



Overview of Underwater Shock

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Capabilities

- Shock response of composite, metallic, and soft materials
- Underwater explosive loading experiments
- In-air blast loading experiments
- Extreme underwater pressure shock experiments
- Dynamic constitutive material characterization and equations of state
- Shock loading at extreme temperature experiments
- Ballistics firing and impact
- Numerical Simulations



Undersea Vehicle Technology Applications

- Implosion and Sympathetic implosion of air backed structures
- Degradation of materials in marine environments
- Mitigation of structural damage for air and underwater blast
- Underwater response to shock of soft and biological materials
- Dynamic fracture



http://bemil.chosun.com/nbrd/gallery/view.html?b_bbs_id=10044&num=71139



<http://auvac.org/newsitems/view/1194>



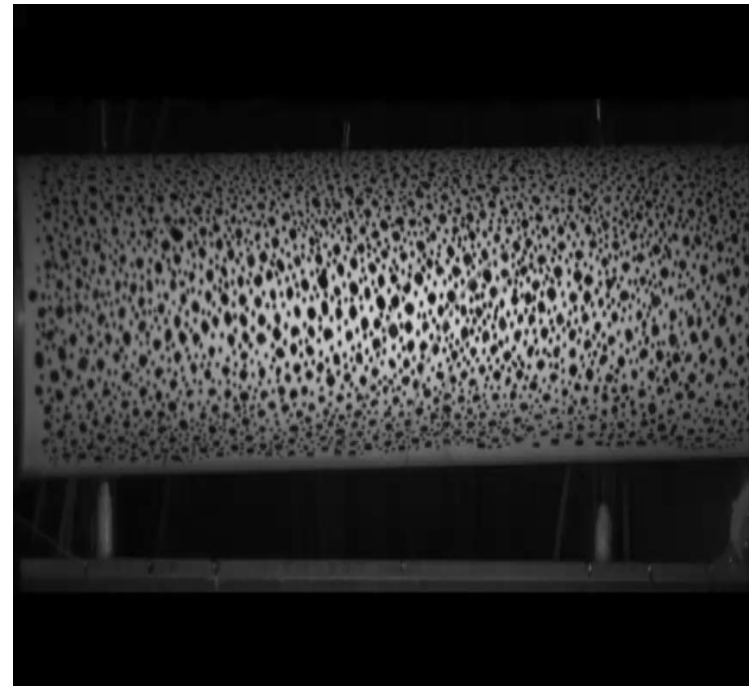
Implosion of Underwater Structures

Implosion Testing Facility



- 84 inch Inner Diameter Pressure Vessel
- Rating = 1000 psi and 4 grams of TNT
- Photron SA-1 High-speed Cameras
- Dynamic Pressure Transducers

