Subsurface Launcher for Joint Services Payloads

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Naval Surface Warfare Center Dahlgren Division

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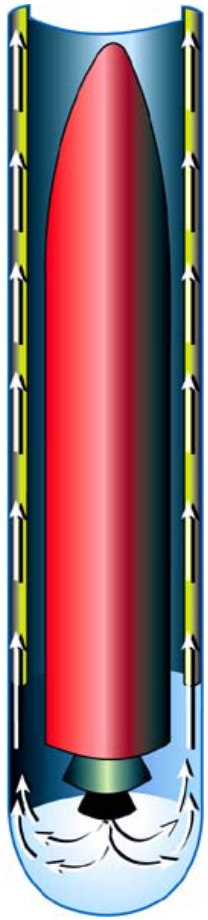
The Team

- **Sponsor – Wah H. Lee, NSSC 073R**
- **Technical Lead - NSWC G64**
- **Submarine Applications - Electric Boat**
- **Academic - Virginia Tech**

CCL Operation

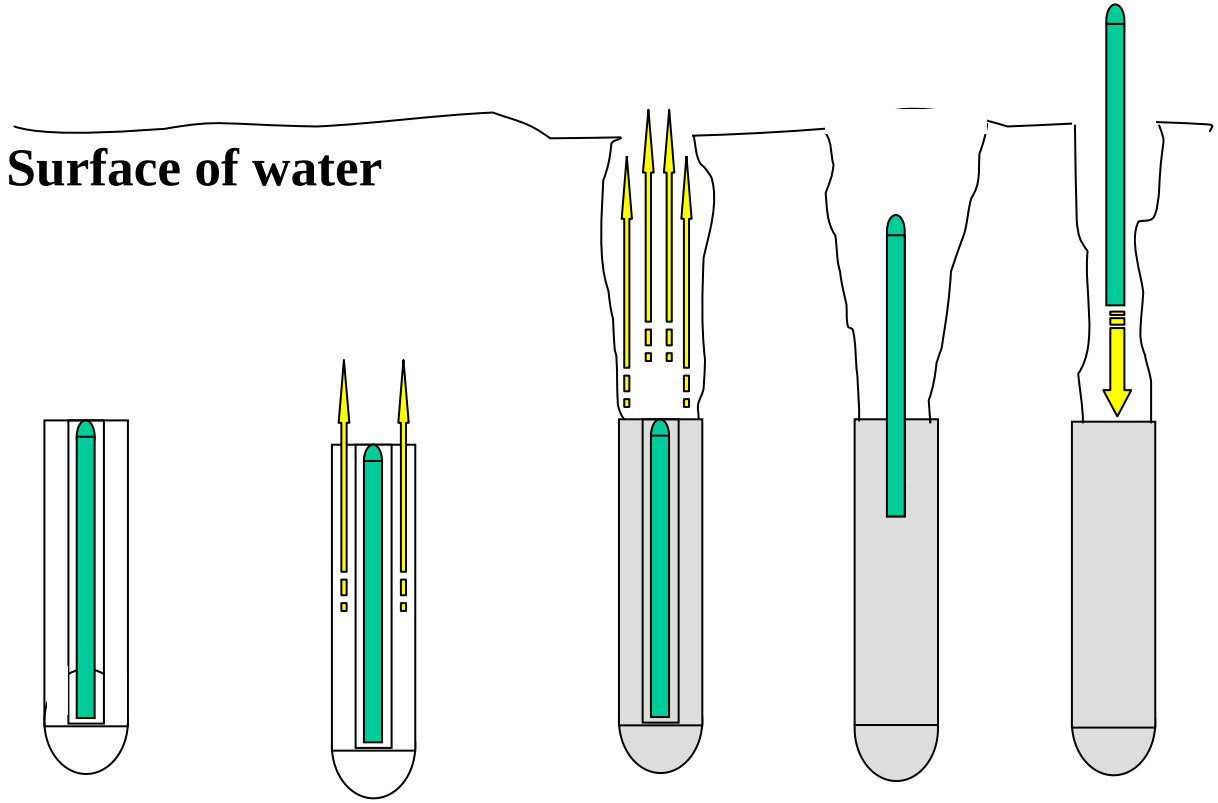
- **Weapon is housed within inner cylinder**
- **Inner cylinder guides weapon during initial stages of launch**
- **End-cap turns exhaust gases 180^0 into annular uptakes … *formed by gap between inner and outer cylinders***
- **A plate with exhaust ports located at the base of the weapon (not shown), in conjunction with the annular uptake, serves to control exhaust gas flow, missile base-pressure and thrust augmentation**



