



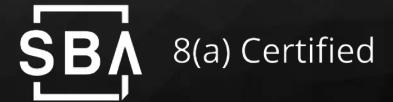
ELEVATE
S Y S T E M S

Elevan LLC

Reverse Engineering and Getting a 3D Printed Part Flying on a B-52

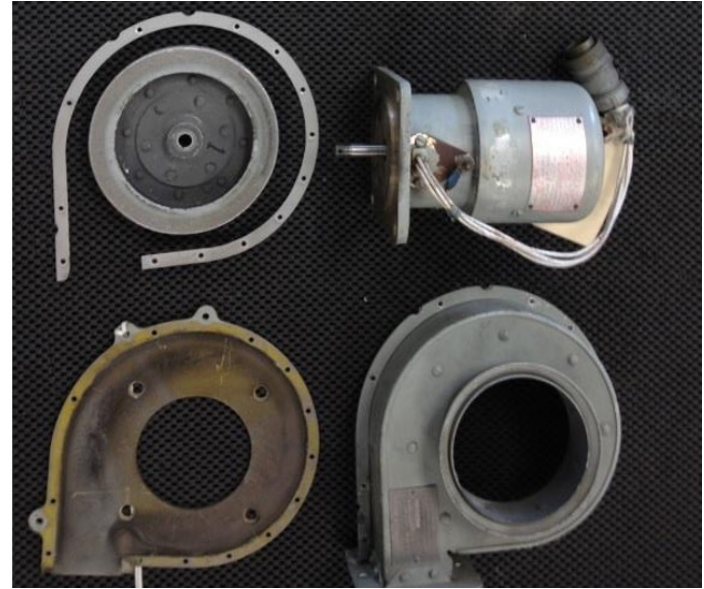


A Woman Owned Small Business



Problem

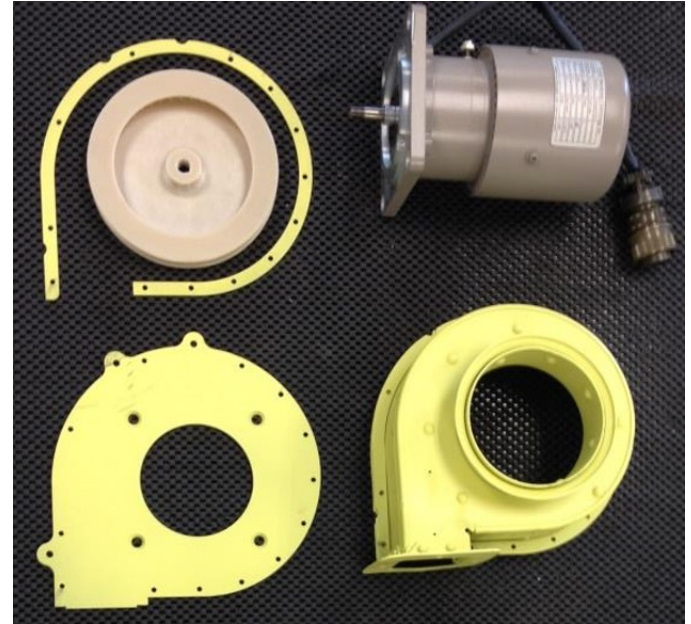
- B-52 Radar Blower Motor Assembly (Circa 1957)
- Blows cold air onto the radar system during engine startup, taxi and takeoff
- Replacement System Not Available



Solution

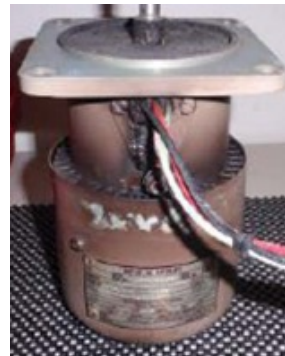
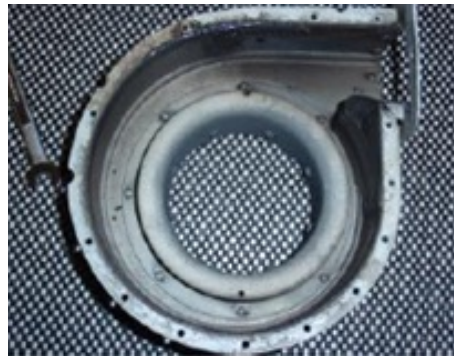
- Reverse Engineered Components and injected the use of AM technologies
- Identified and Qualified new sources of manufacture for the assets

