

End-to-End Development of a High-Altitude Pressure Vessel

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Project Overview

Active Luminescence For x-Ray Emission Detection (ALFRED) was a NASA USIP project with the goal of building and testing an active radiation shield for its upcoming HEROES x-ray observation platform. It was designed by undergraduate students at UAH with the help of NASA mentors and flew to 48 km on a zero pressure balloon at the Columbia Scientific Ballooning Facility (CSBF) in Fort Sumner, NM.



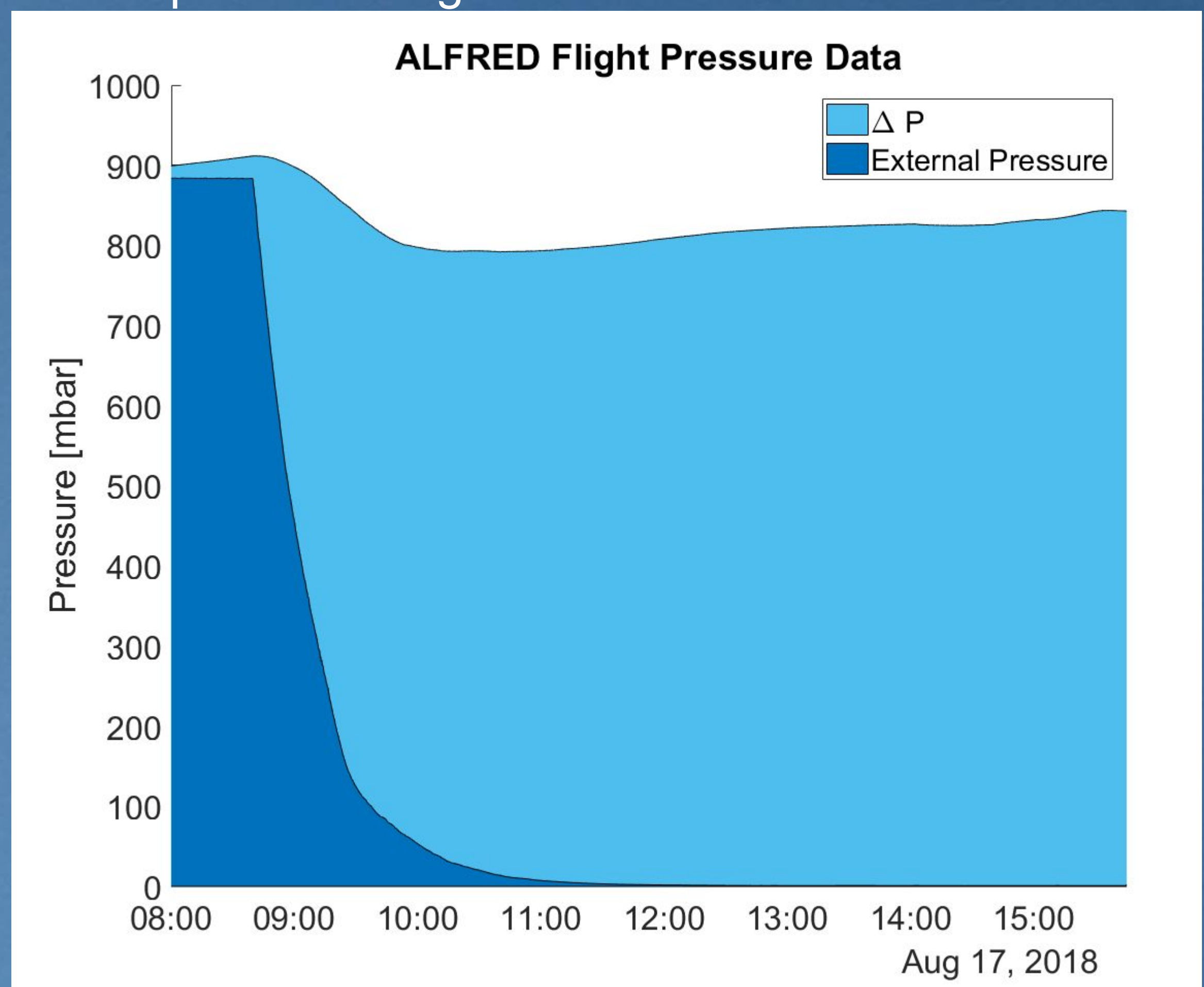
Impact

ALFRED successfully demonstrated a low-cost hybrid of passive and active shielding systems for high energy telescopes and provided a valuable flight demonstration of CLYC as a scintillation material. Its casing is what guaranteed the scientific equipment's successful operation. It protected the equipment from near-vacuum conditions at the top of the stratosphere while holding everything together in an easily-assembled package.

Design Overview and Requirements

High voltage equipment could potentially arc at the float altitude and needed a temperature-controlled, dry, pressurized environment. CSBF required that all payloads withstand 10 g's and weigh less than 300 lbs. The team wanted a simple design that would be manufactured in-house as much as possible.

- Casing designed as a pressure vessel with N₂ purge and internal heaters
- Power and data cables passed through air-tight connectors
- Equipment fixed in place on case-long rail structure
- FEA utilized to ensure casing could withstand required loading



- Exterior and internal pressure data collected during flight
- Pressure vessel successfully held pressure

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