Carbon Composite Cylinder

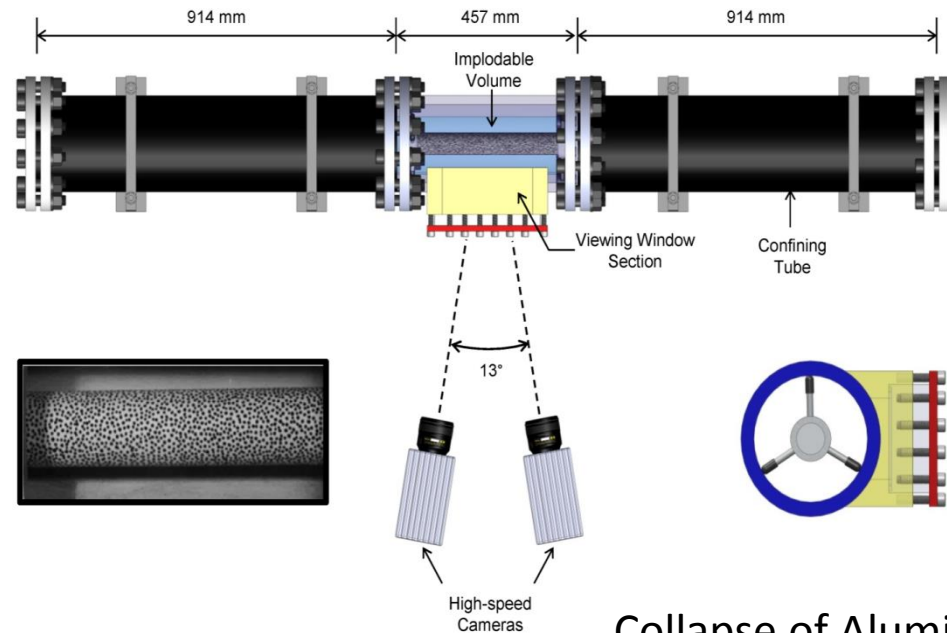


- Inner Diameter: 76.2mm
- Collapse Pressure: 0.73 MPa
- Frame-rate: 50,000 fps

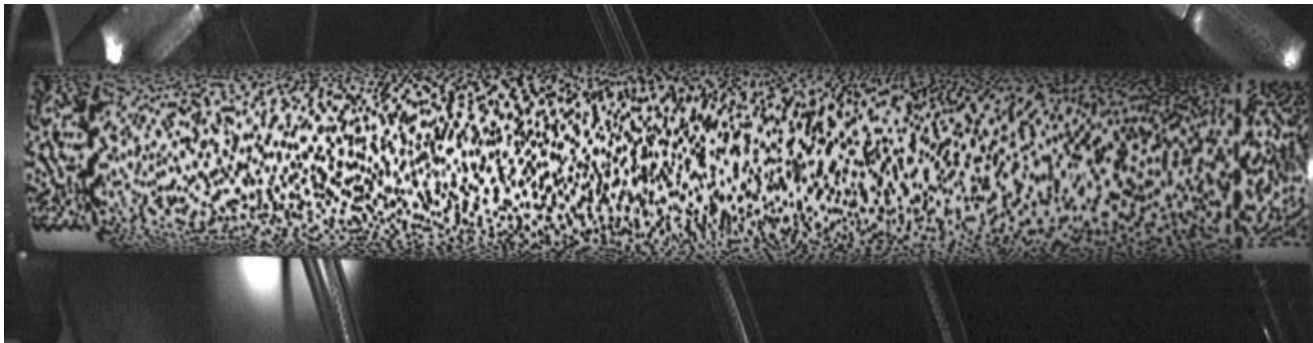


Underwater Shock

Underwater Structures in Confinement



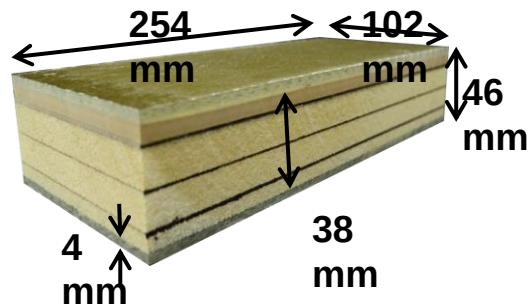
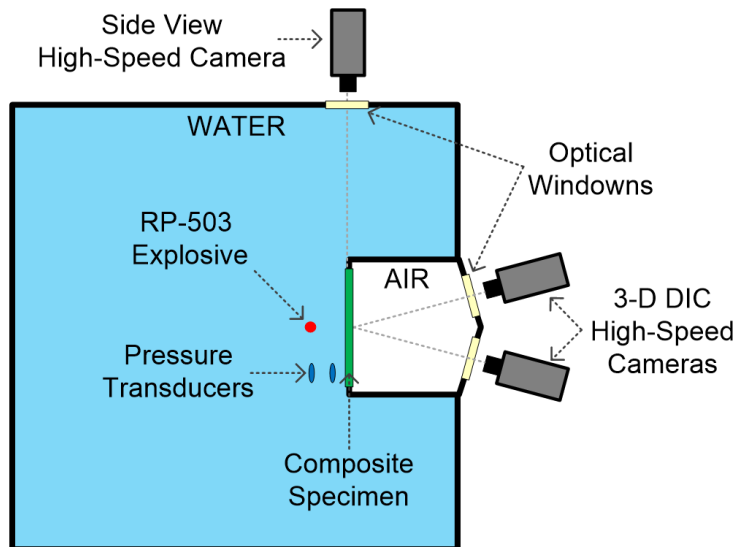
Collapse of Aluminum Tubes





