Course R-13
General Aviation Composite Repair

Course Summary

The General Aviation Composite Repair Course was originally conceived as a manufacturer-specific Cessna repair course devoted specifically to the Columbia, Cessna Corvalis and TTx airframes. It is approved by Cessna, and was initially designed as an airframe specific course for Cessna Service Center repair technicians, mechanics, supervisors, and quality assurance personnel directly involved in providing high performance repairs on these advanced composite structures. However, many General Aviation aircraft from other manufacturers use similar resin and fiber systems and structural repair techniques, such as various models of the Cirrus, Diamond, most high-performance sailplanes, and many LSA composite aircraft. Technicians repairing these types of GA airframes will also benefit from this training. The principles of properly performing a good composite structural repair broadly apply to these airframes as well.

Introduction

Fundamental topics in this course include damage evaluation, material types, resin mixing, ply orientation/application and curing processes for repairing these structures. Specifications, resins, test samples and documentation requirements are also discussed at length in the classroom and then applied in the workshop, allowing the student time to practice different repair scenarios. Students will be introduced to typical repair instructions and given a variety of damaged representative parts and structures on which to perform repairs throughout the week.

Each student or team will assess damage to actual aircraft composite structures, determine a repair approach, typically from Cessna documentation, and undertake the repairs. Should a student/team wish to work from another type of airframe repair document, they are welcome to bring it to class and work from that set of instructions. Over the five-day period, three different parts will be repaired by each student/team, with different materials and challenges that come with each new repair scenario. Details of repair finishing, bodywork, and paint, as well as required process-verification samples will be discussed.

To best facilitate an all-encompassing education of the curing process, our facility is equipped with various brands of “hot-bonders” as well as hot air machines and heat lamps. This ensures that students have flexibility to learn with the equipment they may have at their facility. The advantages and disadvantages of each heat source will become evident to the students as they will have the opportunity to work with several different types throughout the week. Much emphasis is also made on proper thermocouple and heat blanket placement along with different approaches to vacuum bagging materials and methods explored during the week.

Topics

Key Lecture Elements

- Introduction to GA specific composite materials/structures.
- Resin/adhesive systems: mix ratios, viscosity, service temperature limits, storage requirements/shelf life limits, pot life, etc.
- Cure cycles (rheology) & resin sample requirements
- Material forms: dry fabric and wet resins vs. prepregs, fabric weave styles, etc.
- Health and safety issues: proper handling, personal protection, allergic reactions, waste disposal.
- Heating equipment: hot bonders, blowers, blankets, thermocouples
- Vacuum bagging: vacuum/pressures, breather/bleeder schedules, techniques
- FSRM repair procedures: damage assessment, scarf repairs, ply/material identification, etc.
- Inspection methods & techniques: non-destructive inspection methods, defect detection, documentation
- Lightning strike protection/repairs
- Finish and paint requirements

Workshop Exercises

- Ply determination exercise: taper sand and analyze specimens for orientation and ply count
- Solid laminate structural repair to partial depth scratch in skin
- Single side damage repair to honeycomb core sandwich structure
- Practice service instruction repair beyond the FSRM allowable
- Perform post-repair fill and fair finishing to cosmetic surface

Course Benefits

Attendees will receive instruction and learn skills in advanced composite repair, specific to the Textron/Cessna aircraft listed above and for similar GA composite airframes.

Prerequisites

None required - The Advanced Composite Structures: Fabrication and Damage Repair-Phase 1 (M-1/R-1) course is recommended for more in depth subject knowledge if necessary.

Teaching Method

Active classroom lecture and workshop exercises

CEU

3.4