Overview of the 2nd Gen 3.7m HIAD Static Load Test

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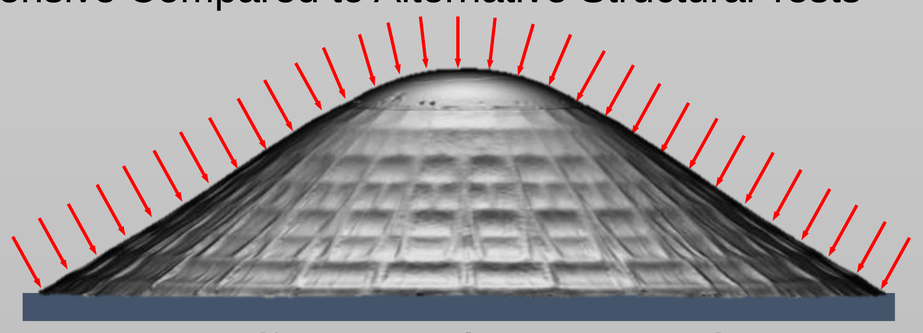
Why Static Load Testing?

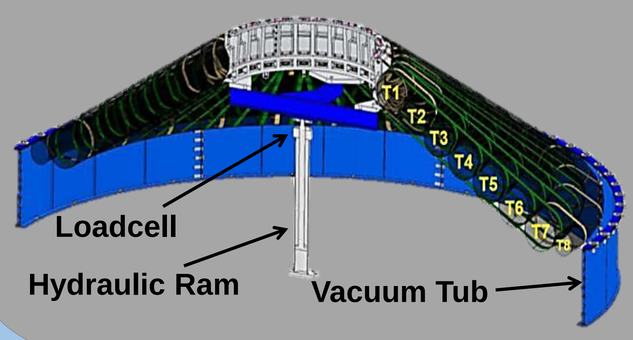
- Demonstrate Structure Maintains Acceptable Shape Under Load
- Demonstrate Structure Robustness to Max Loading Conditions
- Experiment with Different Layouts and Inflation Conditions to Determine the Acceptable Lowest Mass Inflation State
- Inexpensive Compared to Alternative Structural Tests

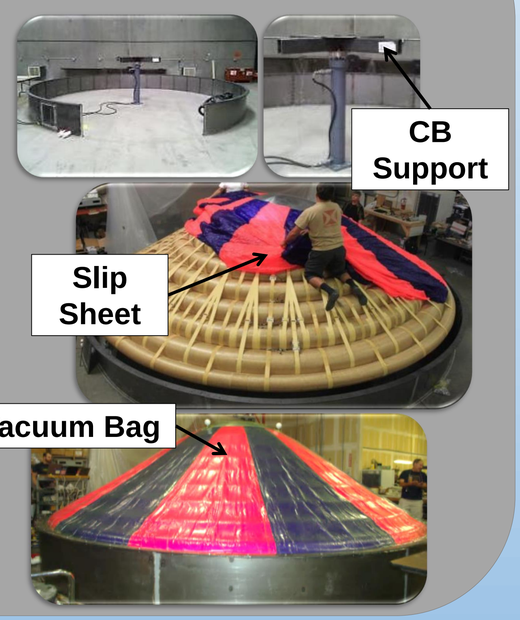


Uniform Normal Pressure Load

Static Load Test Setup

- Vacuum Fixture (Tub)
- Hydraulic Ram & Cross Member
- Slip Sheet & Vacuum bag
- 50,000lb Loadcell & Manometer
- Industrial Vacuum

