be arranged in such a way that the participant has the opportunity to ask questions to the designated instructor, or to provide (general) comments. Online classes or e-learning modules must contain sufficient demonstration by means of explanatory videos. A high degree of interaction must be built in. Teaching level B requires some hands-on manipulative skills, or practical demonstration of the skills and their accompanying actual or simulated components/equipment, but still may be taught primarily in the classroom environment.

Teaching Level 3

Teaching level 3 includes the transferring of knowledge from the instructor to the student, through instruction, lecture, demonstration, having topic related discussions and a high degree of practical application to develop sufficient manipulative skill to accomplish return to service (normal operation). Teaching level C requires hands-on skill, as well as sufficient and appropriate instructional aides to train the participants to develop manipulative skills sufficient to simulate return to service mechanical skill. At this level, the teaching aids must be similar to or be the actual items of equipment on which the participant is expected to develop the required skill levels. A teaching level C subject cannot be taught solely by instruction or lecture in the classroom; the appropriate training aids and hands-on experience must be used. E-learning modules can be used as a guide through practical assignments. Teaching level C includes a high degree of practical application (hands-on) and a strong focus on the development of practical skills.

Module 1 - Introduction

In Module 1, you'll build upon your foundational knowledge and further understand the roles and responsibilities of a sheet metal worker before, during, and after aircraft maintenance. Through discussions and lectures, you'll explore what is required personally and professionally, focusing on attitude, behavior, and professionalism. Additionally, you'll learn about potential health and safety hazards, how to mitigate risks, and the proper use of personal protective equipment (PPE).

Learning Goals

Upon successful completion of this module, the student will be able to:

- Understand the roles and responsibilities of a sheet metal worker before, during, and after aircraft maintenance, and the importance of restoring aircraft integrity;
- Explain the personal and professional requirements for attitude, behavior, and professionalism, including ethical considerations;
- Identify potential health and safety hazards and demonstrate the proper selection and use of personal protective equipment (PPE).

Topics

1. Course Introduction
2. Introduction to the Profession of sheetmetal worker
3. Job Description
4. Responsibilities
5. Way of Working
 - a. Required Mindset and Attitude (Ethics)
 - b. Accuracy and Precision (Including Working with Tight Tolerances)
 - c. Scratch & Damage Prevention
6. Quality Awareness
7. Health, Safety and Environmental Precautions
 - a. Required Mindset and Attitude (Ethics)
 - b. Hazardous Materials and Chemicals
 - c. Accuracy and Precision (Including Working with Tight Tolerances)
 - d. Scratch & Damage Prevention
8. FOD Awareness & Prevention
9. Tool Control
10. Human Factors in Aircraft Maintenance
11. Quality Awareness
12. Traceability Awareness
13. Order and Tidiness in the Sheetmetal Shop (ACRATS Training-/House Rules)

Module 2 - Metal Forming- and Machining Operations (including Tooling and Equipment) Part 2

In Module 2, you will build upon the metal forming and machining operations covered in Level 1. This module will deepen your understanding and enhance your skills in forming and machining sheet metal. You'll learn to bend sheet metal into single and multiple angled parts, including angles other than 90 degrees. You will also calculate developed lengths and bend allowances for these varied angles and accurately mark bend lines for quality control. Additionally, you'll explore advanced techniques such as forming with forming blocks, using wedges, and working with nylon and wooden mallets. You'll also cover shrinking and stretching metal, joggling, and creating lightning holes, focusing on tooling requirements and operation techniques.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Describe and demonstrate the process of bending sheet metal into various angled parts, including calculations for developed length and bend allowances for angles smaller and bigger than standard 90-degree angles;
- Emphasize the importance of accurate marking of bend lines for quality control in metal forming processes;
- Understand and demonstrate the use of forming blocks, including mold making, use of wedges, and operation with nylon and wooden mallets;
- Describe and demonstrate techniques such as shrinking and stretching metal, joggling, and creating lightning holes, with a focus on tooling requirements and operation techniques.

Topics

1. Introduction
2. Bending of Sheet Metal Parts
 - a. Developed Length Calculation (Flat Pattern Lay-out)
 - b. Bend Allowance Formulas
 - c. Empirical Formula (Reference)
 - d. One Pi Formula
 - e. Two Pi Formula
 - f. Bend Allowance Formulas
 - g. 90° degree bends
 - h. Angles greater than 90° degrees
 - i. Angles smaller than 90° degrees
 - j. Bend Lines (Sight Lines)
 - k. Quality Control Finished Part
3. Forming with Forming blocks
 - a. Mould Making
 - b. Use of Wedges
 - c. Nylon and Wooden Malet
 - d. Operation and Techniques
4. Shrinking and Stretching
5. Joggling
 - a. Purpose and Requirements
 - b. Fabrication of Joggling Tooling
 - c. Precautions for Damage Avoidance
 - d. Operation and techniques
6. Lightning Holes
 - a. Tooling
 - b. Hole saw
 - c. Dimple Die

