

HyPerComp Blast Chamber Access/Closure

James Blake, Blake Buffington, Zachary Smith, Gavin Stoker

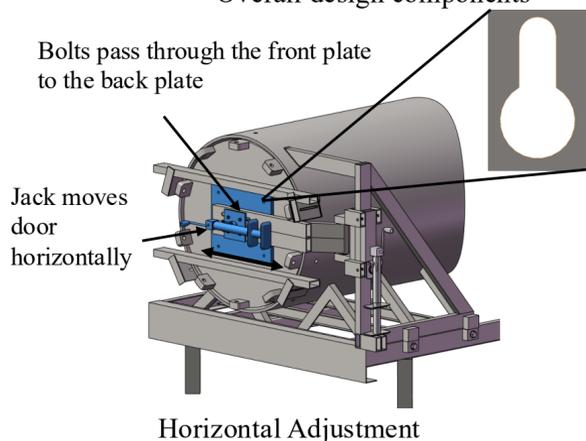
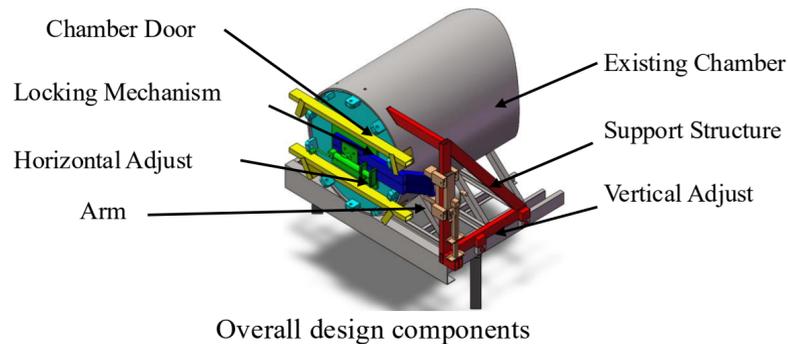


College of Engineering
UtahStateUniversity

Problem Description

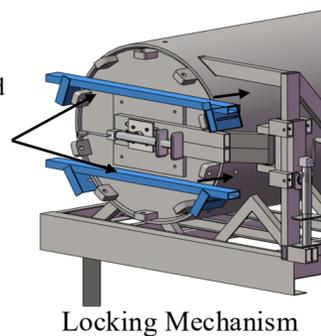
HyPerComp Engineering is targeting an improved design of a blast chamber lid to make testing operations safer, faster, and easier. The lid is meant to contain debris and other potentially destructive effects of a COPV burst during testing. HyPerComp has an existing blast chamber that is difficult to access and operate. The current blast chamber door is a large inconvenience to the company, and they have asked us to make a new design for it.

Our Design

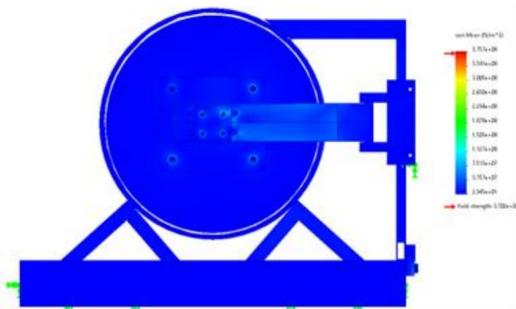
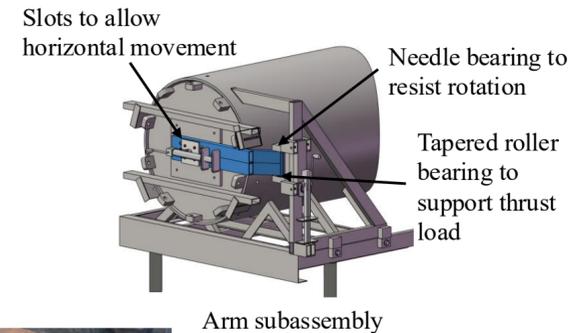
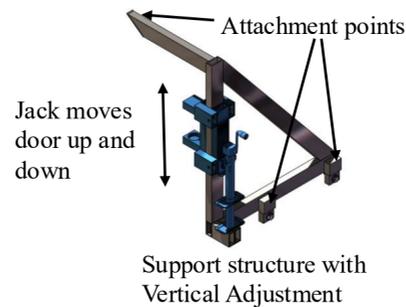


Existing holes in door

Steel bars placed behind door in closed position



Baskets can be slid back for opening clearance

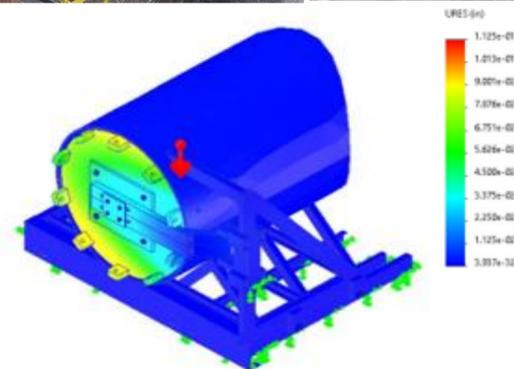


FEA static analysis of structure under effect of gravity shows slight strain in arm and large stress over-reporting near bolt holes

Analysis

$$F_{open} = 2\mu_s N \left(\frac{r_{bearing}}{d_{pullpoint\ to\ hinge}} \right) = 8\ lbf$$

Calculated opening force when pulling on the left side of door



Displacement analysis shows less than 1/8" of deformation at the left edge of door

Design Performance

Requirement / Constraint	Target	Threshold	Performance
Lid interference when open	N/A	0 in ²	0 in ²
Support weight of lid	N/A	1550 lbf	1550 lbf
Lid radial tolerance when closed	¼ in	½ in	½ in
Required opening/closing force	25 lbf	50 lbf	10 lbf
Safety Factor	4	2	2

Conclusion

- Design met or exceeded all requirements
- Door falls closed; needs a stopper to stay open
- Larger tolerances are required for aligning multiple holes

Future Work

- Corrosion Resistive Layer
- Position Locking of door in open position
- Using Electric/Pneumatic Jacks
- Make use of radial hole to lock door

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