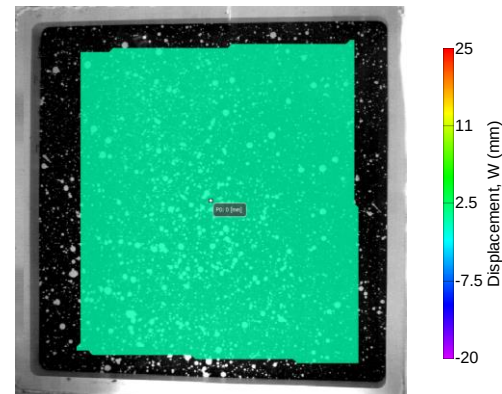
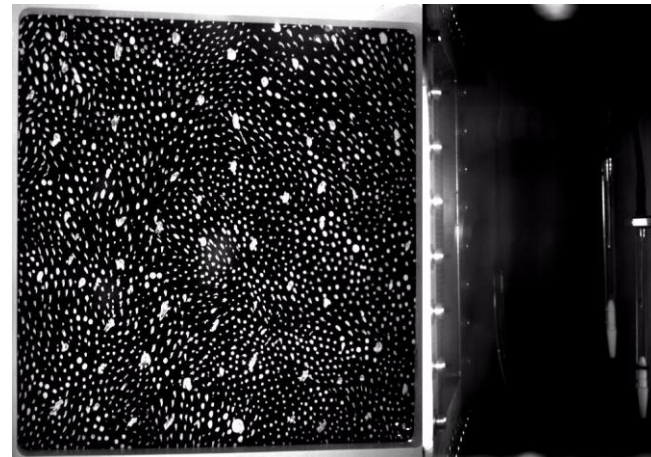
Shock Loading of Air-backed Structures

Top View:



Sandwich Structure

FRONT VIEW: SIDE VIEW:



