Hypervelocity Impact of Composite Overwrapped Pressure Vessel (COPV) and Comparison to a Numerical Model

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Objectives
- Expose COPV to hypervelocity impact (HVI) testing in pressurized and unpressurized condition.
- Assess overall COPV damage incurred by HVI.
- Identify impact conditions likely to result in catastrophic rupture.
- Broaden the conclusions made from experiment by numerical analysis.

Model

- CAD model based on CT scan

Hypervelocity Impact Testing
- Testing occurred at NASA White Sands test Facility (WSTF) Remote Hypervelocity Test Laboratory (RHTL) in Las Cruces, New Mexico.

Experimental and Modeling Results
- HITF16163, Pressurized test, Pass
- HITF16169, Pressurized test, Venting failure
- HITF16162, Pressurized test, Rupture failure
- HITF 16212, Unpressurized test, Pass
- HITF 16394, Unpressurized test, Perforation
- HITF 16211, Unpressurized test, Perforation

Conclusions
- Experiments demonstrate COPV has capacity to withstand hypervelocity impact.
- Failure mode appears to be related to impact energy.
- A numerical model was designed to broaden the scope of this effort.
- Pressurizing of COPV in numerical impact simulations will be the next effort.

References