

Naval EM Railgun Innovative Naval Prototype

Overview

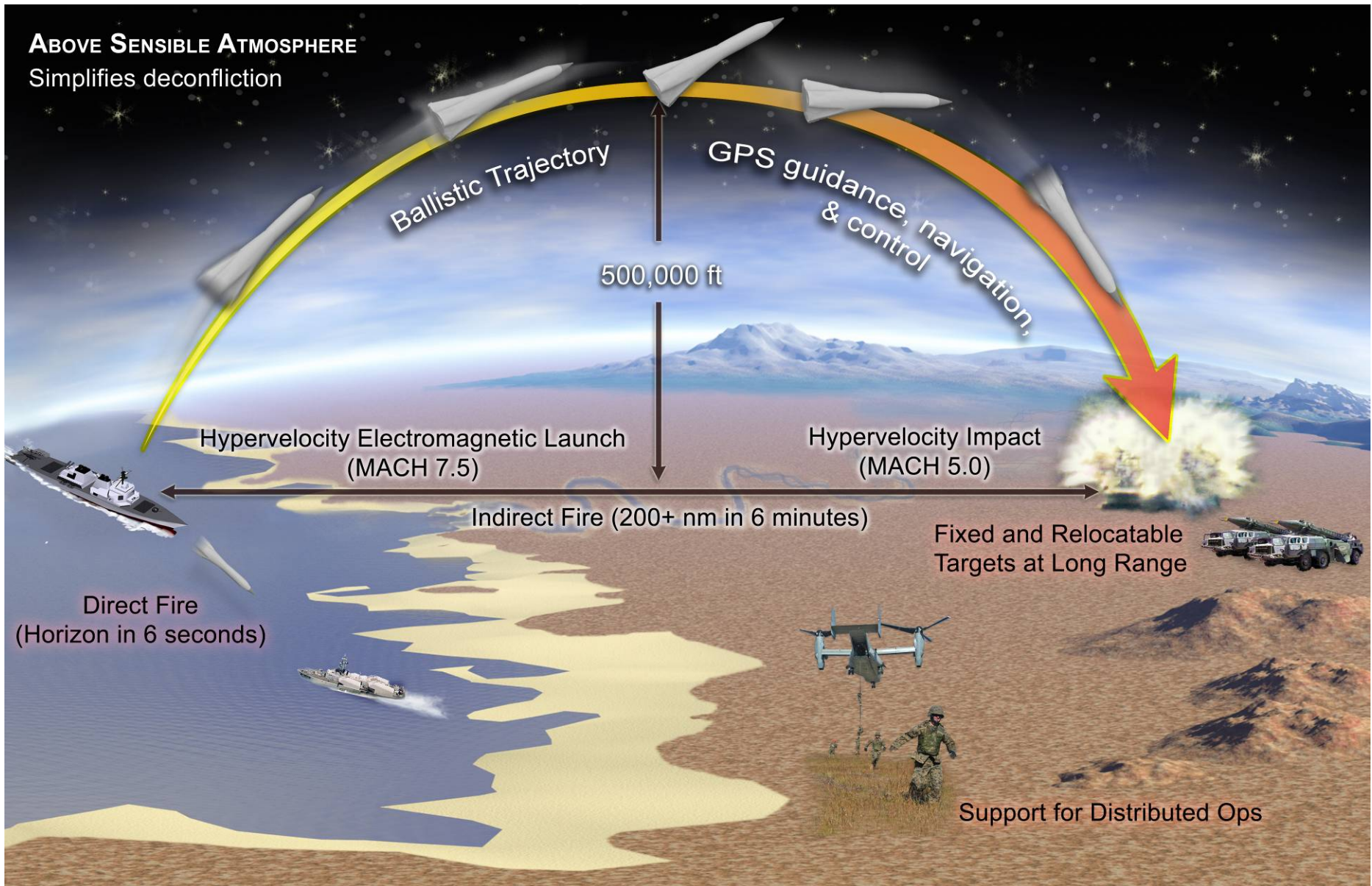
Precision Strike Armaments
Technology Fire Power Forum
June 2008