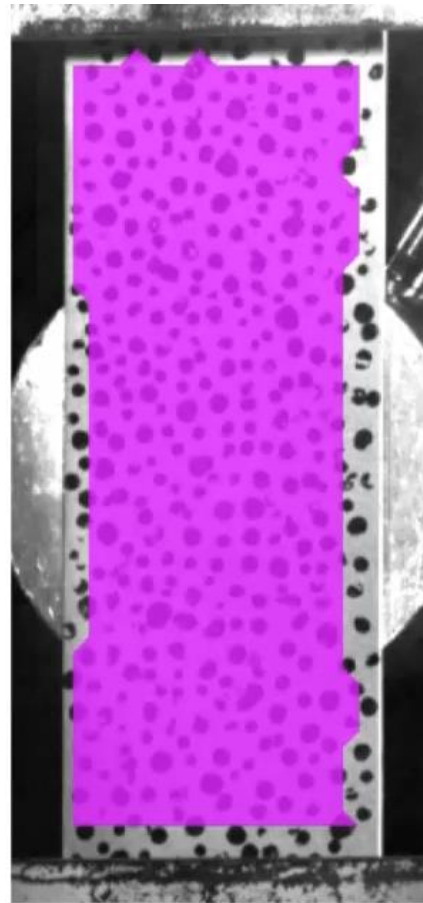


Blast Loading of Structural Panels

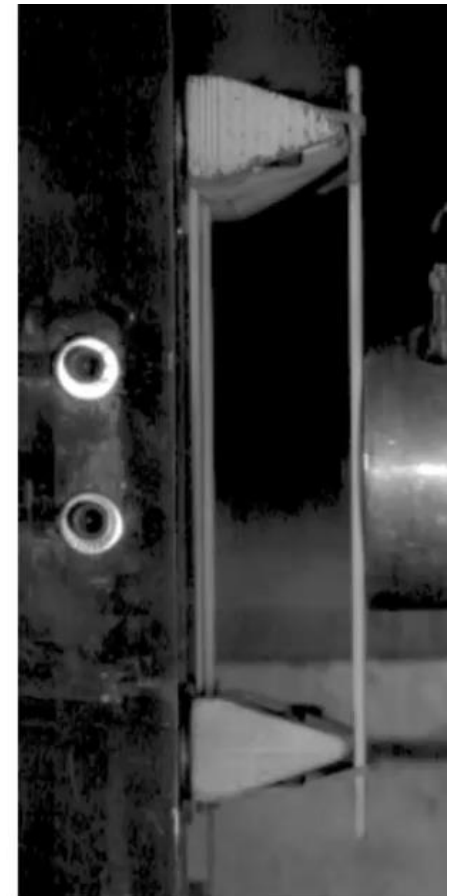
Shock Tube Facility



Blast Loading on Hastelloy Plate