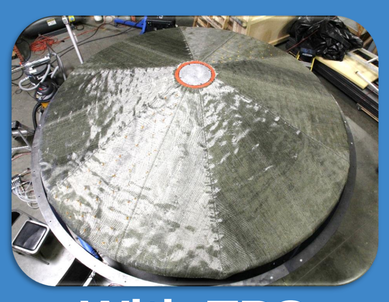




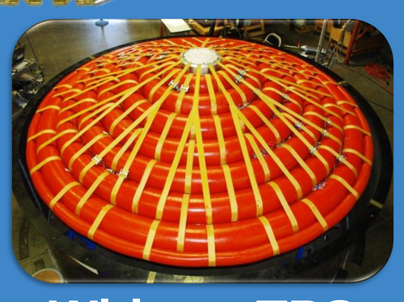
2nd Gen HIAD Test Article

3.7 meters

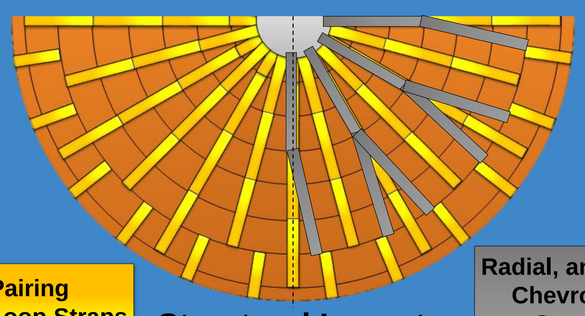
Material: Zylon
Cone-Angle: 70 Deg
Coating: RTV
Liner: Urethane
Tri-Torus: T5.5 (removable)