Module 3 - Introduction

In Module 3, you'll deepen your skills and knowledge in hole preparation techniques, including drilling, reaming, and dimpling. You'll gain a comprehensive understanding of hole tolerance requirements, such as clearance fit, interference fit, and transition fit, and apply ISO 286 Fundamental Tolerances to achieve desired hole characteristics. You'll master the use of various drill bits, reamers, and dimpling tools, executing the dimpling process with precision. This module will also cover adjusting tooling, conducting test strips for quality assurance, and safely removing fasteners from dimpled holes. Additionally, you'll learn to recognize and mitigate dangers associated with dimpling operations, such as material distortion and compromised fastener integrity.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Develop a comprehensive understanding of hole tolerance requirements, including clearance fit, interference fit, and transition fit, and apply ISO 286 Fundamental Tolerances effectively;
- Master the use of various types of drill bits, reamers, and dimpling tools, executing the dimpling process with precision;
- Adjust tooling appropriately and conduct meticulous test strips for quality assurance;
- Safely remove fasteners from dimpled holes, understanding the criticality and precautions involved;
- Recognize and mitigate the dangers associated with dimpling operations, such as material distortion and compromised fastener integrity.

Topics

1. Introduction
2. Types of Drill Bits and Reamers
 - a. Hole (Tolerance) requirements
 - b. Clearance Fit
 - c. Interference Fit
 - d. Transition Fit
 - e. ISO 286 Fundamental Tolerances
 - f. Twist Drill
 - g. Double Margin Drill
 - h. Reamers
3. Dimpling
 - a. Application and Restrictions
 - b. Adjusting of Tooling
 - c. Test Strip
 - d. The dimpling Process
 - e. Removal of Fasteners in Dimpled Holes
 - f. Criticality and Precautions
 - g. Process

Module 4 - Assembly of Sheet Metal Repair Parts

In Module 4, you'll develop the ability to effectively assemble sheet metal repair parts, which is crucial for the maintenance and repair of aircraft structures. You'll learn techniques for accurately copying holes using tools such as hole finders, plexiglass templates, and precise measuring and calculating methods. Additionally, you'll become proficient in using drill stops to ensure precise hole placement and alignment during the assembly processes.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Develop the ability to assemble sheet metal repair parts effectively, contributing to aircraft maintenance and repair;
- Employ techniques for accurately copying holes using tools such as hole finders, plexiglass templates, and precise measuring and calculating methods;
- Become proficient in the use of drill stops to ensure precise hole placement and alignment during assembly processes.

Topics

1. Introduction
2. Copying of Holes
 - a. Hole Finder
 - b. Plexiglass
 - c. Measuring and Calculating
 - d. Use of Drill Stops



Module 5 - Aircraft Special Fasteners and Fastening Processes

In Module 5, you'll learn to select and install various aircraft special fasteners, enhancing your skills in aircraft maintenance and repair. You'll explore less commonly used types of solid rivets, such as Monel rivets, DD-rivets, NACA-riveting, and double countersunk rivets, and learn the intricacies of rivet removal using a solid rivet chisel. You'll gain a deep understanding of interference fit fasteners and high interference fit fasteners, mastering their installation techniques. Additionally, you'll become proficient in interpreting fastener hole and drill data, including for oversize fasteners. You'll also familiarize yourself with Avdel, Huck bolt, and Taper Lok fasteners, and develop proficiency in the installation, wet installation, and safe removal of these fasteners. Furthermore, you'll explore alternatives and substitutions for fastening processes in specific aircraft maintenance scenarios.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Enhance their ability to select and install various aircraft special fasteners, contributing to aircraft maintenance and repair processes;
- Learn about different types of solid rivets, such as Monel rivets, DD-rivets, NACA-riveting, and double countersunk rivets, and how to remove them using a solid rivet chisel;
- Understand and master the installation techniques for interference fit and high interference fit fasteners;
- Interpret fastener hole and drill data, including oversize fasteners, and understand the use of Avdel, Huck bolt, and Taper Lok fasteners;
- Develop proficiency in the installation, wet installation, and safe removal of various fasteners;
- Explore alternatives and substitutions for fastening processes in specific aircraft maintenance scenarios.

Topics

1. Introduction
2. Solid Rivets
 - a. Monel Rivets
 - b. DD-Rivets (including Annealing Rivets)
 - c. NACA-Riveting
 - d. Double Countersunk Rivets
 - e. Rivet Removal with Solid Rivet Chisel
3. Interference Fit Fasteners
4. High Interference Fit Fasteners
5. Fastener Hole and Drill Data
6. Hole and Drill Data Oversize Fasteners
7. Avdel
8. Huck bolt
9. Taper Lok
10. Fastener Installation
11. Wet Installation of Fasteners
12. Fastener Removal (of all discussed types)
13. Alternatives/Substitution

