Back-Up HC-144 Hydraulic System

Team FLY: 1/c Early, 1/c Cajigas, 1/c Marchalonis, and 1/c Garrett
Project Advisor: CDR Govertsen
Project Sponsor: Air Station Cape Cod

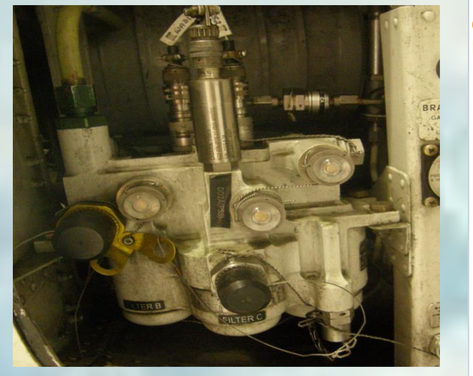
Customer Needs

Top customer needs provided by Cape Cod and ALC are summarized below:

1.	Reliability
2.	Durability
3.	Instillation Fit
4.	Intuitive Controls
5.	Simple PMS
6.	30 Year Lifespan
7.	Light Weight
8.	Compact Size

Project Objective

The objective of this project is to design a back-up hydraulic system for the HC-144's cargo ramp, that allows flight crews to raise the ramp in the event of a hydraulic failure. Flight crews are not trained to land with the ramp down. The proposed design utilizes a manual hydraulic pump connected to the existing system.



Suction and Pressure quick release

Aircraft System Constraints

- System operating pressure is 3000 psi
- Ramp weighs 423 lb
- Flow rate is 7 L/min

Mount For the Manual Pump & Mount

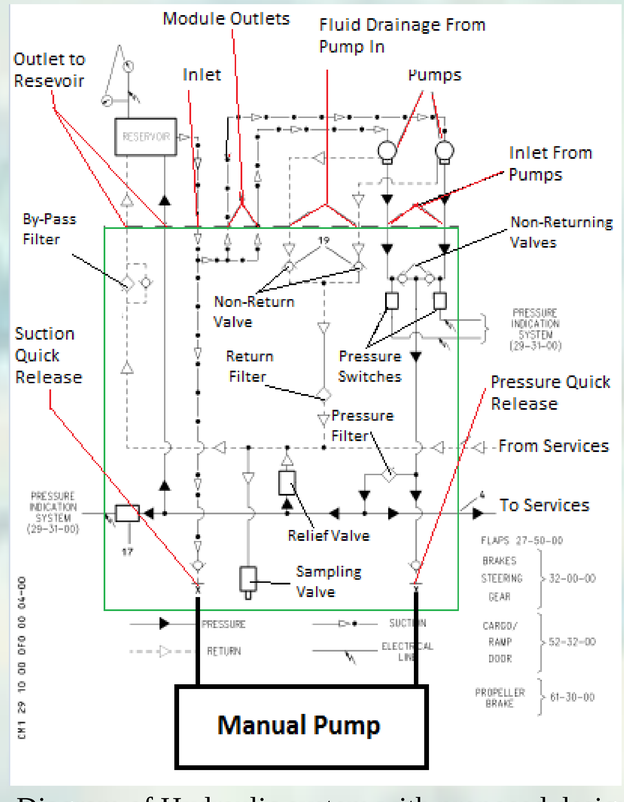


Diagram of Hydraulic system with proposed design

Aircraft v. Prototype

The prototype was designed to accurately represent the HC-144 cargo ramp. There are some modifications that need to be made for installation into the aircraft:

- Integrate into hydraulic manifold
- Route hard lines through fuselage
- Connection points for manual pump

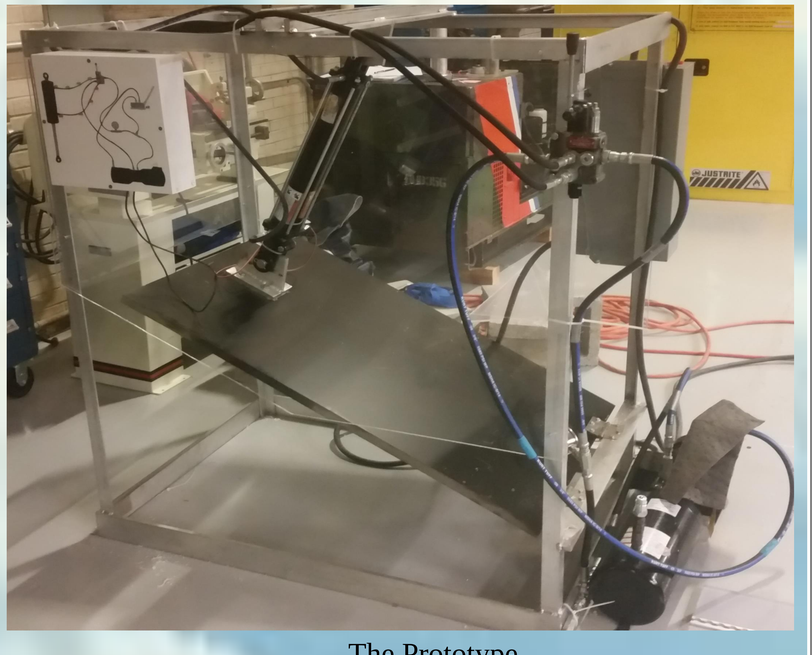
Prototype of Design Solution

The prototype simulates the back-up hydraulic system's integration into the existing hydraulic system. It includes a manual hydraulic pump, electric pump, directional control valve, manual pump mount, and quick disconnects.

Prototype Performance

The prototype was tested under various loads to determine the functionality of the proposed backup system. Overall pressure, transient pressure, and flowrate were tested. It was determined that the back up system will not exceed the 3000 psi constraint of the HC-144 CASA. The tested values are as follows:

- At 421 pounds of weight, the pressure was 115 psi with a max transient pressure of 140 psi.
- 1 minute to raise the ramp with 103 actuations.



The Prototype