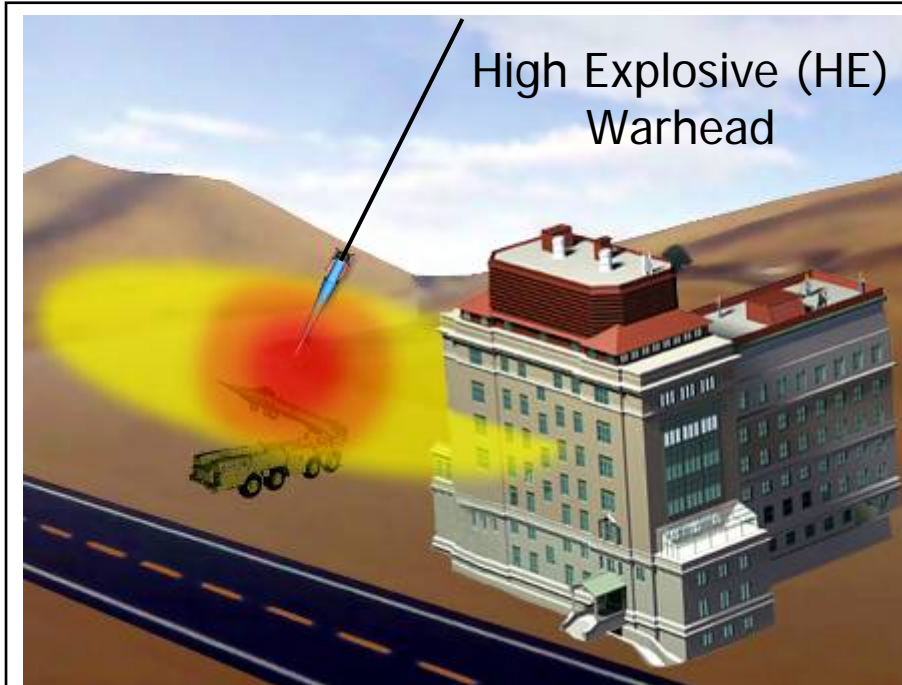
World Record Media Event



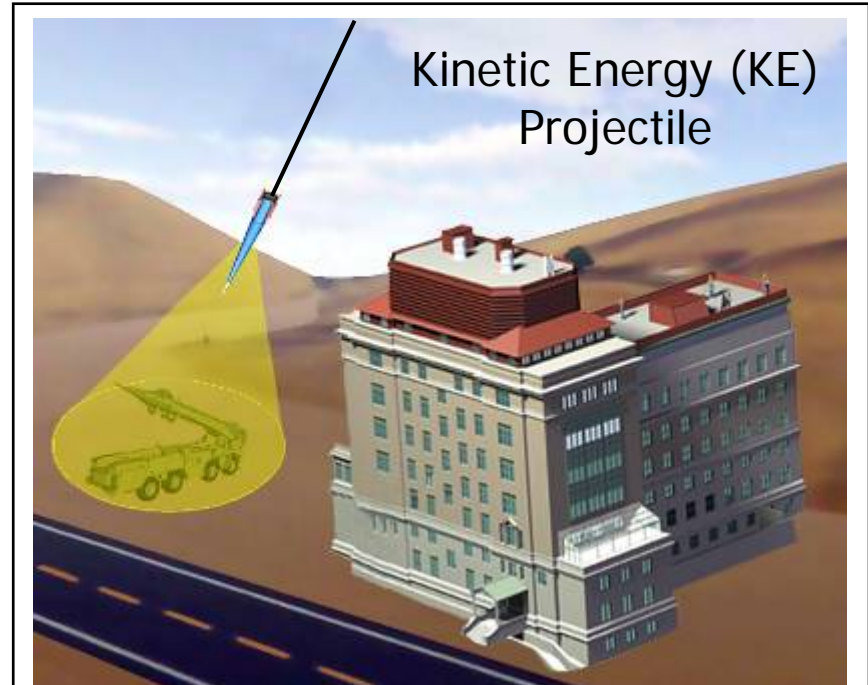
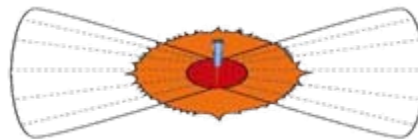
EM Railgun – Game Changing