Module 6 - Aircraft Metallic Structures

In Module 6, you'll develop a comprehensive understanding of aircraft metallic structures, enhancing your knowledge of aircraft construction and maintenance processes. You'll explore various types of aircraft structures and understand their construction principles and applications. You'll learn to classify aircraft structures, distinguishing between primary and secondary structures, principal structural elements (PSE), fatigue critical baseline structures (FCBS), and safe life items. You'll gain insights into the types of stresses and loads experienced by aircraft structures. Additionally, you'll learn about the role of stations and stringers in providing structural support and stiffness and interpret station and stringer diagrams.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Comprehensively describe various types of aircraft structures, including monocoque and semi-monocoque structures, and their construction principles and applications;
- Classify aircraft structures into primary and secondary structures, principal structural elements (PSE), fatigue critical baseline structures (FCBS), and safe life items;
- Recognize and understand the types of stresses and loads experienced by aircraft structures and their effects on structural integrity;
- Analyze the distribution of stresses and loads on aircraft and component structures to understand how different parts of the aircraft are affected during flight and ground operations;
- Understand the role of stations and stringers in providing structural support and stiffness, and interpret station and stringer diagrams for structural layouts and damage location;
- Identify and understand the functional and structural characteristics of different aircraft zones.

Topics

1. Introduction
2. Types of Structures (including Monocoque- and Semi-Monocoque Structures)
3. Structure Classification
 - a. Primary- and Secondary Structure
 - b. Principal Structural Elements (PSE)
 - c. Fatigue Critical Baseline Structure (FCBS)
 - d. Safe Life Items
4. Types of Stresses and Loads
5. Stresses and Loads on Aircraft- and Component Structures
6. Stations and Stringers (including Station and Stringer Diagram)
7. Aircraft Zones

Module 7 - Introduction

In Module 7, you'll develop a comprehensive understanding of regulatory authorities and aircraft maintenance documentation. You'll learn to navigate and interpret various manuals effectively, including understanding the transition from ATA 100 to A4A iSpec 2200 and S1000D standards. You'll explore the role of original equipment manufacturers (OEMs) in providing maintenance guidelines and become familiar with various aircraft maintenance manuals such as the Aircraft Maintenance Manual (AMM), Component Maintenance Manual (CMM), Illustrated Part Catalog (IPC), Service Bulletins (SB), and Structural Repair Manual (SRM). You'll gain proficiency in navigating and interpreting the SRM, mastering the ability to locate relevant information, interpret technical terms, and apply repair procedures in compliance with regulatory standards.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Gain a comprehensive understanding of regulatory authorities governing aircraft maintenance, including the transition from ATA 100 to A4A iSpec 2200 and S1000D standards;
- Understand the role of original equipment manufacturers (OEMs) in providing maintenance guidelines;
- Familiarize themselves with various aircraft maintenance manuals, including the AMM, CMM, IPC, SB, and SRM, understanding their purpose, structure, and usage;
- Become proficient in navigating and interpreting the Structural Repair Manual (SRM), including locating relevant information, interpreting technical terms, and applying repair procedures effectively.

Topics

1. Introduction
2. Regulatory Authorities
 - a. ATA 100 to A4A iSpec 2200 and S1000D
 - b. Original Equipment Manufacturer (OEM)
3. Aircraft Maintenance Manual (AMM)
4. Component Maintenance Manual (CMM)
5. Illustrated Part Catalog (IPC)
6. Service Bulletins (SB)
7. Structural Repair Manual (SRM)
 - a. Purpose of the Manual
 - b. Navigating the Manual
 - c. Interpretation of the Manual
 - d. Definition of Terms Used in the Manual

Module 8 - Inspection and Damage Assessment

In Module 8, you'll learn to perform detailed inspections and damage assessments on aircraft components and parts using commonly used inspection tools. You'll understand the tooling requirements, including those related to Fuel Tank Safety. You'll also learn the correct methods for damage assessment, including identifying the type of damage, measuring damage accurately, and comparing measured damage dimensions to allowable damage limits as specified in the source documentation.

