AMT A153: GENERAL MATERIALS, PROCESSES & WELDING - FAA

Item	Value
Curriculum Committee Approval Date	12/08/2021
Top Code	095000 - Aeronautical and Aviation Technology
Units	3 Total Units
Hours	121.5 Total Hours (Lecture Hours 27; Lab Hours 94.5)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	Yes
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S)

Course Description

Materials used in aircraft, cleaning of parts, hardware and other fastener identification, and aircraft welding. Transfer Credit: CSU.

Course Level Student Learning Outcome(s)

1. Identify and select correct hardware and materials for installation on aircraft.
2. Identify different types of corrosion and determine correct method for corrosion removal treatment and prevention.
3. Demonstrate the ability to solder, braze and weld aircraft materials.

Course Objectives

- 1. Determine the correct length of bolts
- 2. Demonstrate the correct procedure to install bolts with castle nuts and bolts with self-locking nuts and torque to correct valves.
- 3. Identify the various family groups of aluminum alloy by visual recognition of code designators
- 4. Identify appropriate alloys for five specified aircraft applications.
- 5. Identify the SAE code markings and, referring to the SAE or AISA publications, and interpret the coding for ten samples.
- 6. Identify each rivet by head shape, alloy, dimensions, and where applicable, type letter designating strength characteristics
- 7. Identify various samples of materials suitable for use in aircraft firewalls and exhaust shrouds. He/She will use pertinent technical reference information or aircraft manuals to illustrate the suitability of the materials.
- 8. Identify six different samples of aircraft control able as to type of cable, number of strands, number of wires per strand, materials, and whether preformed or non-preformed.
- 9. Identify samples of aluminum alloys, at least five of which are considered heat-treatable, five nonheat-treatable, and three with trademarks indicating surface corrosion prevention treatment.
- 10. Will explain the steps in heat treatment of aluminum alloys, including the effect of heating a metal such as steel slightly above its critical temperature, then cooling it rapidly,
- 11. Will explain strain hardening and its effect on the tensile strength of aluminum alloy.
- 12. Demonstrate how to anneal a piece of copper tubing and how to stress relieve a welded steel part
- 13. Inspect and evaluate the quality of the weld in each of ten welded aircraft assemblies.
- 14. Identify heat treatable and weldable aluminum alloys.
- 15. Demonstrate the proper use of the cleaning operation with the proper precautions while cleaning aircraft components.
- 16. Select and employ the correct materials and clean the exterior surfaces of an airplane.
- 17. Select those parts which indicate intergranular corrosion. He/She will describe the methods of preventing and/or controlling this type of corrosion.
- 18. Evaluate corrosion such as metal flake, scale powder and salt deposits. They will describe how the corrosion should best be removed and the part then be treated from further corrosion.
- 19. Remove corrosion products, such as metal flakes, scale, powder and salt deposits from aluminum parts. He/She will describe how parts are protected from dissimilar metal corrosion.
- 20. Apply paints and/or similar organic coatings to aircraft parts.
- 21. Demonstrate cleaning and protecting battery compartments and adjacent areas by neutralizing the acid, removing corrosion, and applying acid-proof paints.
- 22. Identify "fretting" corrosion.
- 23. Describe the methods of protecting the interior of steel tubing and demonstrate the use of blast cleaning methods.
- 24. Explain the preparation of metal for soldering, brazing and welding, preheating prior to welding and the precautions regarding welding over previously brazed or soldered joints.
- 25. Demonstrate soldering electrical wires or cables to solder type connectors, sweat-soldering lap-joints of brass, tinned steel and stainless steel.
- 26. Identify and select parts which he considers repairable by welding. He/She will set up an oxy-acetylene welding set, clean and prepare steel parts for welding, and use the welding set to repair the steel parts by welding. He/She will make a similar repair appropriate to the damaged area selected. He/She will preheat the parts, select correct size tip and adjust an oxy-acetylene torch for correct type flame, select and use filler rod; perform welding of the steel parts and normalize them.
- 27. Identify ten welded splices, joints and sleeve repairs in tubing and tubular welded clusters. He/She will inspect ten samples of aircraft welded tubular structures and list whether each selected weld meets return-to-flight standards as specified in FAA publications.
- 28. Explain the use of silver brazing for stainless steel bonding,
- 29. Demonstrate how the metal should be prepared, what brazing tools to use, required brazing temperatures, and methods of cleaning after silver brazing.
- 30. Explain the method of cleaning magnesium for welding, the function of flux, the types of gases to use the use of butt joints when welding magnesium, and the methods of welding titanium.

Lecture Content

MATERIALS AND PROCESSES Identify and select aircraft hardware and materials Identify and install aircraft bolts Identify aluminum

alloys Identify steel alloys Recognition of economic and engineering criteria in selection of aircraft materials Identify rivets by physical characteristics Identify materials used in aircraft firewalls and exhaust shrouds Identify aircraft control cable Determine suitability of material for A/C repair Perform basic heat treating processes Effects of heat treatment Identify aluminum alloy code designation of heat treatability Heat treatment processes and strain relieving Anneal copper and steel parts CLEANING AND CORROSION CONTROL Identify and select cleaning methods Identify caustic cleaners Identify various cleaning agents used in the cleaning of specified parts Clean exterior of aircraft Identify corrosion Apply protective coatings Remove rust Clean rubber products WELDING TECHNIQUES Solder, braze and arc weld steel Preparation and precautions before soldering, brazing and welding Solder electrical connections and make lap joints Repair steel parts by welding Fabricate tubular structures Tubular steel fabrications and repair by welding Solder stainless steel Silver soldering of stainless steel Welding aluminum and stainless steel Inspect aluminum and stainless steel Weld magnesium and titanium Welding of magnesium and titanium

Lab Content

Faculty input required.

Method(s) of Instruction

- Lecture (02)
- Lab (04)

Instructional Techniques

1. Detailed multimedia/lectures of each topic covered. 2. Student feedback during each lecture. 3. Detailed illustrative discussion of textbook examples. 4. Concentration on schematic reading and system operation fault diagnosis. 5 Practical troubleshooting. 6. Laboratory exercises pertaining to subjects discussed during which students work individually or in small groups.

Reading Assignments

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Writing Assignments

Student must show proficiency in writing logbook entries using correct punctuation, sentence structure and readability.

Out-of-class Assignments

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Demonstration of Critical Thinking

Interview, list, multiple choice exams, and short answer.

Required Writing, Problem Solving, Skills Demonstration

Student must show proficiency in writing logbook entries using correct punctuation, sentence structure and readability.

Textbooks Resources

1. Required Jeppesen. AC43.13-1B2A, Acceptable Methods, Techniques, and Practices-Aircraft Inspection and Repair, ed. Superintendent of Documents; U.S. Government Printing Office, 2001 Rationale: - 2. Required Jeppensen. AP Technician “GENERAL” Textbook, ed. Englewood: Jeppesen Sanderson, 2000 Rationale: latest 3. Required Jeppensen. AP Technician “AIRFRAME” Textbook, ed. Englewood: Jeppesen Sanderson, 2007 4. Required Kroes, Michael J., and James R. Rardon. Aircraft Basic Science, 7th ed. New York: Glencoe/McGraw-Hill, 1993 Rationale: latest 5. Required Kroes, Michael J., et al. . Aircraft Maintenance Repair, 6th ed. New York: Glencoe/McGraw-Hill, 2007