HE versus KE Projectiles



- Blast Overpressure
- Large Area of Fragment Spray
- High Collateral Damage

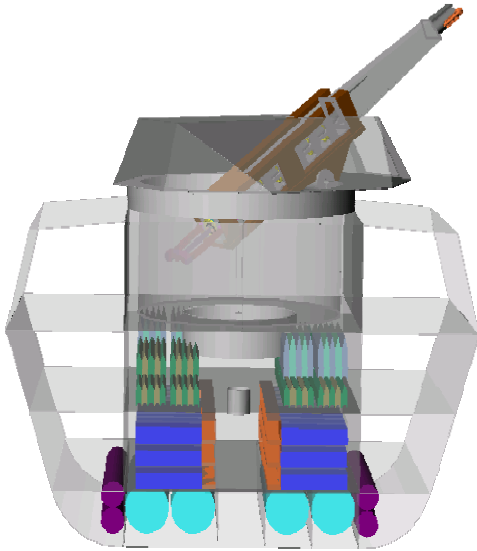


- No Blast Overpressure
- Focused Fragment Pattern
- Minimal Collateral Damage



UNCLASSIFIED

Navy Electromagnetic Railgun



Why is it important?

- Volume & Precision Fires
- Time Critical Strike
- All weather availability
- Variety of payload packages
- Scalable effects
- Deep Magazines
- Non explosive round/No gun propellant
 - Greatly simplified logistics
 - No IM (Insensitive Munitions) Issues
- Missile ranges at bullet prices

What is it?

- Gun fired with electricity rather than gunpowder
- Revolutionary 250 mile range in 6 minutes
- Mach 7 launch / Mach 5 hit
- Highly accurate, lethal GPS guided projectile
- Minimum collateral damage

Who needs it?

- Marines and Army troops on ground
- Special forces clandestine ops
- GWOT
- Suppress air defenses

When?

- Feasibility Demo 2011
- System Demo 2016
- Fielding Objective 2020-2025

Naval Railgun – Key Elements

Launcher



- Multi-shot barrel life
- Barrel construction to contain rail repulsive forces
- Scaling from 8MJ (state of the art) to 32MJ to 64MJ Muzzle Energy
- Thermal management techniques
- M&S – Represent interaction between bore and projectile

Projectile



- Dispensing and Unitary Rounds
- Gun launch survivability
 - 20-45 kGee acceleration
 - Thermal Risk Management
- Hypersonic guided flight for accuracy
- Lethality mechanics

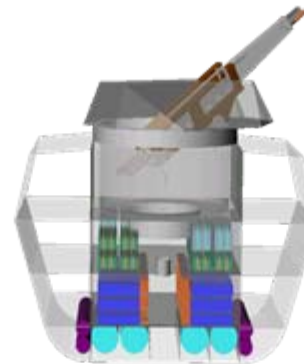
Pulse Forming Network (PFN)



Capacitors or Rotating Machines

- Energy Density
- Rep rate operation & thermal management
- Switching
- Torque management and multi-machine synchronization (rotating machine)