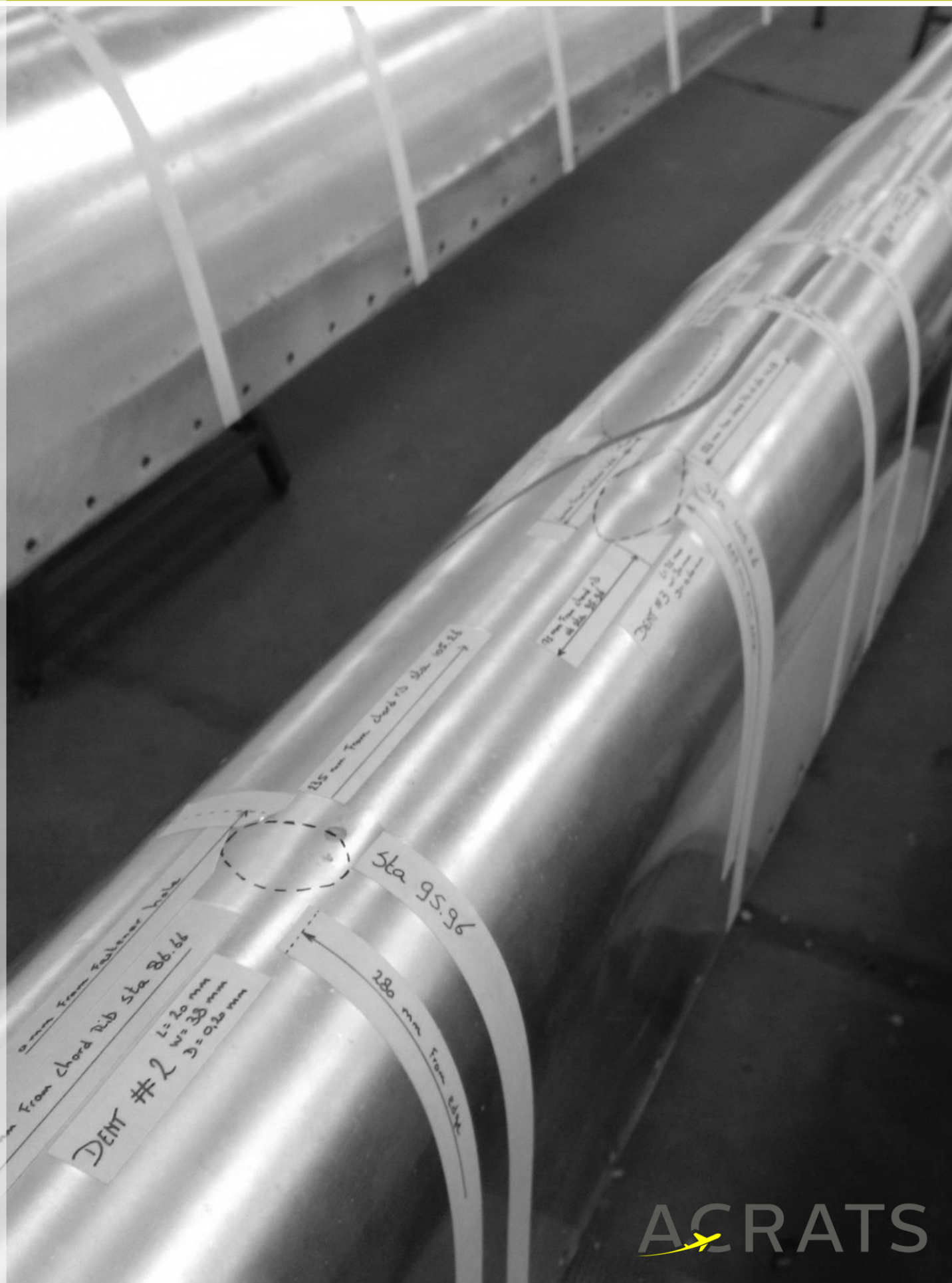
Learning Goals

Upon successful completion of this module, the student will be able to:

- Describe and demonstrate the methods to perform thorough inspections on aircraft components and parts using commonly used inspection tools;
- Understand and comply with tooling requirements, including those specific to Fuel Tank Safety;
- Identify and classify different types of damage, measure damage accurately, and compare measurements to allowable damage limits specified in the source documentation.

Topics

1. Introduction
2. Source Documentation Selection
3. Structural Repair Manual in Practice
 - a. Effectivity
 - b. Identification
 - c. Type of damage (Damage Classification)
 - d. Most Common Damages
 - e. Damage Dimensions and Extend of the Damage
 - f. Location of the damage
 - g. Material Identification Damaged Area (e.g. Kind of Material and Thickness)
 - h. Allowable Damage Limits (AD/ADL)
 - i. Repair Method Selection
4. Inspection Tooling
 - a. Tool Requirements
 - b. Prohibited Tooling (e.g. Upon Fuel Tank Entry)
 - c. Human Factors
5. Remaining Thickness Measurement (e.g. after Blending)
6. Non-Destructive Testing (NDT)
 - a. Eddy Current
 - b. Tap Testing (Metallic sandwich Structure)



Module 9 - Damage Reporting

In Module 9, you'll develop the capability to accurately assess and report damages in aircraft structures. You'll learn techniques for mapping damages effectively using grids and lines and conveying this information in comprehensive damage reports. You'll understand the critical importance of specifying the exact damage location and ensuring uniformity in reporting methods across different scenarios. Additionally, you'll recognize and address the influence of human factors on the accuracy and completeness of damage reporting.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Accurately assess and report damages in aircraft structures;
- Master the techniques of mapping damages using grids and lines and the ACRATS Damage Grid Template;
- Convey damage information in comprehensive reports, specifying the exact damage location and ensuring uniformity in reporting methods;
- Understand and address the influence of human factors on the accuracy and completeness of damage reporting.