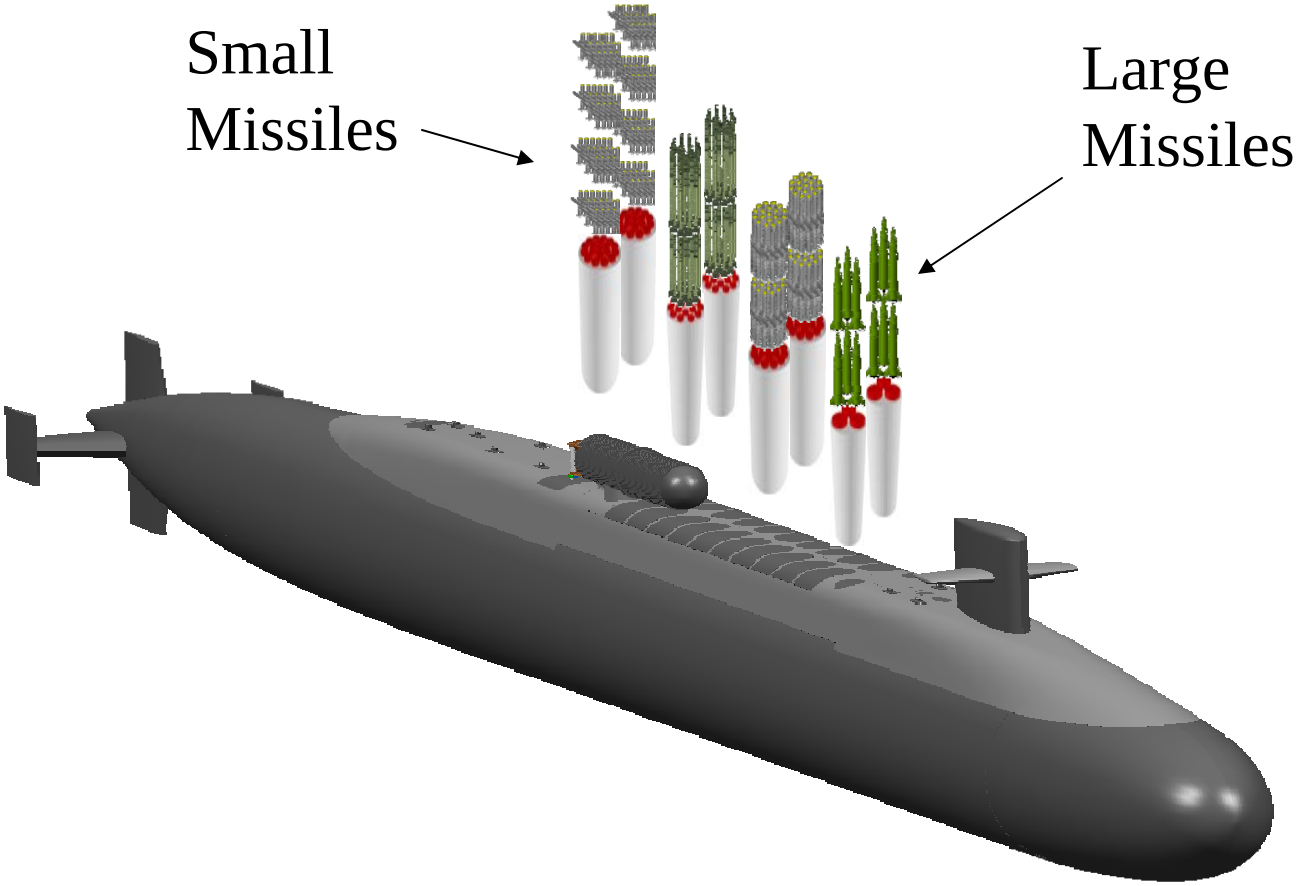
CCL ATACMS Launch

Time-Sequence Photo of ATACMS Launch from CCL at NSWCDD

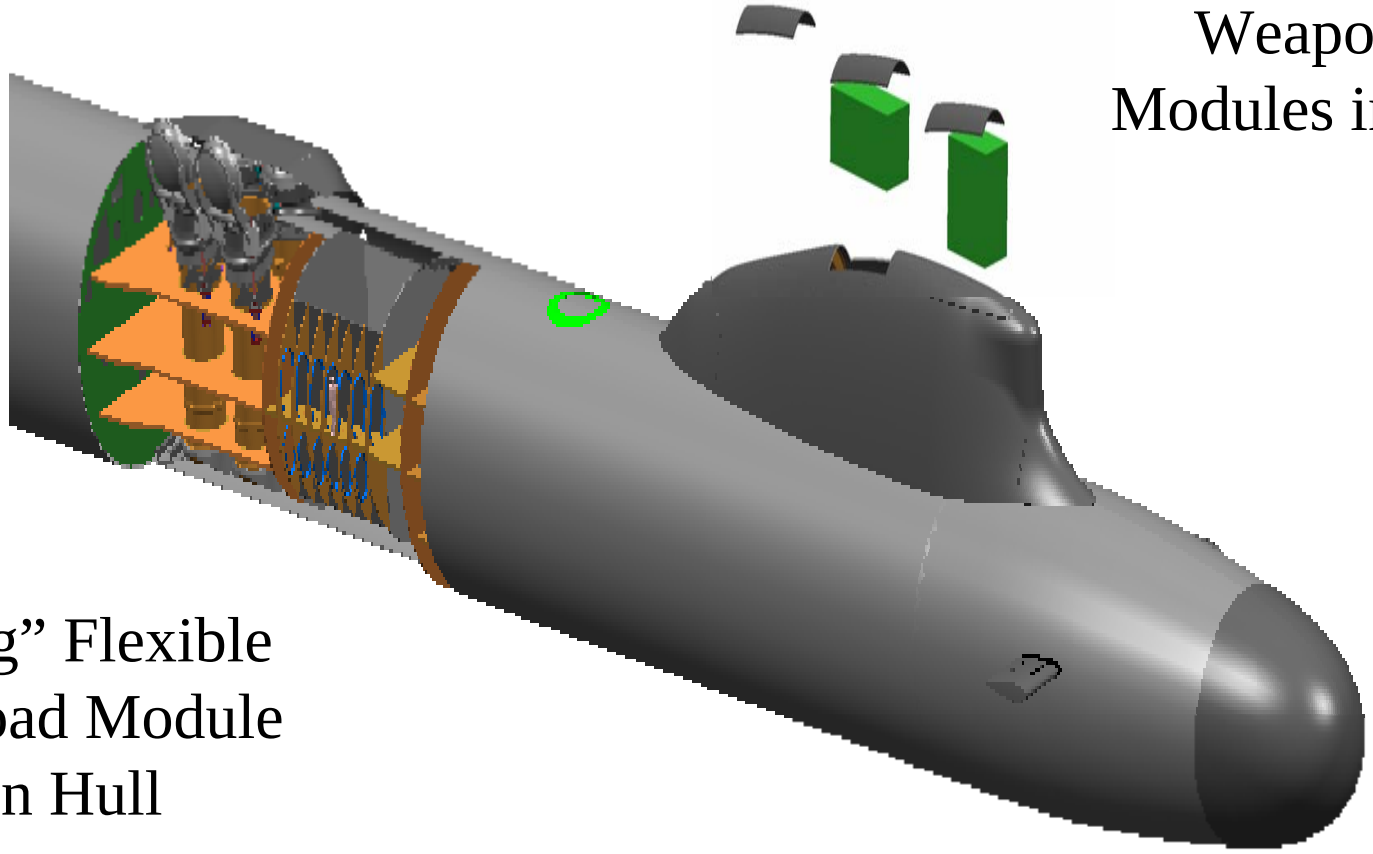