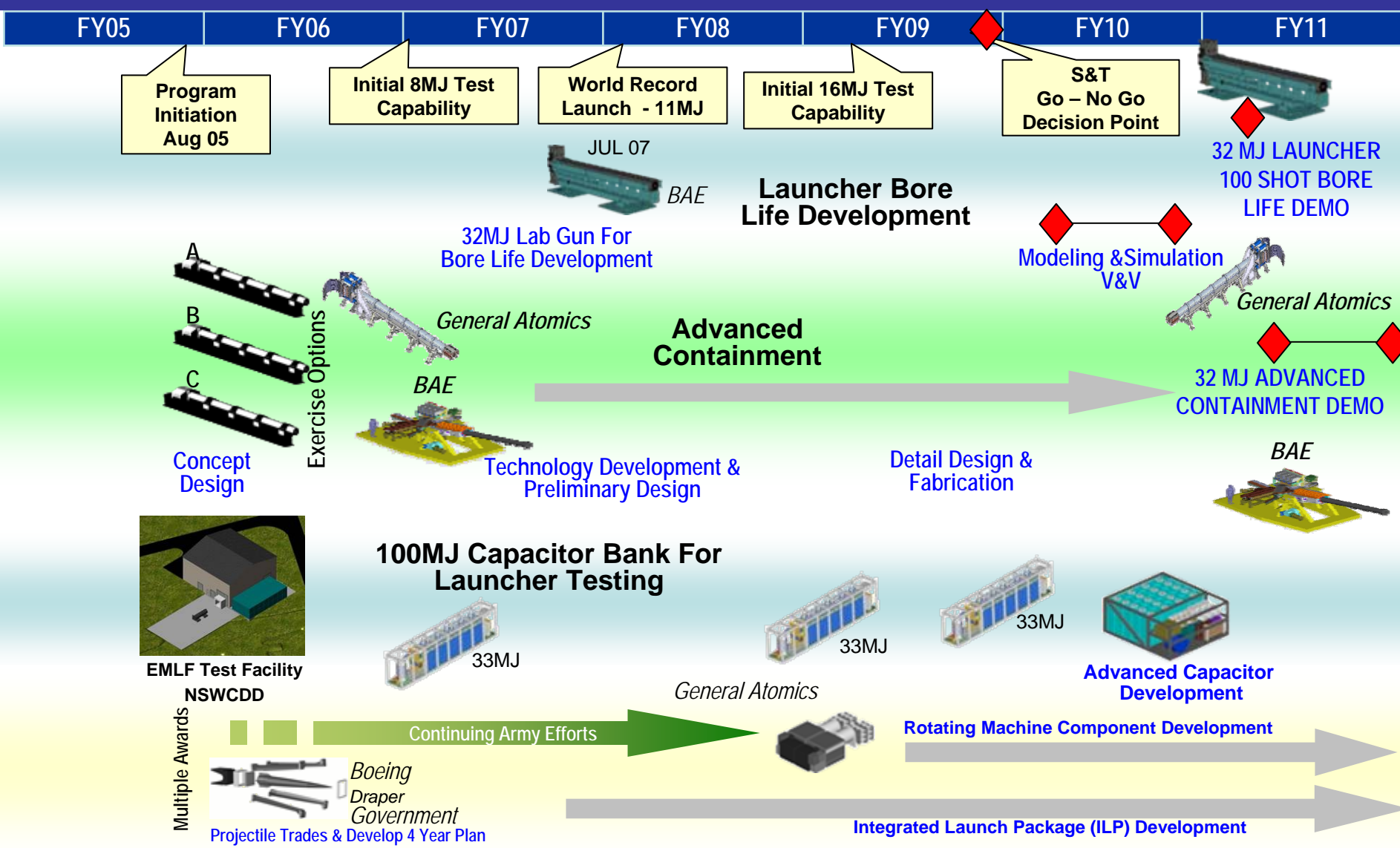
Ship Integration



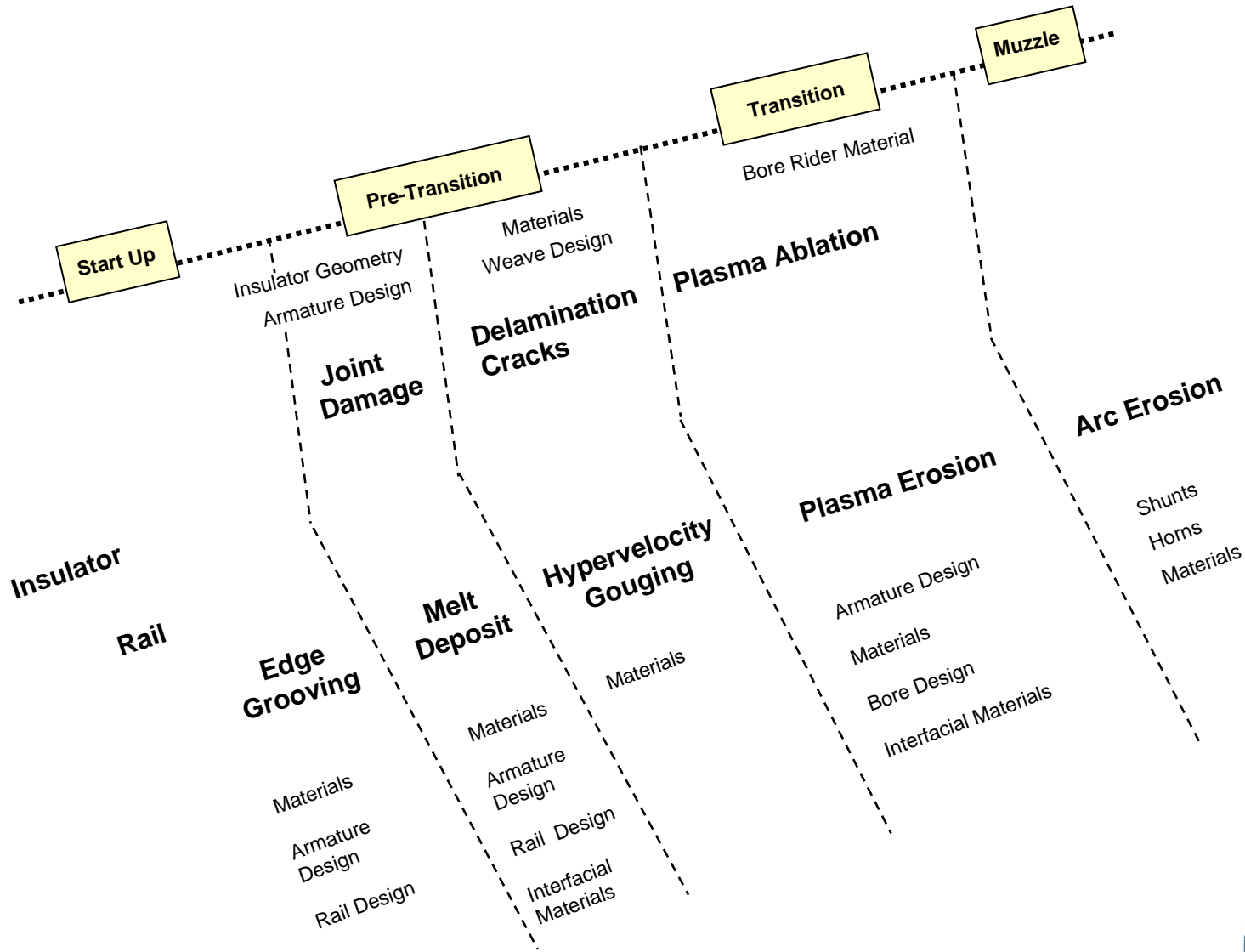
- Dynamic Power Sharing
- Space and Weight
- Thermal and EM Field Management

