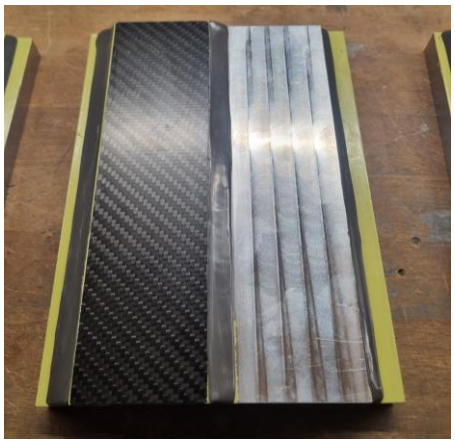
HSLU Hochschule Luzern

Technik & Architektur
Master of Science in Engineering
Mechanical Engineering

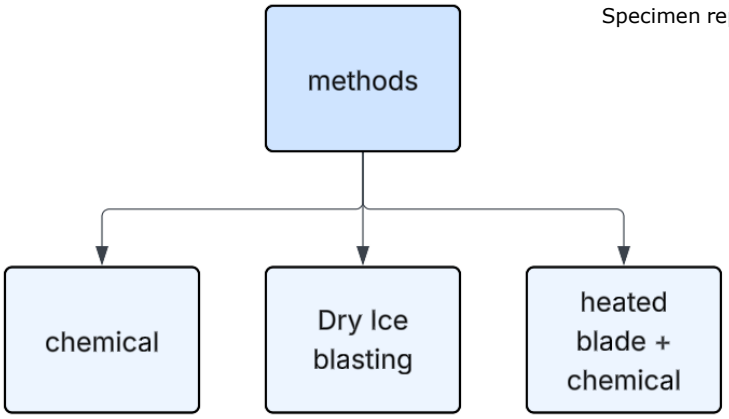
Master-Thesis Mechanical Engineering

Aircraft sealant removal

Fighter Aircraft Wing



Specimen representing sealant location



Tested methods

Problem description
Non-destructive inspection (NDI) is essential in aircraft maintenance, enabling early detection of cracks, corrosion, and other irregularities. In military aviation, where reliability and safety are paramount, NDI plays a vital role. This work was conducted in collaboration with RUAG AG, a Swiss defense and aerospace company, where NDI is routinely used to ensure the structural integrity of military aircraft components. The reliability of such inspections, expressed as the probability of detection, decreases significantly when sealants cover the inspected surfaces. Acting as a barrier between probe and structure, sealants often need to be removed to obtain reliable results. Currently, the most common method is manual scraping with plastic tools. While simple, it demands high manual effort, prolongs maintenance, and carries the risk of damaging sensitive components. Even minor defects caused during scraping can reduce structural performance and lead to costly rework. These drawbacks underline the need for more efficient and surface friendly removal methods, especially in critical areas.

Solution approach
The thesis moved from concept to practice by testing three sealant removal methods on specimens. Their efficiency, surface impact and costs were systematically evaluated. The best method was formalized in a process specification, and a qualification plan was created to prepare it for possible certification and future use in aircraft maintenance.

Result
The study examined three methods for aircraft sealant removal. The chemical process was time consuming, required repeated applications, and caused primer loss, making it unsuitable for practical use. Dry ice blasting achieved fast and complete removal, preserved the primer, and produced no secondary waste, clearly ranking highest in all evaluations. The heated blade combined with chemical removal proved slower but reliable and safe for the components.

It ranked second and offers a strong alternative when dry ice blasting is financially not feasible. Overall, the comprehensive evaluation confirmed dry ice blasting as the preferred method, with the heated blade approach as a valuable backup option.

Emil Stojilkovic

Hauptbetreuer:
Prof. Dipl. Masch.-Ing. ETH Dejan Romancuk

Zweitbetreuer:
Dipl.-Ing. Dr. mont. Matthias Bartosik

Experte:
Dipl. -Ing. ETH Markus Gottier

FH Zentralschweiz

RUAG

FH University of Applied Sciences TECHNIKUM WIEN

MSE | MASTER OF SCIENCE IN ENGINEERING