Elevate Systems is NOT a manufacturing company



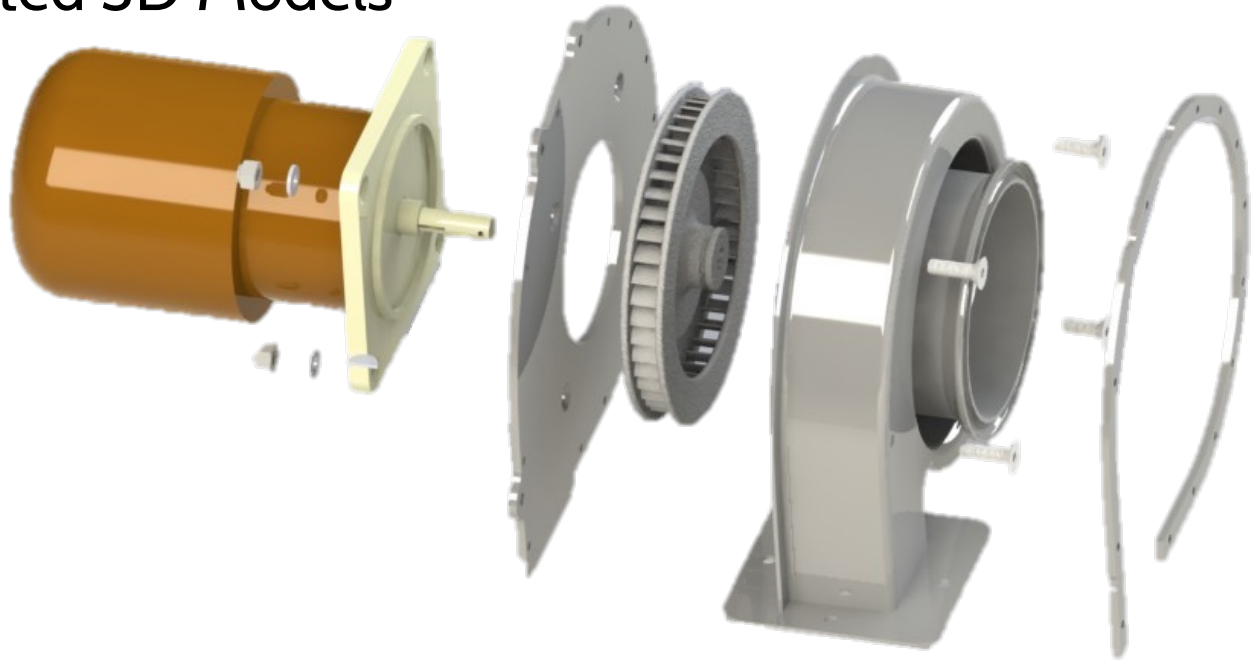
Process

- Reverse Engineered Assets



Process

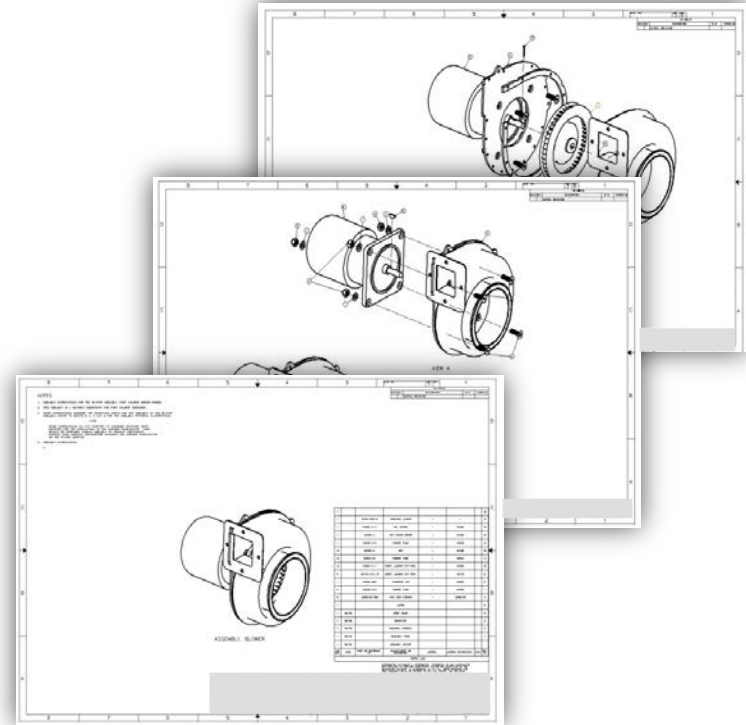
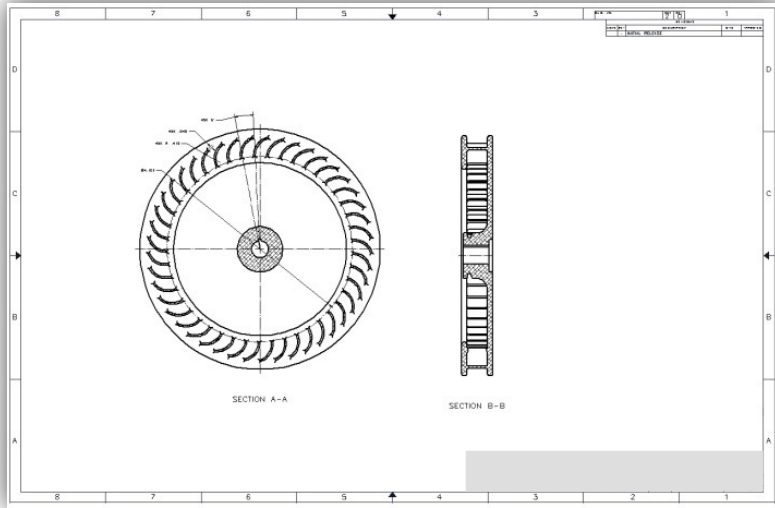
- Created 3D Models



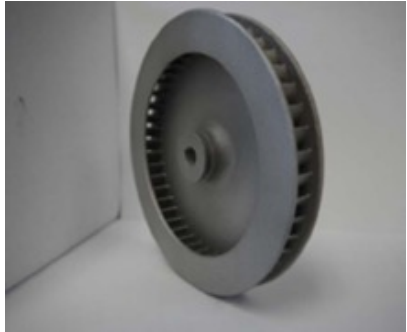
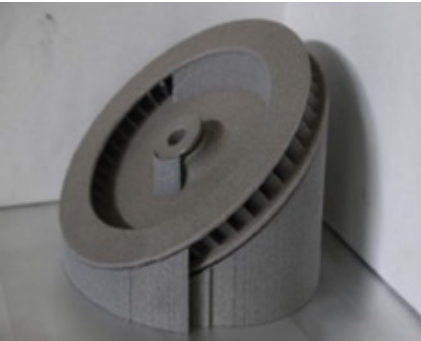
Process



- Created Drawing Packages



AM Phases - Prototyping



AM Phases

- Introduced the use of ULTEM 9085 (thermoplastic)