Water Piercing Missile Launcher



Notional Pressure Hull Installations



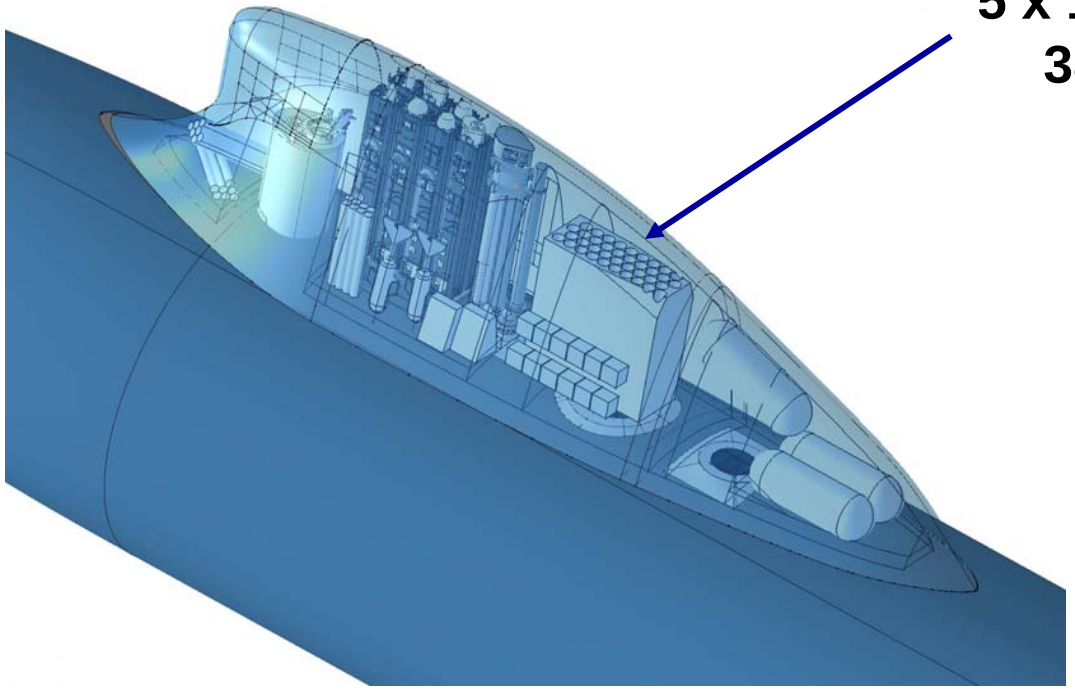
Notional Installations in Attack Submarine



