



University of Minho
School of Engineering

Hangar 9 Solo Trainer Aircraft Structure Restoration

**Master's in Aerospace Engineering
Projeto Aeroespacial**

Group:

André Sousa, PG52564

Bernardo Santos, PG54445

Inês Gomes, PG51669

Maura Guimarães, PG51670

1. Main Mission Definition

The group's main mission is to physically restore the UAV (Unmanned Aerial Vehicle) structure, ensuring optimal flight conditions in all phases.

2. Framework and Motivation

In the scope of the curricular unit Aerospace Project, the students must repair and upgrade an Unmanned Aerial Vehicle (UAV), providing it with all the required abilities to perform a flight under different operational conditions.

This challenge follows a Project Learning-based approach to building knowledge by integrating the skills developed in the remaining curricular units of the Aerospace Engineering study plan to operationalize the UAV.

The UAV repair and upgrade tasks were split into three main work packages: Structure, Propulsion, and Avionics.

Leading the Structures Work Package, the team's primary purpose is to repair and optimize the UAV structural elements, namely the fuselage, wings, landing gear, and rear stabilizers. To achieve the established goal, the group must analyze the structure in its current state, identify the elements with the potential to be optimized considering their functional role and impact on the overall system, and repair/ replace the damaged components.

The mission's success strongly depends on the cooperation between the groups responsible for the different domains, constituting a perfect representation of the actual scenario in an industrial/organizational context.

3. Objectives

In order to achieve our main goal, the group defined milestones that must be met:

- Diagnosis & identification of the UAV structural problems;
- Create an UAV structure CAD model;

- Topological optimization, using the finite element method, of the wings structural components: spars & ribs;
- Manufacturing of the new components;
- Repair the wings;
- Repair the landing gear;
- Optimize the wings attachment mechanism;
- Repair & attach the rear stabilizers;
- Conduct a stable flight test.

4. Timeline

Keeping in mind that the other groups rely on the UAV structure to properly test their parts of the project, our team organized its work as follows:

Week 1:

- UAVs previous cover removal;
- UAVs disassembling;
- Identify the aircraft damaged components;
- Sanding some components to remove residues from previous operations.

Week 2:

- Study of the structural optimization possibilities.

Week 3-4:

- Topological optimization, regarding the wings structural components: spars & ribs.

Week 5-6:

- Substitution components manufacture.

Week 7:

- Implementation of the new components, on the UAV structure.

Week 8:

- UAV validation.

Week 9:

- Final Tests