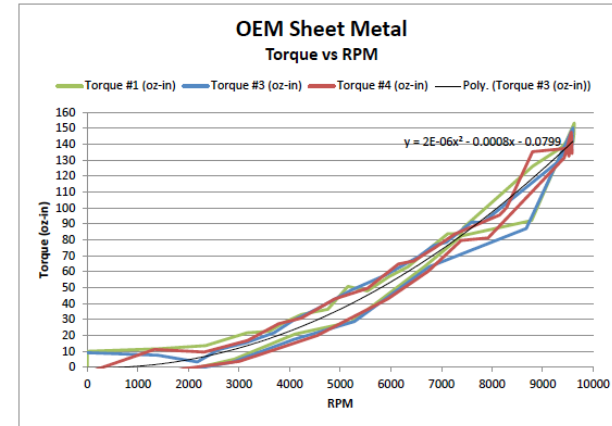
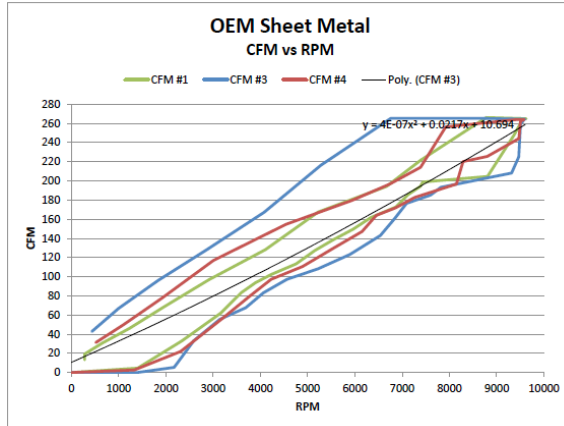
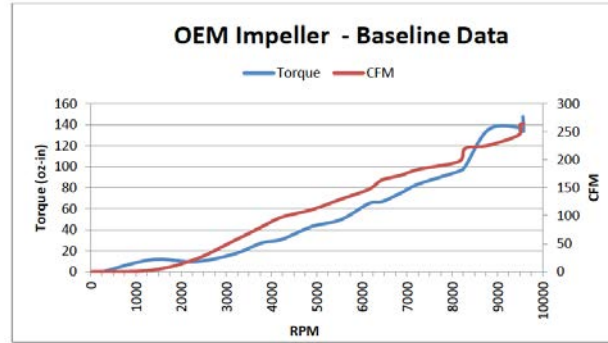


Received Approval to use Thermoplastic Impellers

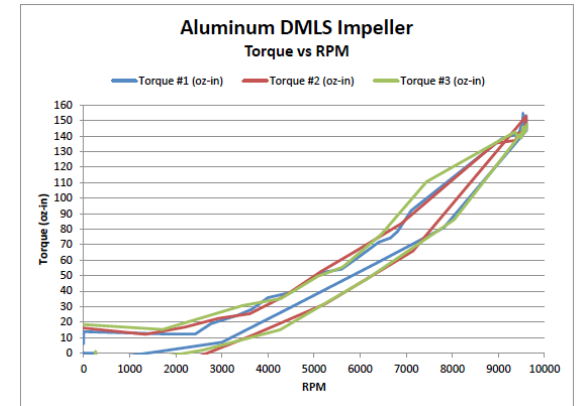
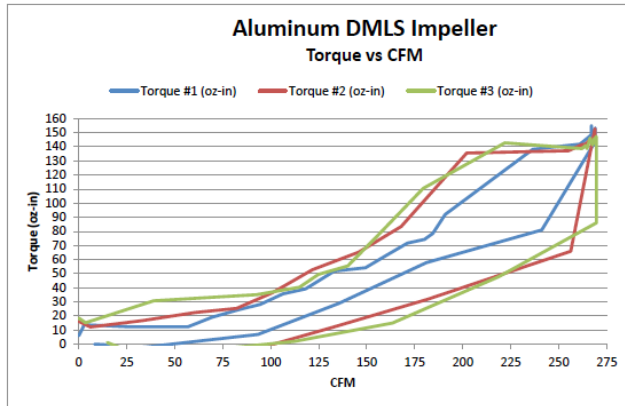
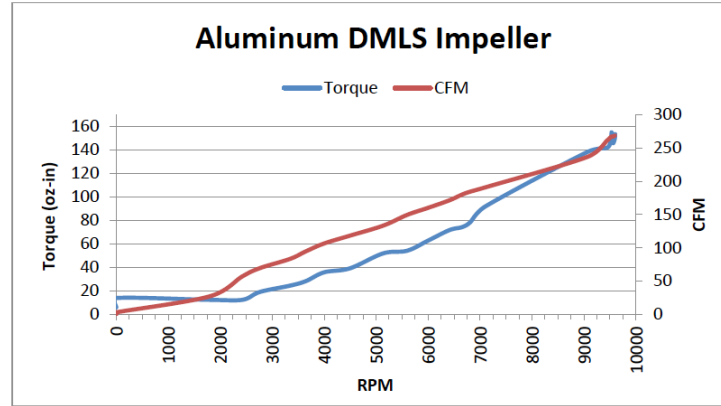