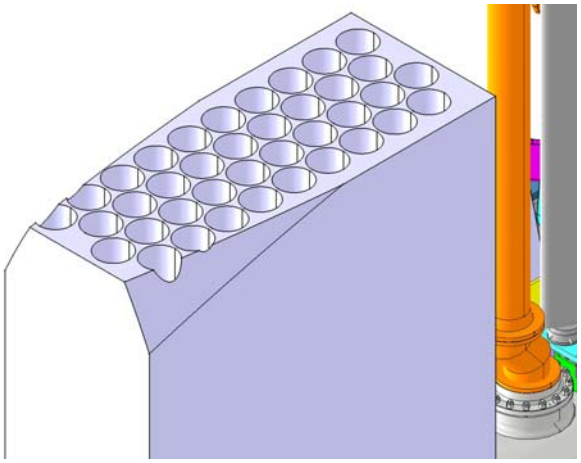
Weapons Modules in Sail

"Plug" Flexible Payload Module in Hull

Detail of Payload in Attack Submarine Sail

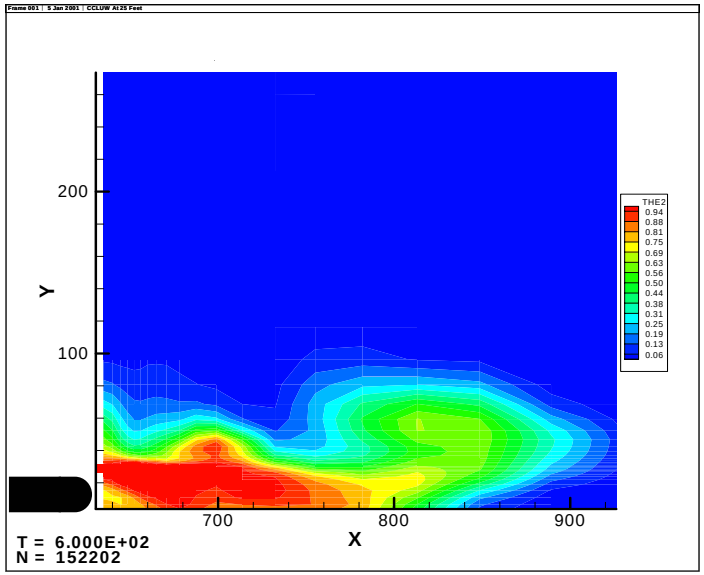


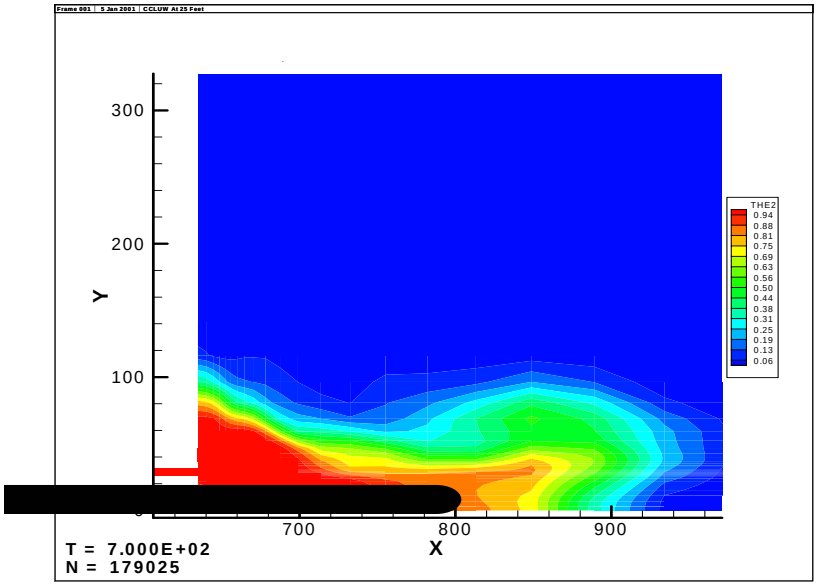
5 x 12 x 12 ft module with 38 NetFires Missiles