Topics

1. Introduction
2. Damage Mapping
 - a. Grids and Lines
 - b. ACRATS Damage Grid Template
3. Damage Reporting
 - a. Formulating Effectively
 - b. Reporting Methods
 - c. Reporting Requirements
 - d. Importance of Exact Damage Location
 - e. Uniformity
 - f. Illustrations
 - g. Human Factors
4. Damage Report Follow-Up

Module 10 - Structural Repair Part 2

In Module 10, you'll develop comprehensive skills and in-depth knowledge in performing structural repairs on aircraft components, ensuring adherence to industry standards and regulations while prioritizing safety and quality. You'll gain a thorough understanding of standard repair principles outlined in ATA/SRM Chapter 51-70 and master precise repair procedures. Additionally, you'll acquire specialized techniques for addressing various types of damage encountered in aircraft structures, understand appropriate repair strategies, and distinguish between permanent, interim, and time-limited repairs. You'll also learn about flight restrictions and inspection intervals based on flight hours, flight cycles, and letter checks, enabling you to contribute effectively to aircraft maintenance and repair operations.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Understand and apply standard repair principles outlined in ATA/SRM Chapter 51-70;
- Perform specific repair procedures for various types of damage, including abrasions, corrosion, cracks, and punctures;
- Identify and categorize different types of damage such as dents, disbond, gouges, holes, scratches, and nicks;
- Understand and implement appropriate repair strategies for each damage category;
- Distinguish between permanent, interim, and time-limited repairs, and understand the implications of flight restrictions and inspection intervals based on flight hours, flight cycles, and letter checks.

Topics

1. Introduction
2. Standard Repairs
 - a. Standard Repairs Principles
 - b. ATA/SRM Chapter 51-70
3. Specific Repairs
4. Terms & Definitions
 - a. Damage Categories
 - b. Allowable Damage
 - c. Repairable Damage
 - d. Replacement of Damaged Parts
 - e. Damage Types and Description (including Illustrations)
 - i. Abrasion
 - ii. Corrosion
 - iii. Crack
 - iv. Creases
 - v. Dent
 - vi. Disbond
 - vii. Gouge
 - viii. Hole
 - ix. Nick
 - x. Puncture
 - xi. Scratch
 - f. Types of Repairs
 - g. Repair Categories
 - h. Category A, B and C Repairs
 - i. Conversion of temporary repairs into permanent repairs
 - j. Flight Restrictions and Inspection Intervals
 - k. Flight Hours
 - l. Flight Cycles
 - m. Letter Checks
5. Aerodynamic Smoothness
 - a. Aerodynamic Smoothness Requirements
 - b. Aerodynamic Smoothness of Fasteners
6. Structural Repair Definitions
7. Equipment and Tools for Repair

Module 11 - Corrosion Control of Aluminum Alloys: Prevention, Recognition and Removal

In Module 11, you'll develop advanced proficiency in the prevention, recognition, and removal of corrosion specifically in aluminum alloy aircraft structures. Through discussions, lectures, and feedback, you'll gain the knowledge and skills necessary to effectively implement corrosion control measures, ensuring the structural integrity and airworthiness of aircraft.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Understand the types, causes, and effects of corrosion on aircraft structures, and recognize the importance of corrosion control;
- Apply techniques for preventing corrosion, including the use of protective coatings, sealants, and corrosion inhibitors;
- Recognize and inspect corrosion using visual and non-destructive testing (NDT) methods.
- Implement various corrosion removal methods, ensuring safety and effectiveness;
- Conduct practical exercises in corrosion removal, focusing on real-world applications like seat track corrosion removal.

Topics

1. Introduction to Corrosion
 - a. Overview of Corrosion Types, Causes, and Effects on Aircraft Structures.
 - b. Importance of Corrosion Control for Ensuring Safety and Longevity of Aircraft Components.
 - c. Common Corrosion-Prone Areas on Aircraft.
2. Corrosion Prevention Techniques
 - a. Application of Protective Coatings, Sealants, And Corrosion Inhibitors.
 - b. Implementation of Proper Maintenance Practices to Minimize Corrosion Risk.
 - c. Importance of Environmental Factors and Aircraft Storage Conditions in Corrosion Prevention.
3. Recognition and Inspection of Corrosion
 - a. Techniques for Visually Inspecting Aircraft Structures for Signs of Corrosion.
 - b. Utilization of Non-Destructive Testing (NDT) Methods for Detecting Hidden Corrosion.
 - c. Identification Of Different Types of Corrosion and Assessment of Corrosion Severity.
 - d. Critical Areas
4. Corrosion Removal Methods
 - a. Safety Precautions
 - b. Overview of Mechanical, Chemical, and Manual Corrosion Removal Techniques.
 - c. Selection of Appropriate Removal Methods Based on Corrosion Type, Location, And Severity.
 - d. Safety Precautions and Best Practices for Corrosion Removal Operations.
5. Corrosion Removal Techniques
6. Practical Exercise: Seat Track Corrosion Removal

Module 12 - Surface Protective Treatment and Coatings

In Module 12, you'll learn to comprehend and apply surface treatment and protective coating techniques effectively. Through discussions, lectures, and feedback, you'll gain skills in assessing surface conditions, selecting appropriate coatings, and executing precise application and removal processes. Mastering these techniques will enhance the durability, corrosion resistance, and aesthetic appeal of treated surfaces in various aerospace applications.