- Blue – INP Phase 1
- Gray – INP Phase 2

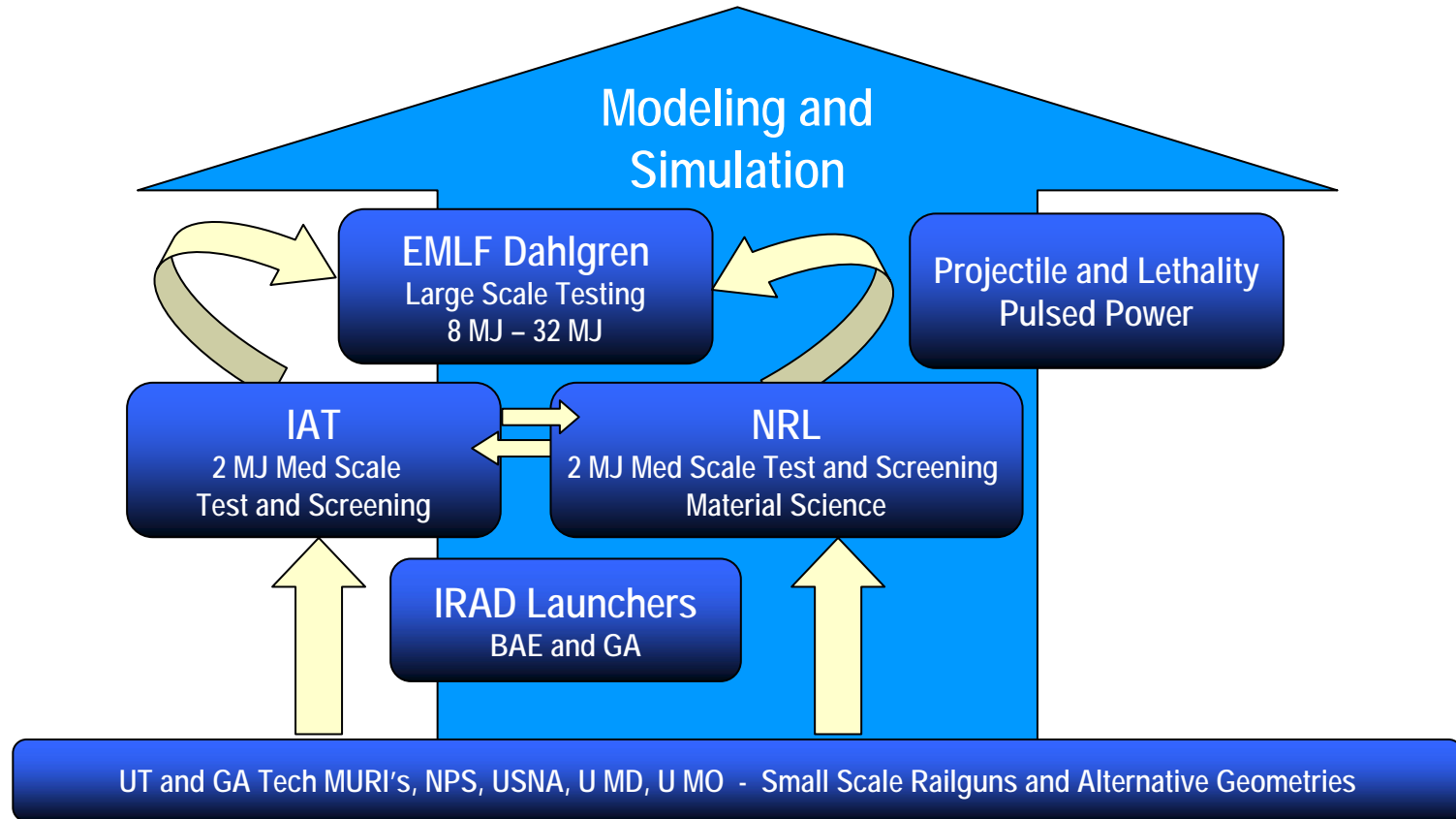
ONR INP Phase I Program



Bore Life Approach



Test and Analysis Concept



- T&E is a multi-tiered effort with basic research conducted at the smallest (quickest & least expensive) scale.
- Promising results are analyzed and promoted to the next appropriate scale for confirmation & maturation.
- Modeling and Simulation
 - Critical element for design
 - Updated after test & analysis results

Bore Life Electromagnetic Launch Facility (EMLF)



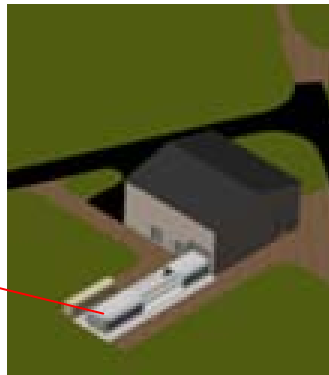
Pulsed Power



High Energy Lab Launcher



Terminal Back-Stop Construction

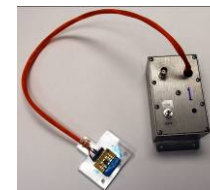
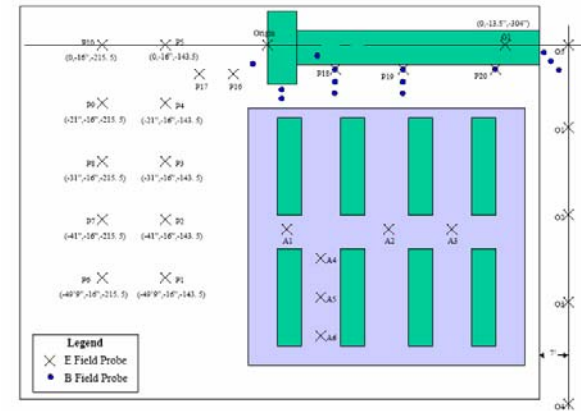


9.8 MJ Shot Fired

Environmental Considerations

- Electromagnetic Interference (EMI)
 - EMI fields at Dahlgren Facility being quantified
 - Field probes in facility
 - Standard computer models
 - Assessment of shipboard impact
 - Industry prototypes to be measured
- Particulates
 - Particulates emitted from launcher when fired
 - Safety procedure followed at labs
 - Particulates studied at Naval Research Laboratory
- Mitigation and safety strategies being developed as required per DoD instructions and Industry standards.