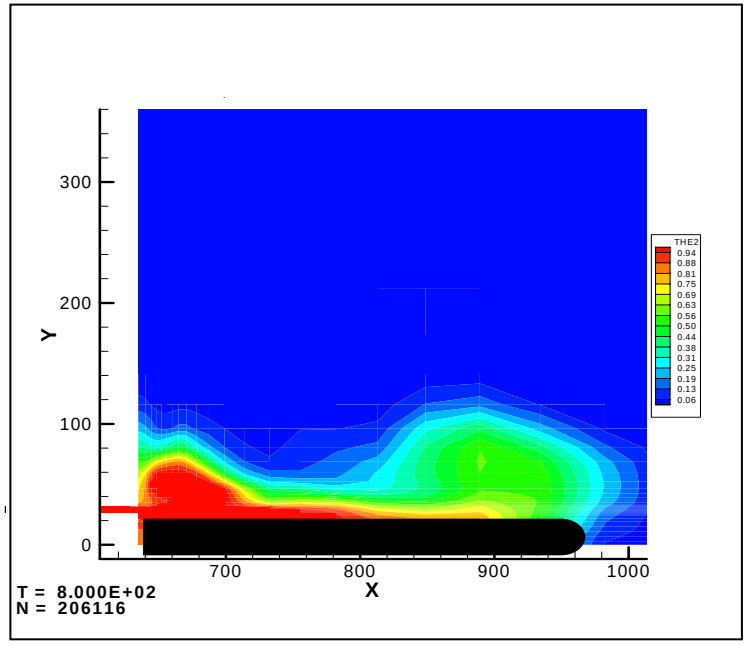


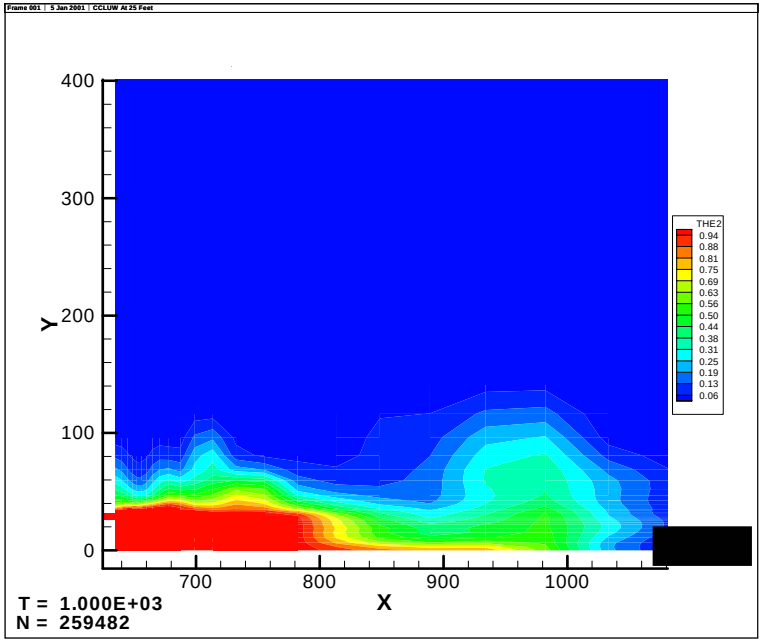
NetFires missiles for “Stand and Fight” capability against small surface craft (swarms)