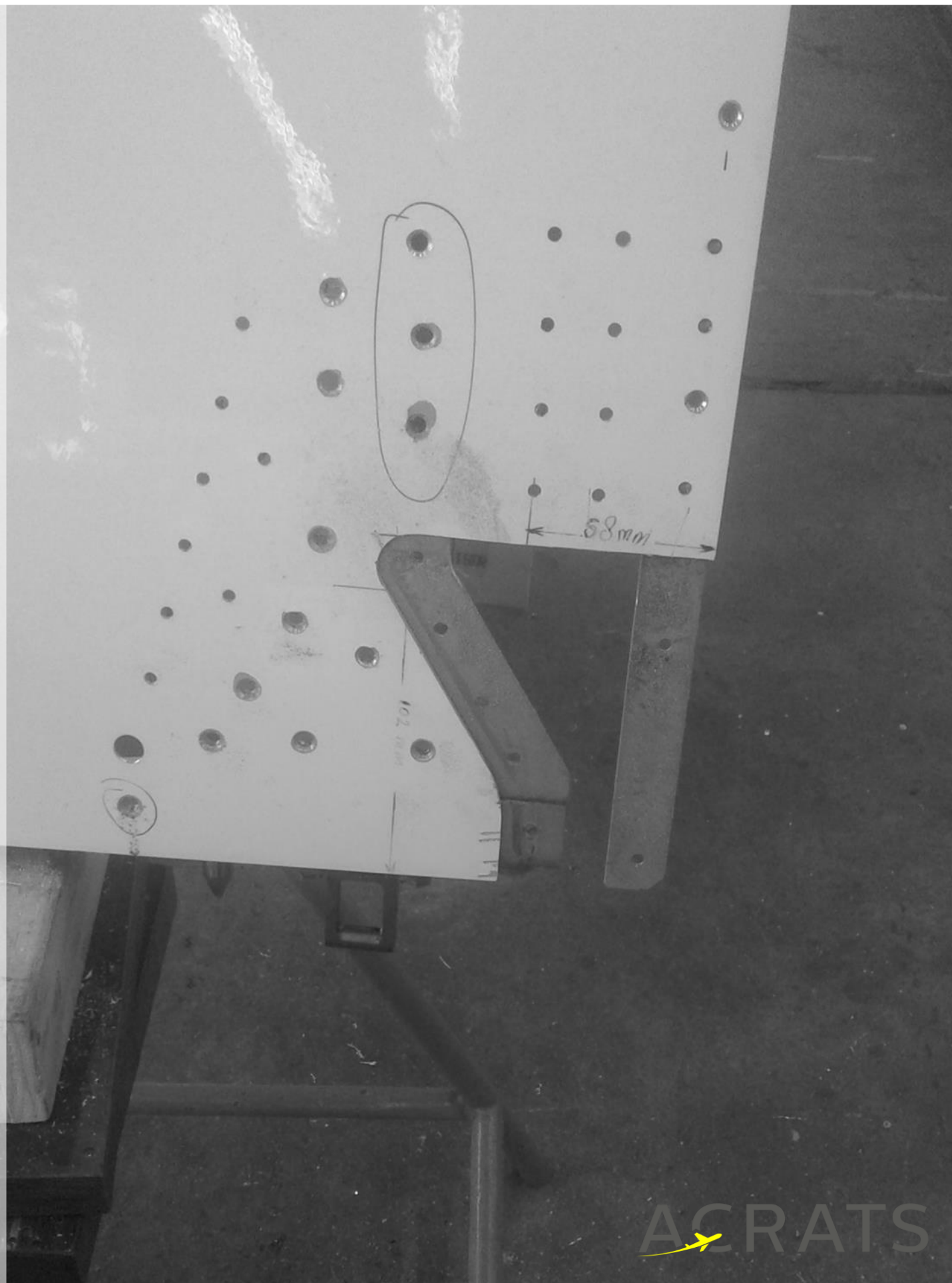
Learning Goals

Upon successful completion of this module, the student will be able to:

- Comprehend and apply surface treatment and protective coating techniques effectively;
- Assess surface conditions and select appropriate coatings for aerospace applications;
- Execute precise application and removal processes for protective coatings, primers, paints, and sealants;
- Understand health and safety considerations, including handling hazardous materials like Chromium 6.

Topics

1. Introduction
2. Protective Coating Application and Removal
3. Primer and Paint Application and Removal
 - a. Health and Safety (including Chromium 6)
 - b. Removal with use of Chemical
 - c. Removal by Abrasion
4. Sealant Application and Removal



Module 13 - Introduction

In Module 13, you'll learn how to apply, remove, and repair sealant on aircraft. You'll understand which areas of the aircraft need sealing and how to choose the right sealant. You'll also learn the importance of cleaning repair areas before applying sealant and develop the skills to apply sealant properly to ensure effective sealing. Additionally, you'll learn how to safely perform sealant application, removal, and repair while following safety precautions.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Apply, remove, and repair sealant on aircraft;
- Identify areas of the aircraft that need sealing and choose the right sealant;
- Understand the importance of cleaning repair areas before applying sealant;
- Apply sealant properly to ensure effective sealing;
- Safely perform sealant application, removal, and repair while following safety precautions.