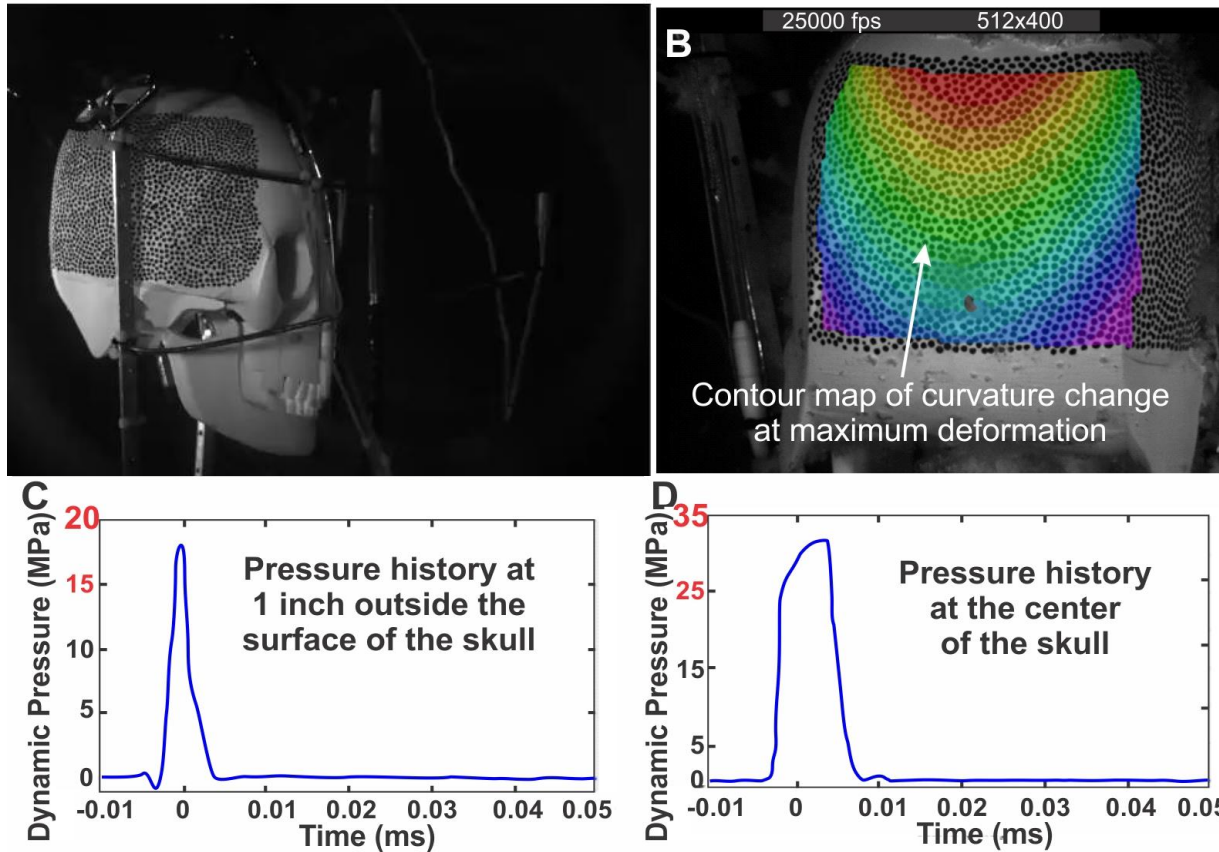
Front View



Side View



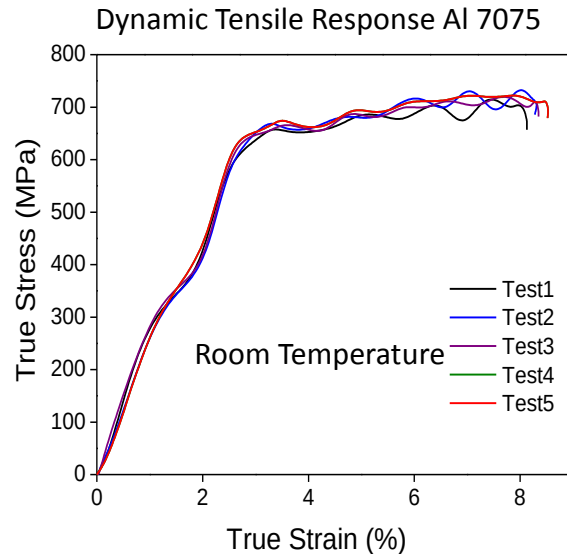
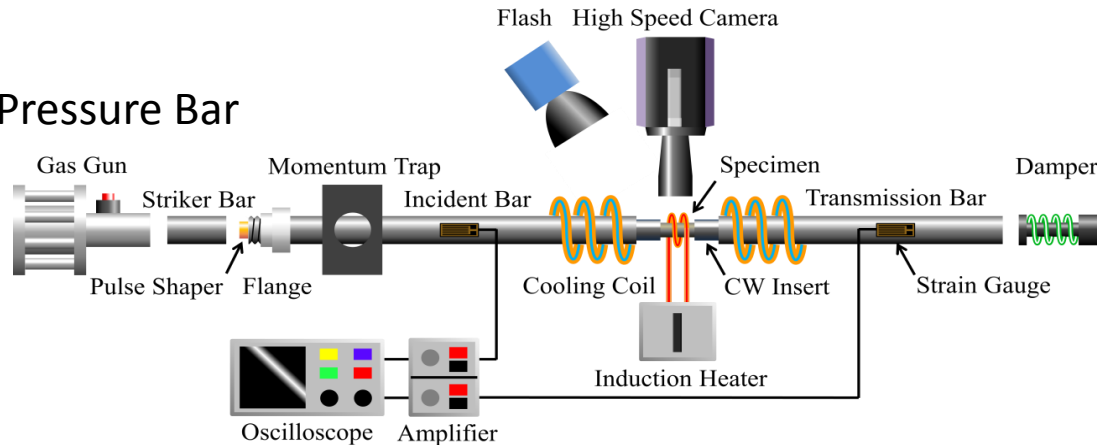
Shock Response of Biological Materials