Computer Simulation of Water Piercing Missile Launch

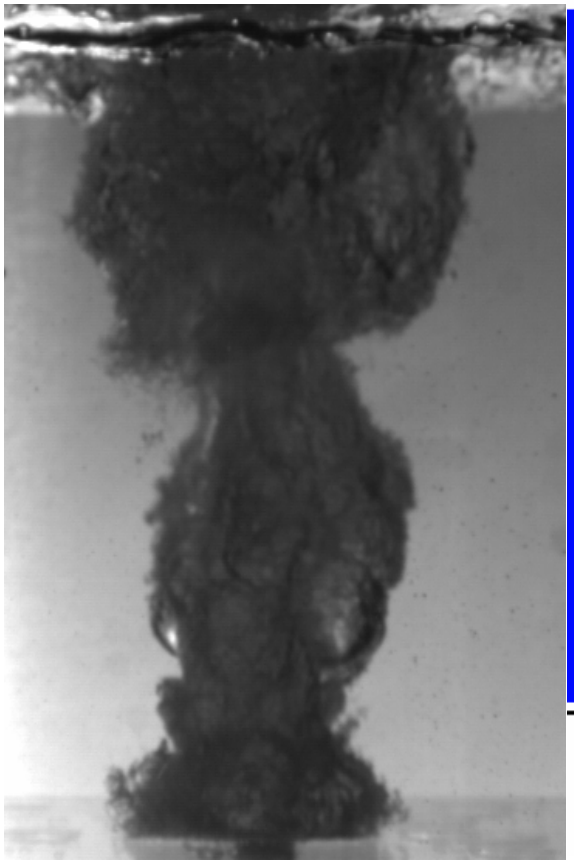


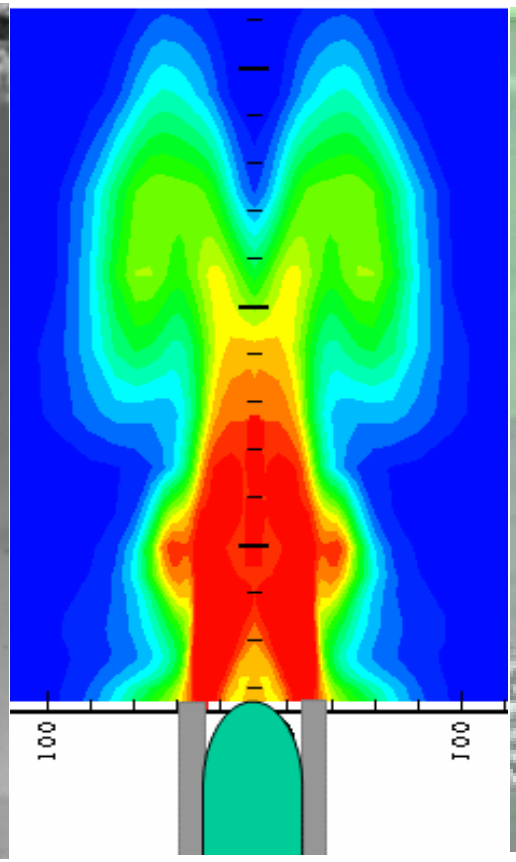






Rocket Powered, CFDLIB, and Air Powered Flow Fields



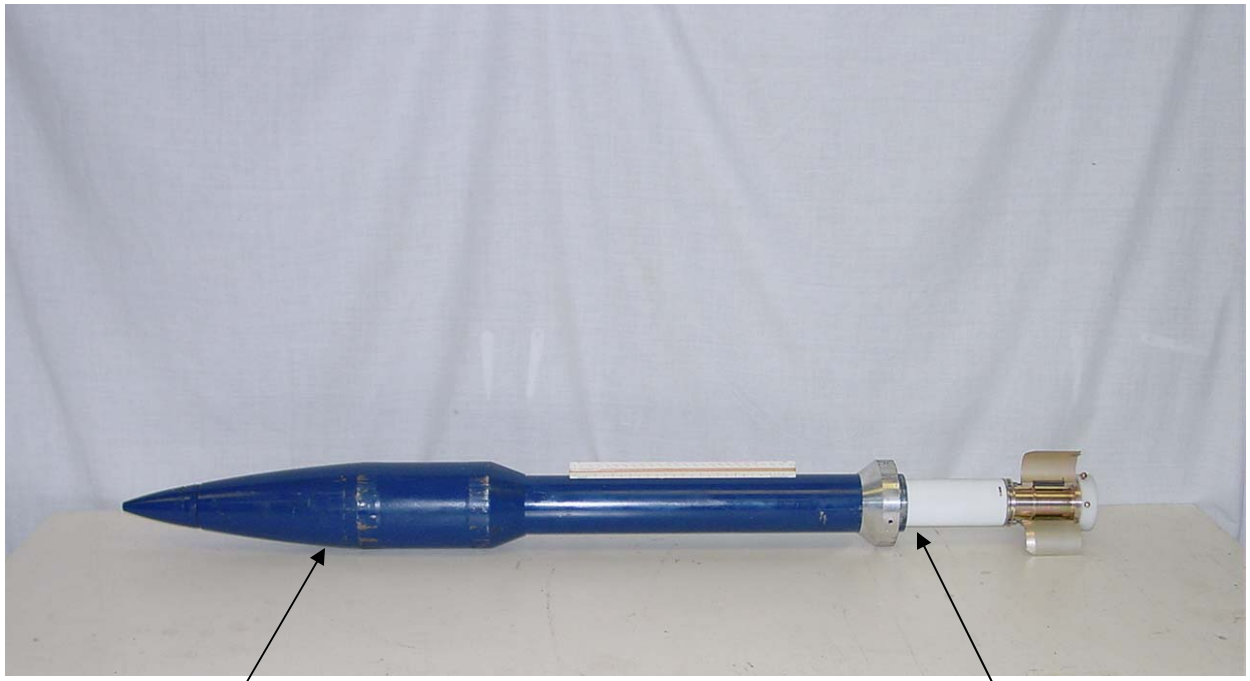


Elevated Test Tank at ARL

Breech and CCL Under Test Tank

Water Piercing Missile Launcher
Restrained Firing with 7-Inch Diameter
CCL and MK66 Rocket Motor