Topics

1. Introduction
2. Terms and Definitions
3. Areas of the Aircraft and Applicable Sealing
4. Application of Sealing
5. Removal of Sealing
6. Cleaning the Repair Area
7. Repair of Sealing
 - a. Sealing Repair Materials
 - b. Sealing Repair Procedures

Module 14 - Traceability

In Module 14, you'll learn how to effectively manage traceability and record-keeping processes in aircraft maintenance. You'll develop the skills to accurately record maintenance actions, track component histories, and maintain a detailed audit trail. You'll also understand the significance of traceability in identifying maintenance trends, analyzing historical data, and facilitating decision-making within the maintenance organization. Additionally, you'll learn to comply with regulatory requirements and utilize electronic record-keeping systems.

Learning Goals

Upon successful completion of this module, the student will be able to:

- Understand the importance of traceability in aircraft maintenance;
- Provide examples of effective traceability practices;
- Maintain accurate maintenance records;
- Ensure compliance with regulatory standards;
- Utilize electronic record-keeping systems;
- Retrieve and analyze maintenance records.

Topics

1. Understanding the Importance of Traceability
2. Examples of Traceability
3. Maintaining Accurate Records
4. Compliance with Regulatory Standards
5. Utilizing Electronic Record-Keeping Systems
6. Retrieving and Analyzing Maintenance Records

Module 15 - Practical Exercises

Frame Repair with Forming Blocks

Participants will engage in a practical exercise focused on repairing aircraft frames using forming blocks. Guided by instructors, participants will fabricate repair parts designed to restore damaged frame sections. They will utilize forming blocks to shape metal sheets according to the required specifications, ensuring proper fit and alignment with the existing structure. Through hands-on experience, participants will learn the intricate techniques of metal forming and shaping, paying close attention to detail and accuracy.

Component Inspection: (Multiple) Damage assessment and Damage Reporting i.a.w. SRM

Participant will perform inspection on a real aircraft component that has multiple damage for which he or she has to work with the most commonly used inspection tooling (e.g. a depth gauge and the special ACRATS developed grid tool for mapping the remaining thickness of blend-outs). Participant will have to consult the Structural Repair Manual (SRM) for the assessment and evaluate each damage for being within allowable damage limits, check if flight restrictions are applicable if damage is allowed, or find a suitable repair method if damage out of allowable damage limits, as discussed in module 12.

(Critical) Aerodynamic Surface Skin Flush Repair over Stringers

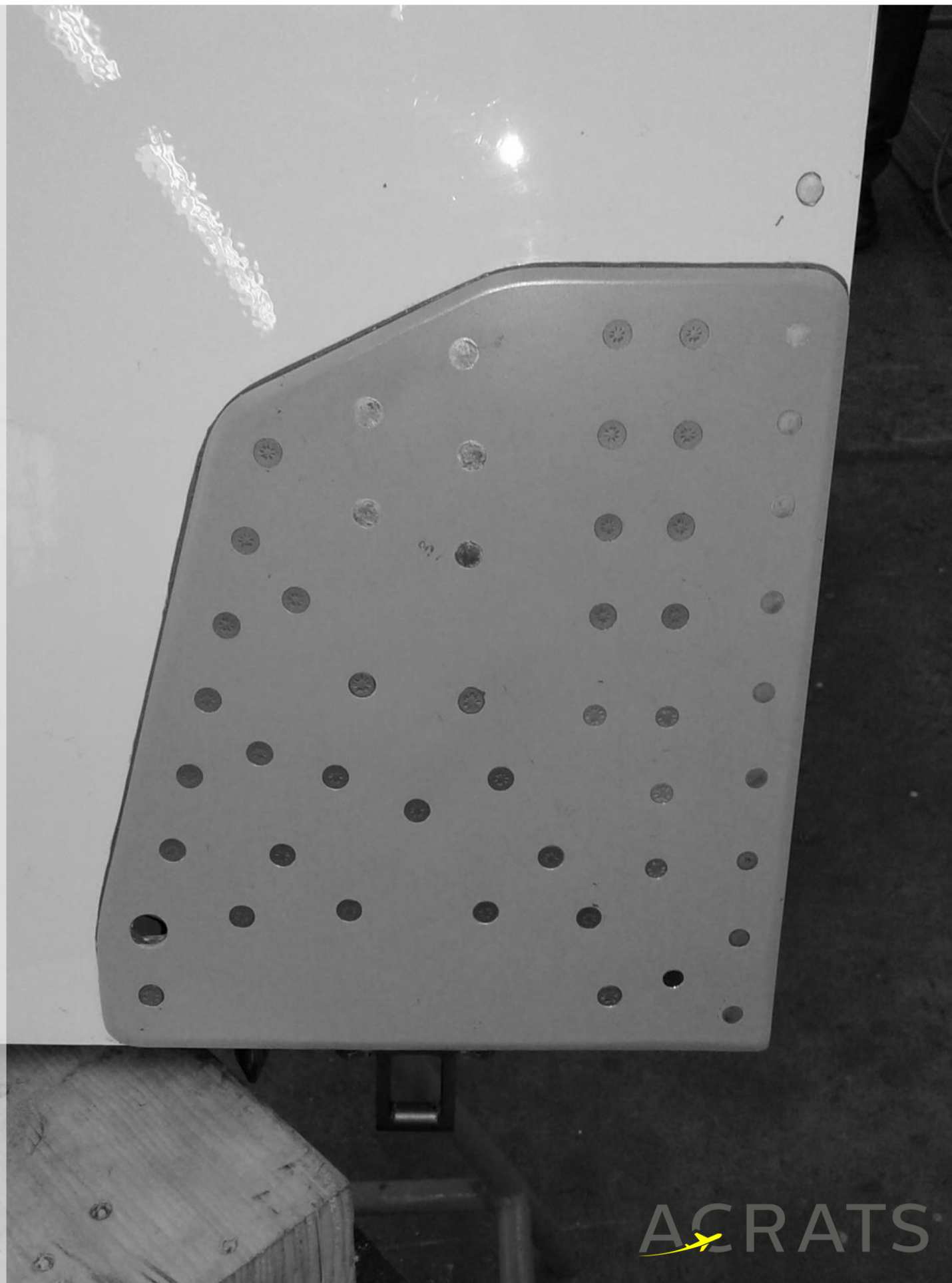
Participant will perform a flush repair on a skin according to structural repair manual. Participants shall, among other things cut out the damaged part with careful precision, manufacture an inner doubler and an insert plate to fit in the cut-out (of the damage), drilling new holes- and copy existing rivet rows within. Furthermore, participants must consider and maintain the appropriate gap between undamaged skin and insert plate, as well as all the other standard repair principles as discussed in module 13. Participant will install the repair parts with flush (countersunk) solid rivets, for as the skin is a critical aerodynamic surface. The repair parts will be wet installed with sealant compound.