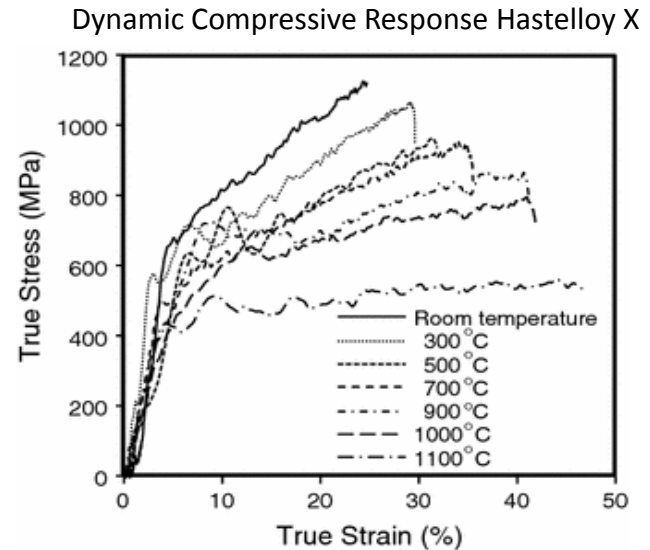


Dynamic Constitutive Response of Materials

Split Hopkinson Pressure Bar



Strain Rate
2000/sec





Underwater Shock

Determination of Material Hugoniot

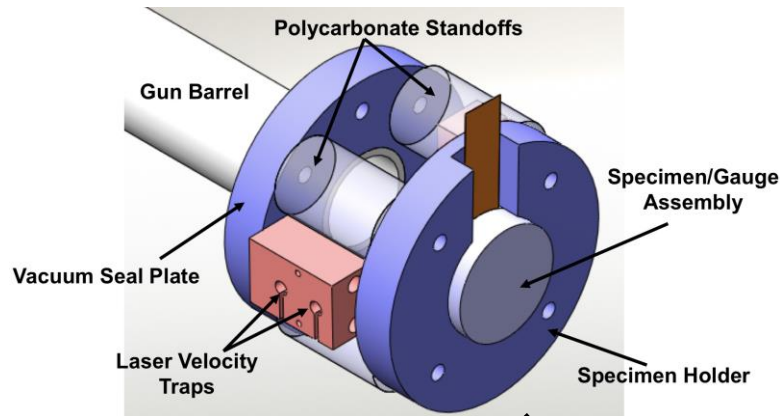
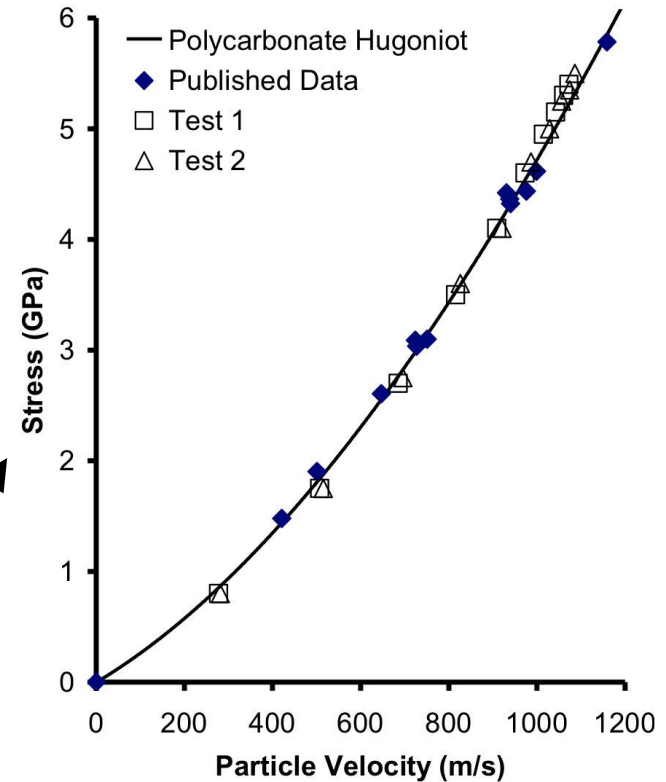
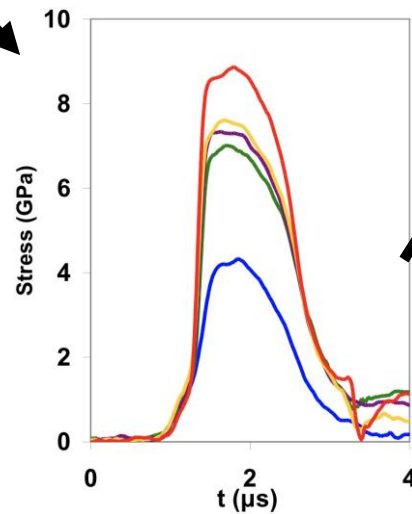


Plate Impact Facility



Sabot/Impactor Assembly

Sample/Gauge Assembly



Extra slides if needed



Active Research Projects

- “Shock Response of Composite Materials Subjected to Aggressive Marine Environments: An Experimental and Computational Investigation”
- “Dynamic Underwater Response of Proximal Composite Cylinders”
- “Implosion of Advanced Composite Structures Within Complex Underwater Environments”
- “Underwater Dynamic Response of Soft Material”
- “Residual Strength of Composite Materials Subjected to Blast Loading”
- “Underwater Blast Injury Monitoring”