Missile for Water Piercing Missile Launcher Fly-out Experiment



Simulated Army TCMS missile made from an inert projectile

2.75-inch MK 66 Rocket Motor

Scale Water Piercing Missile Launcher with Simulated ATACMS Missile

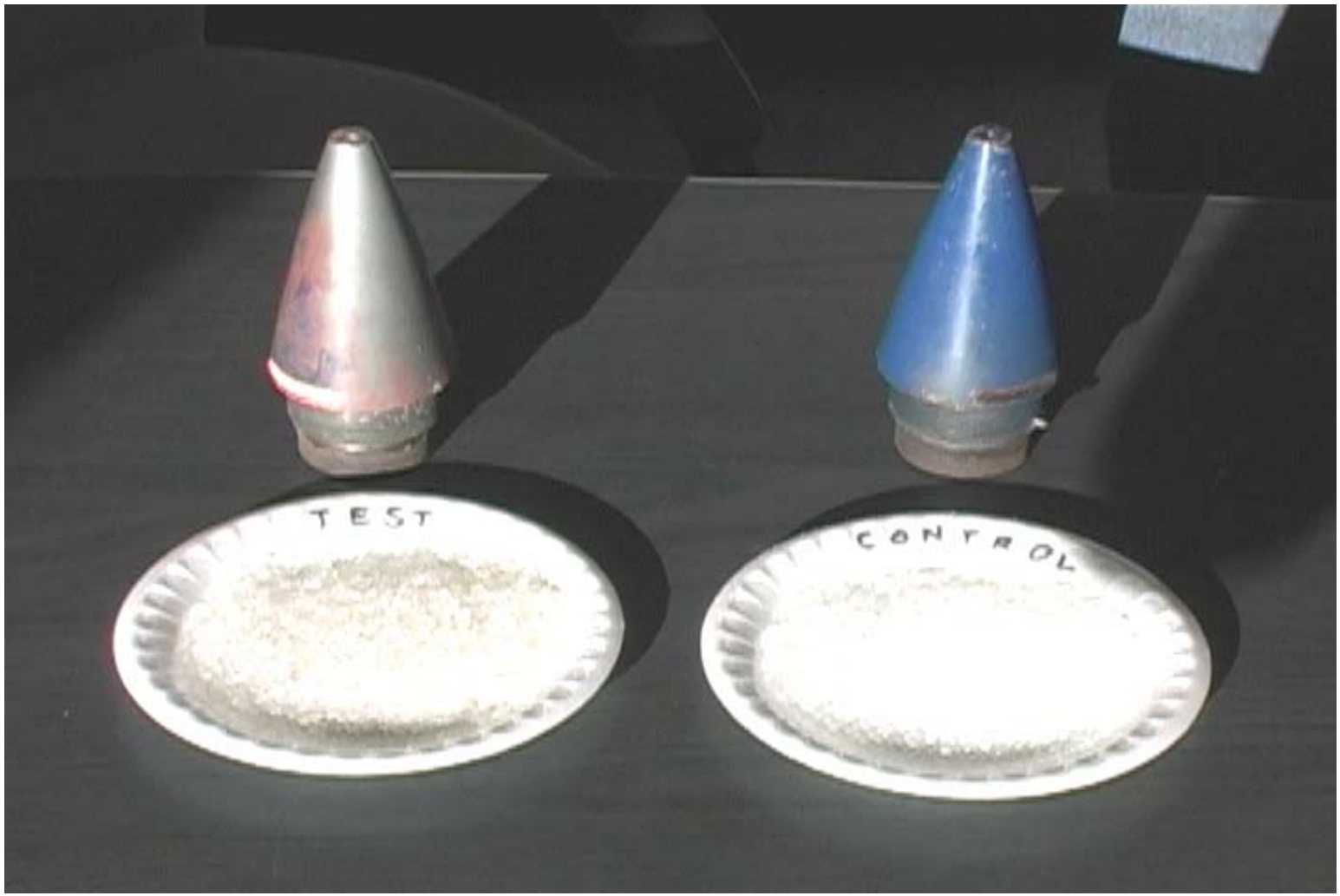
Fly-out Experiment



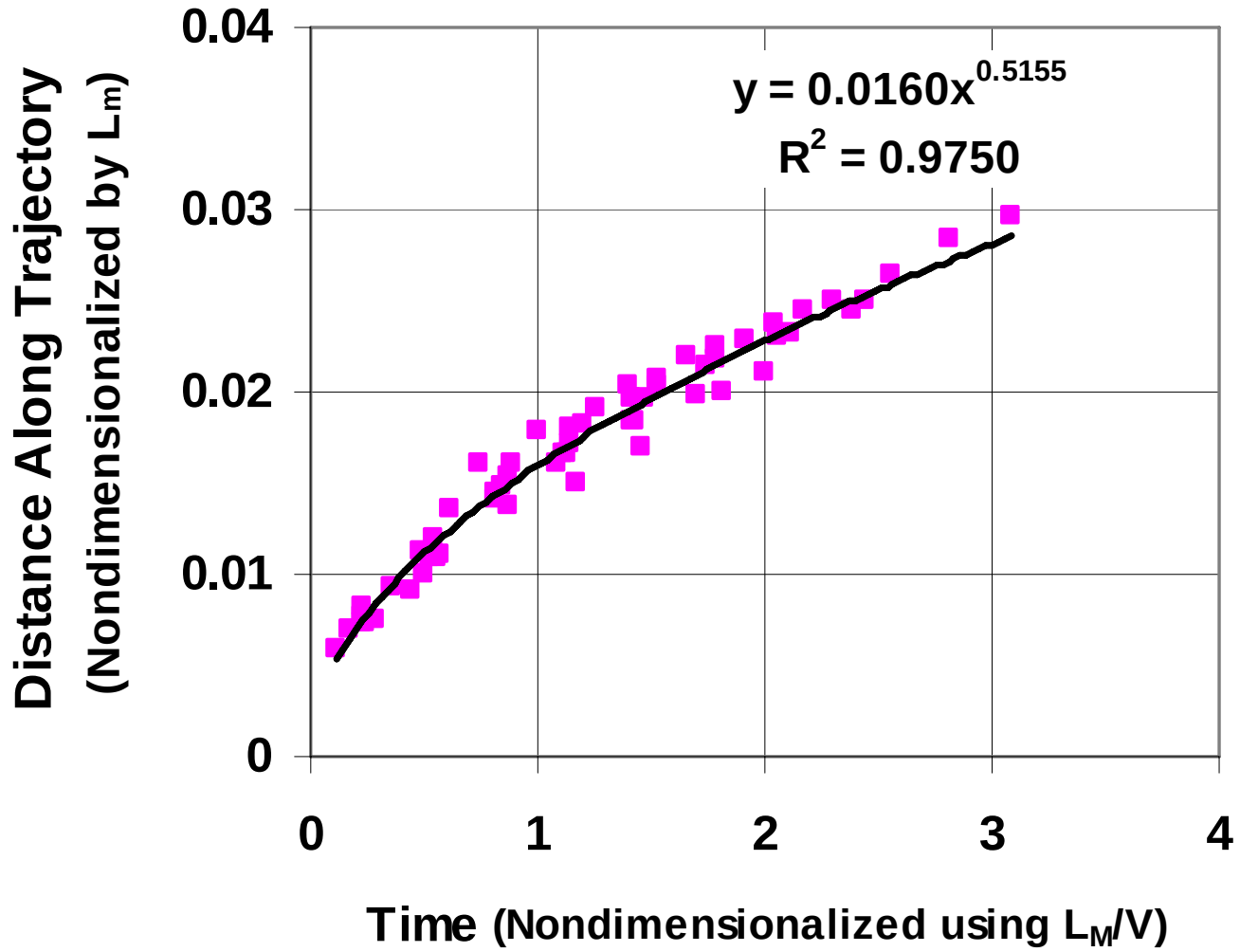
Flyout Movie Goes Here


Recovered Simulated
Army TACMS Missile

Fuze Plugs with Holes on Centerline and Dessicant to Detect Moisture Intrusion



Jet Tip Trajectory Data from 8 Tests with Three Launchers and Three Depths



Summary

- Water Piercing Missile Launchers have been analyzed with Computer Fluid Dynamics Methods
- Air-powered, Sub-scale, and Scale Models Representing Operational Missiles have been Built and Tested
- Empirical Models have been used to Correlate the Data and Develop a Predictive Model for Larger Systems
- The Water Piercing Missile Launcher Holds Promise as Payload Launcher for Submarines