Seat Track Corrosion Removal

Participants will actively participate in a practical exercise focused on the removal of corrosion from aircraft seat tracks. Under the guidance of instructors, they will learn to identify corrosion-affected areas and assess the extent of the damage. Utilizing appropriate tools and techniques, such as mechanical abrasion or chemical treatment, participants will engage in hands-on corrosion removal procedures. Emphasis will be placed on following safety protocols and ensuring the integrity of the seat tracks during the removal process. Additionally, participants will gain practical experience in post-removal treatments to prevent future corrosion and maintain the structural integrity of the seat tracks.

Structural Member Repair

Participants will perform different types of repairs most commonly performed on the various structural members (e.g. frames and stringers) within a semi-monocoque aircraft construction, as discussed in module 10. Participant shall, among other things manufacture (form) repair- angles and profiles as discussed in module 4 and 5 and install them in accordance with the structural repair manual.



16 - Assessment Criteria

- ✓ Demonstrates thorough understanding of aircraft structural repair principles outlined in ATA/SRM Chapter 51-70, including precise repair procedures and compliance with industry standards and regulations.
- ✓ Applies a comprehensive approach to damage assessment and reporting, effectively mapping damages, accurately identifying damage types and dimensions, and interpreting allowable damage limits as per applicable source documentation.
- ✓ Exhibits proficiency in the selection and installation of aircraft special fasteners, including solid rivets, high interference fit fasteners, and Avdel, Huck bolt, and Taper Lok fasteners, ensuring proper installation techniques and adherence to safety protocols.
- ✓ Displays advanced knowledge and skills in corrosion control of aluminum alloys, effectively implementing corrosion prevention measures, recognizing and inspecting corrosion, and applying appropriate removal methods.
- ✓ Demonstrates competence in metal forming and machining operations, accurately calculating bend allowances, employing various forming techniques, and executing hole preparation techniques such as drilling, reaming, and dimpling with precision.
- ✓ Shows proficiency in structural member repair, including fabrication of repair angles and profiles, installation in accordance with the structural repair manual, and adherence to standard repair principles for different structural members within semi-monocoque aircraft construction.
- ✓ Applies comprehensive knowledge of regulatory authorities and aircraft maintenance documentation, effectively navigating and interpreting manuals such as the Aircraft Maintenance Manual (AMM), Component Maintenance Manual (CMM), and Structural Repair Manual (SRM) to locate relevant information and interpret technical terms.
- ✓ Demonstrates meticulous attention to detail and adherence to safety protocols in practical exercises, including component inspection, aerodynamic surface skin flush repair, and leading-edge repair, ensuring accurate execution of repair procedures and compliance with industry standards.

17 - Examination

The written examination shall contain a minimum of 30 multiple choice questions.

LEVEL 2

SHEETMETAL

Training



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DETAILED COURSE OUTLINE ATS2132

AIRCRAFT METALLIC STRUCTURE: MANUFACTURING, ASSEMBLY, INSPECTION, DAMAGE ASSESSMENT AND REPAIR LEVEL 2