ADDITIVE MANUFACTURING AND OPTIMIZING ROCKET END-RING

Project Description

What was the purpose of this project?

- Design a rocket end-ring that is optimized for manufacturing using directed energy deposition of titanium

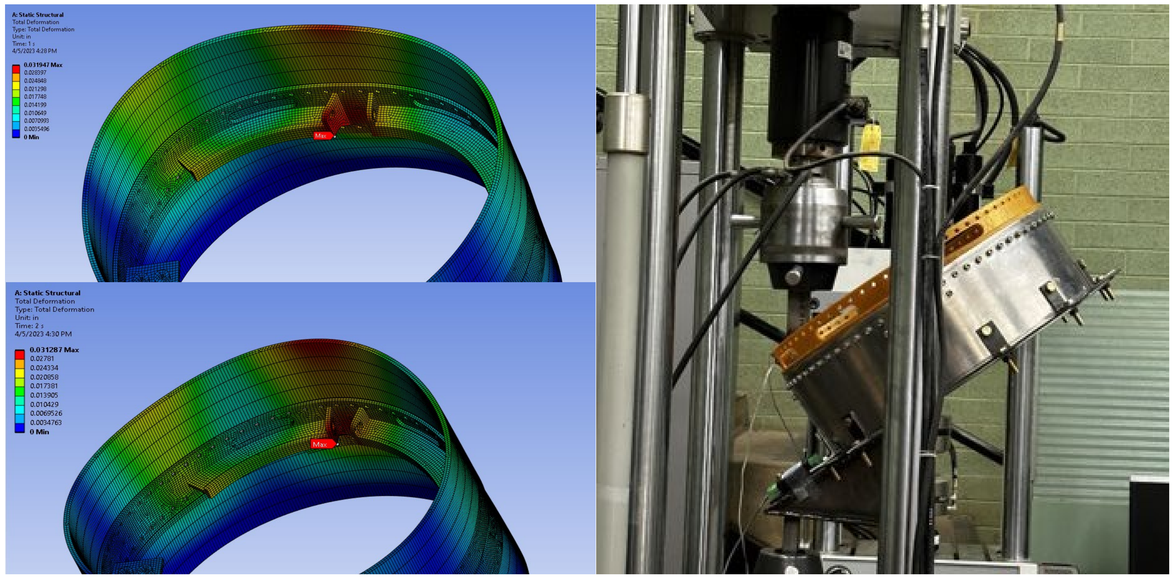
What problem is this project trying to solve?

- Produce the end-ring in one solid part with limited post processing without sacrificing strength and stiffness

What are the requirements for this project?

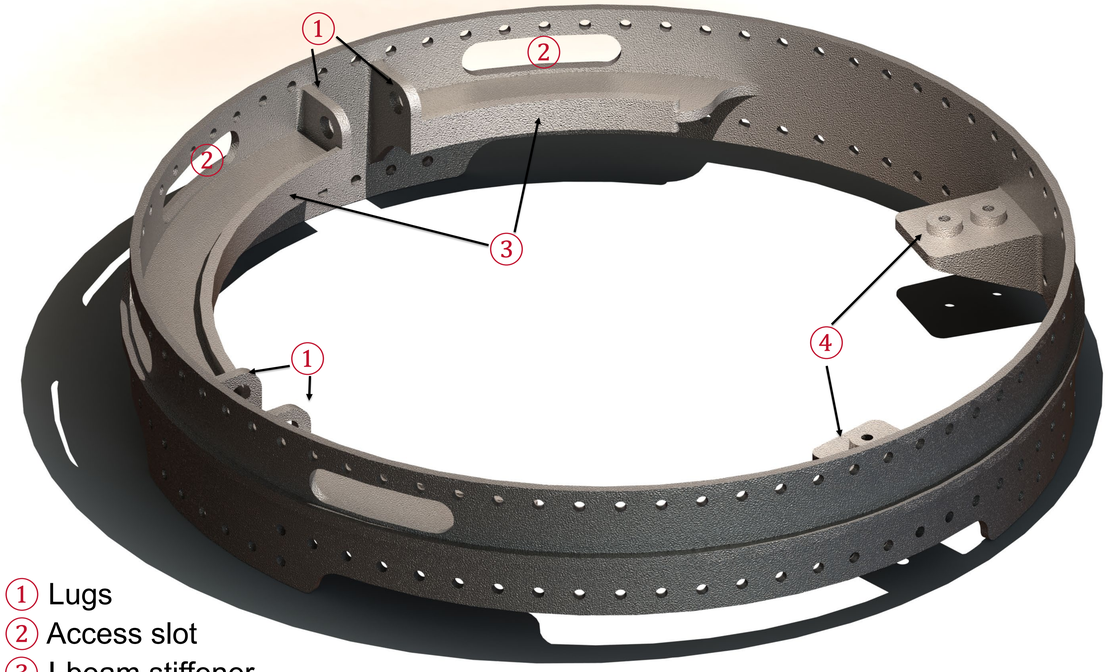
- Mass Limit < 10 lbm
- Backup Stiffness > 400 kip/in
- Remain inside provided design space
- Limit amount of support material that will need to be machined away

Performance Review



- Using Ansys software, backup stiffness and Von Mises stress were calculated.
- The following loads were analyzed: Loads on lug holes, and line load.
- Worst load expected values: 312.5 kip/in backup stiffness, 43 ksi stress
- Testing was performed to verify Finite Element Analysis (FEA)

Design Description



① Lugs
② Access slot
③ I-beam stiffener
④ Avionics box mounts

Conclusion

The design was a successful proof of concept that additive manufacturing can be used to replace the existing assembly. The ring exceed the weight requirement while achieving a sufficient stiffness.

Lessons Learned

- Release part to manufacturer as soon as possible to avoid delays
- Evaluate test fixture and dry run test protocol prior to live run
- Different part in the project can be worked in parallel

Future Work

- Testing other features on the ring
- Verify design is can be scaled to larger rings

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