With TPS



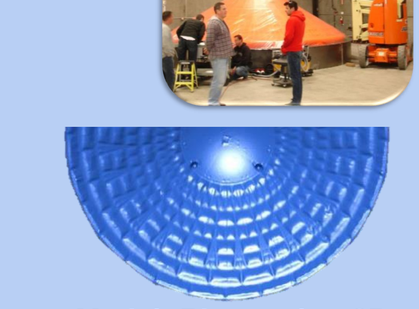
Without TPS



Structural Layout

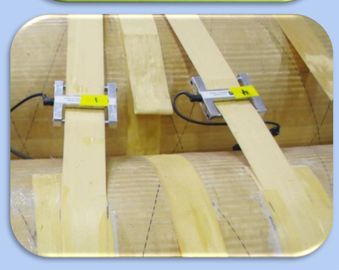
Instrumentation

Laser Scanner



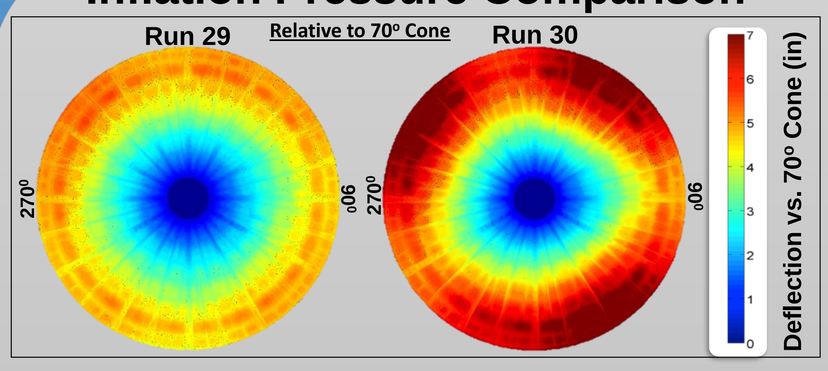
Matlab Plots using 3D Point Cloud Files

Strap Loadcells

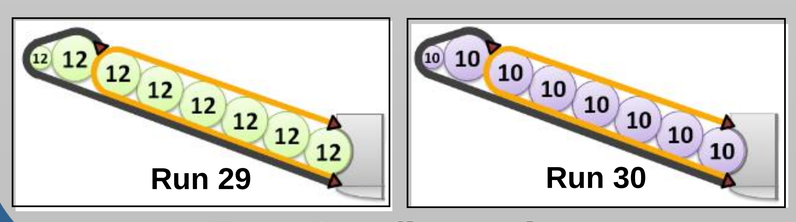


Example Test Results

Inflation Pressure Comparison



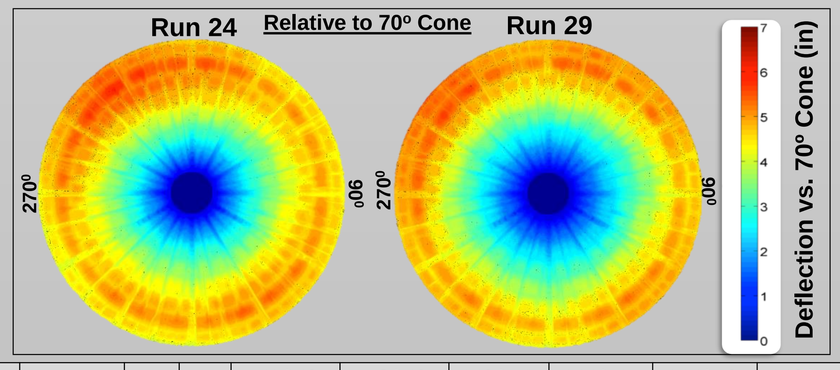
- **12 PSI:** Uniform Deflection Under 10,000lb Load
- **10 PSI:** Aersohell Begins Asymmetric Deflection



Run Configuration

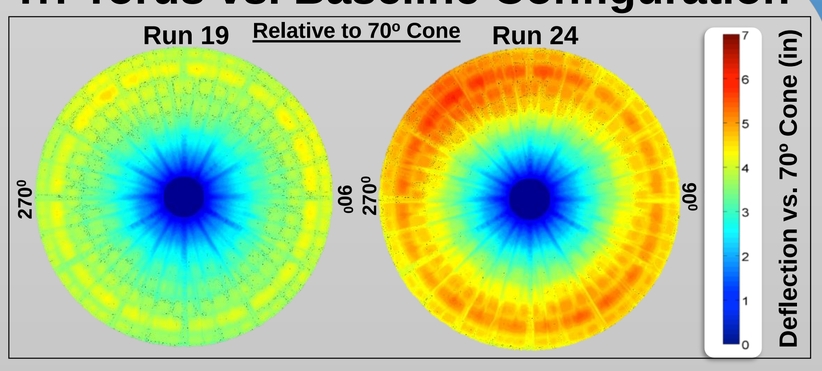
Chevron Termination

- **Centerbody Chevron Termination:** Slight Deflection Reduction, Pairing Loop Load Reduction

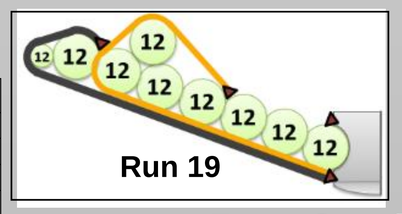


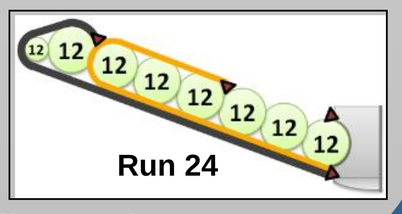
10,000 lbs	Run	R	CF	T1/T2		T2/T3		T3/T4		T4/T5		T5/T6		T6/T7	
				Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft	Fwd	Aft
	Run 24	458	210	164	170	173	173	137	2	-12	-25	-58	78	-1	1
	Run 29	411	186	126	127	129	99	111	39	-27	-34	-55	23	-5	23
	Diff (lbs)	**-46**	**-24**	**-38**	**-43**	**-44**	**-75**	**-26**	**37**	**-15**	**-8**	**4**	**-54**	**-4**	**23**
	%Change	**-10.1**	**-11.5**	**-23.2**	**-25.5**	**-25.5**	**-43.1**	**-18.9**	**-**	**-**	**-**	**-**	**-69.7**	**-**	**-**

Tri-Torus vs. Baseline Configuration



- **With Tri-Torus:** Less Deflection by ~2in
- **Baseline (No Tri-Torus):** Less Shoulder Stiffness





Run Configuration

Conclusions and Future Work

- Aeroshell Performs Well at 10,000lbs of Load with 12 PSI Inflation
- Alternate Chevron Termination Reduces Load In Inflatable Structure
- System Variability Can Induce Early Asymmetric Deflection
- Tri-Torus Increases Rigidity of Structure, but Increases Volume & Mass

- Develop and Test 15m Class 2nd Gen HIAD Aeroshell
- Perform Pack and Deploy Testing on 2nd Gen Aeroshell
- Conduct Greater Zylon Environmental Testing to Fully Characterize Current System and Document Limitations

Static Load Test Team

Laser Scan 3D Point Cloud