Field measurements inside the Electromagnetic Launch Facility

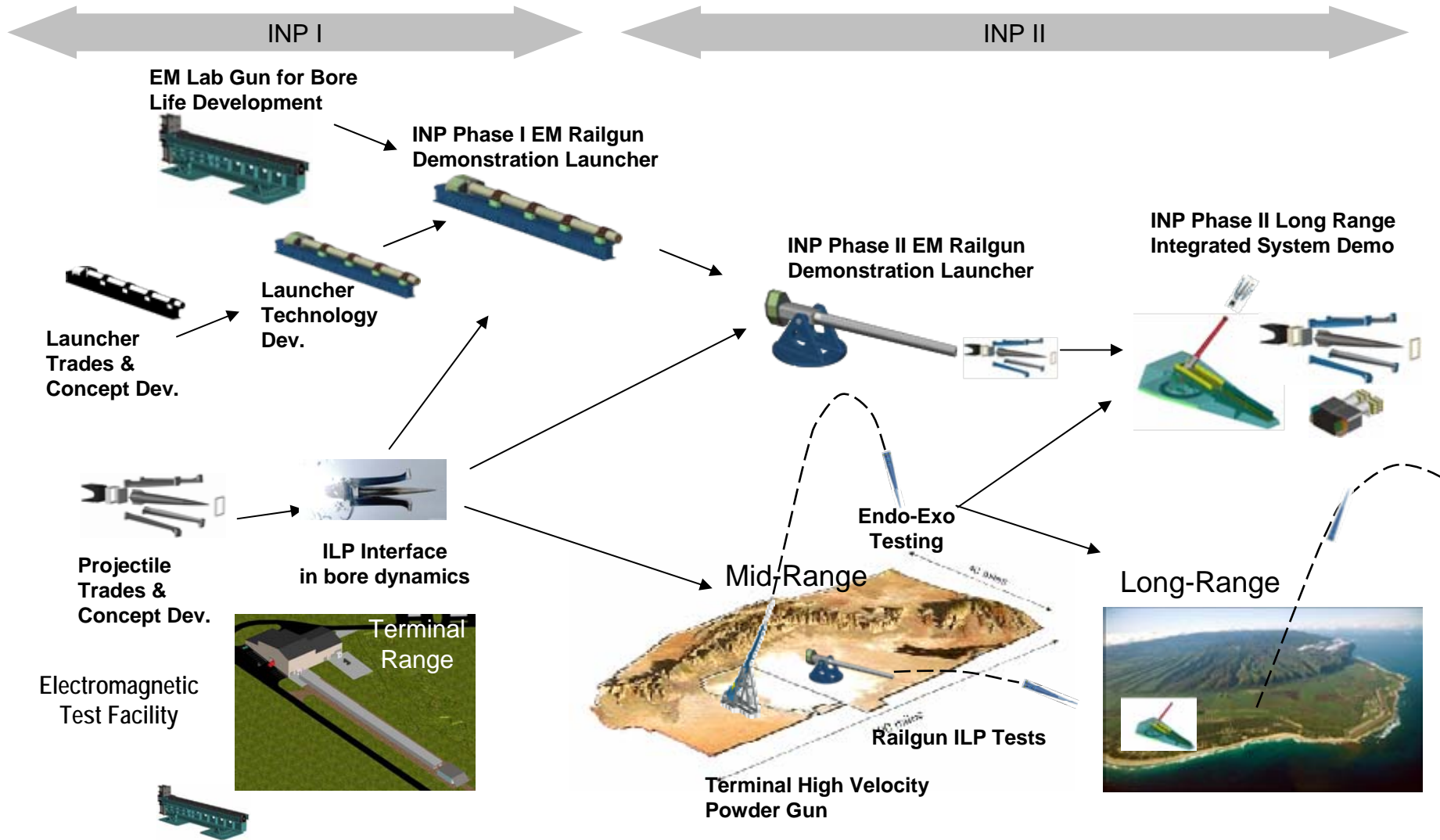


B Field Probe



E Field Probe

Path to Integrated System Demo



Army & Navy Collaboration



A strong collaboration continues to benefit both programs, increasing political stability, execution efficiency, and technical achievement.

- Naval EM Railgun is a “Navy after Next” Game Changer
- Navy & Army EM Railgun Collaboration
- Risk Mitigation
 - Establish Bore Life Consortium
 - Advanced Containment Launchers – Competitive solutions
 - Integrated Launch Package (ILP) and Projectile development
 - Understand Ship and Weapons System Requirements Integration

Challenges Understood and Being Addressed

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