Impeller	CFM	RPM	# Vanes	Current (amps)
Full (45 Vanes)	300	10,650	45	A: 5.0 B: 5.7 C: 6.1
30 Vanes	261	10,820	30	A: 4.8 B: 5.1 C: 5.4
23 Vanes	213	11,240	23	A: 3.4 B: 3.8 C: 4.0

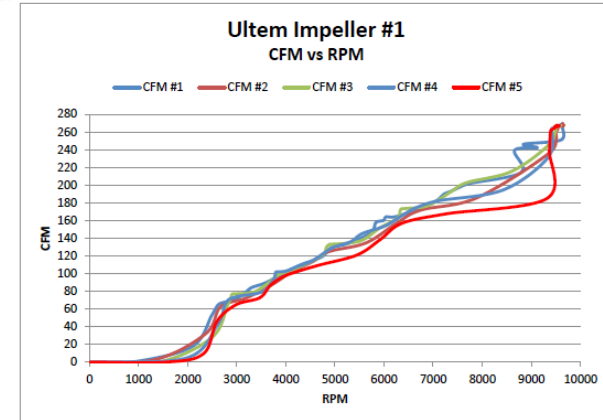
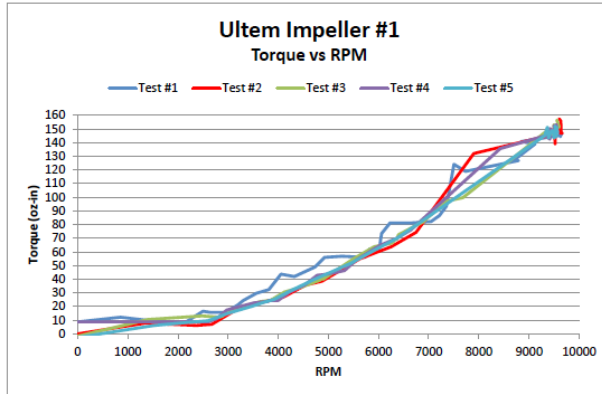
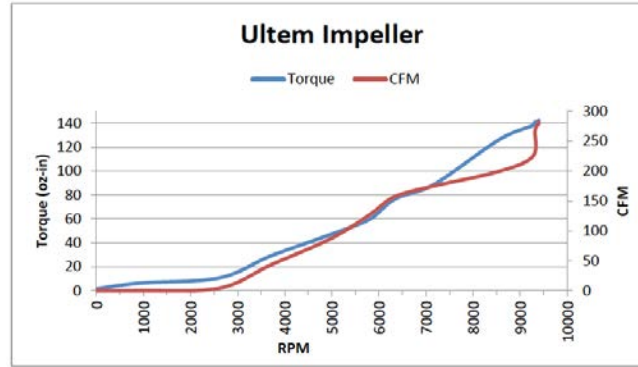
TESTING



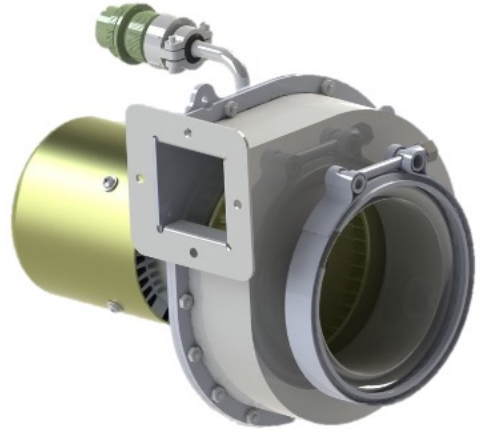
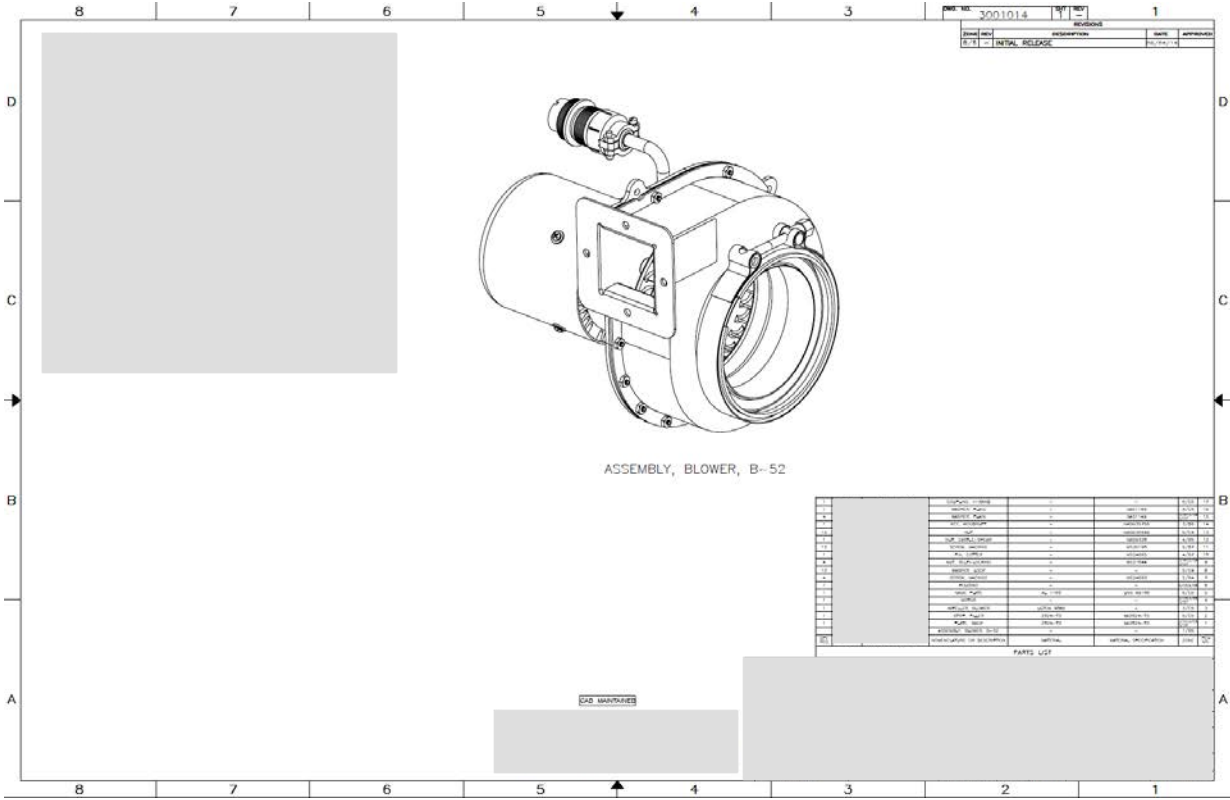
TESTING



TESTING



Completed TDP & Testing



Customer Briefed B-52 CCB to get Approval



We Delivered:

- Unrestricted Technical Data Package
- Source for 2D Drawings and 3D files
- All Test Data
- Difference Data Sheets (TO Changes)
- Identified and Qualified new sources of manufacture
- 5 Prototypes (Zero Time Assets)

Customer Briefed B-52 CCB to get Approval



The Commodities Group at Tinker AFB received approval from the B-52 Configuration Control Board to mount the Zero Time Radar Blower Motor Assembly in the aircraft

It flew without incident for over 6 months.

At this point the assets were fully approved to be used on all

B-52s

Project Outcome

- The 3D printed impeller spins at approximately 11,000 RPM
- It is flying on over 60 B-52s today
- The Air Force has access to 100% of the data
- Cost for Impeller went from ~\$10K for a recreation, ~\$3K for the aluminum printed impeller to <\$300 for the thermoplastic impeller



Thank You!

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