



# Naval EM Railgun Innovative Naval Prototype

3 August 2006



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# Report Documentation Page

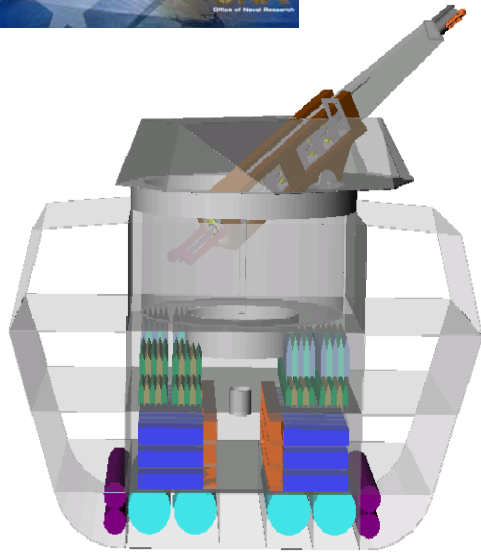
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# Navy Electromagnetic Railgun



## Why is it important?

- Volume & Precision Fires
- Time Critical Strike
- All weather availability
- Variety of payload packages
- Scalable effects
- Deep Magazines
  - 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?

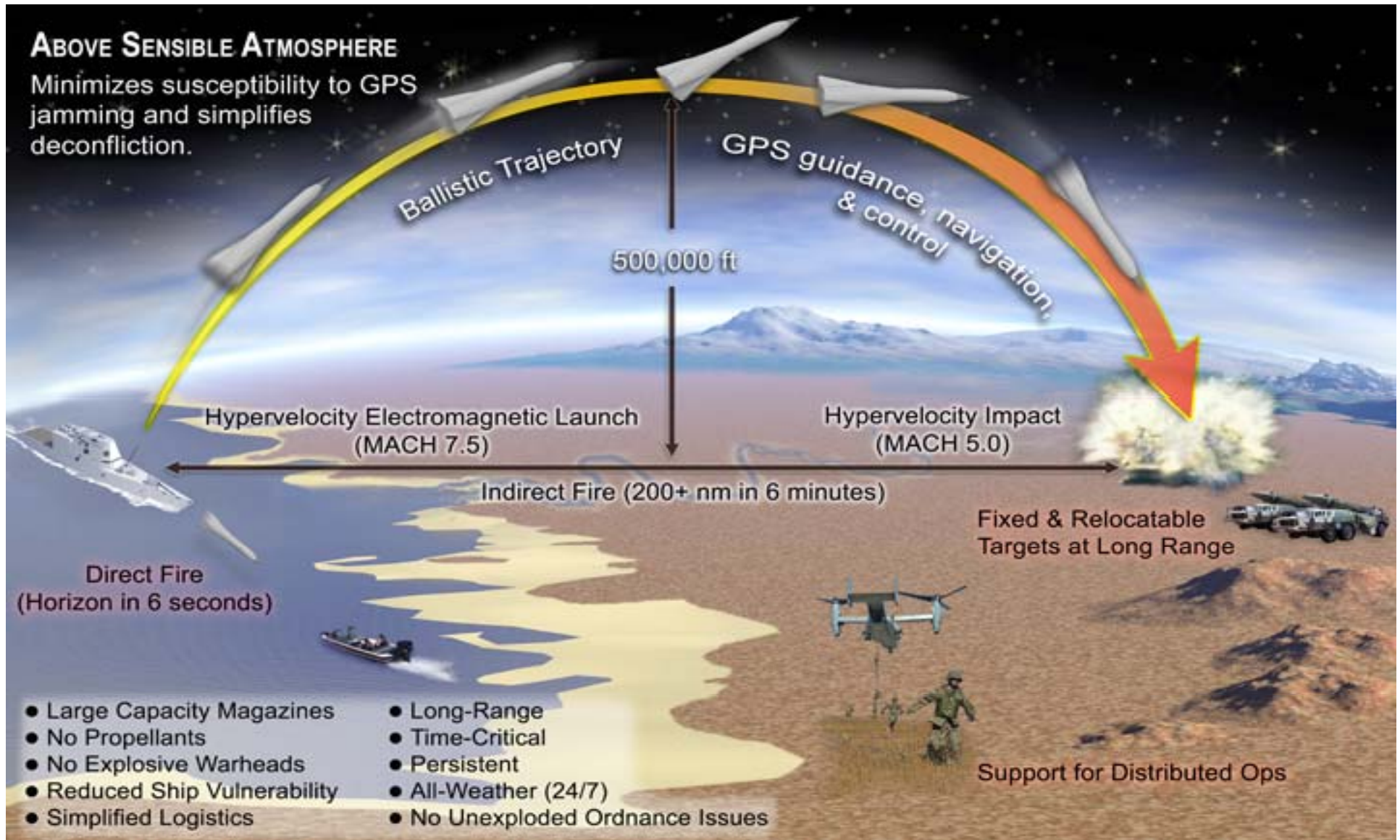
- Marines and Army troops on ground
- Special forces clandestine ops
- GWOT
- Suppress air defenses

## When?

- Initial 32MJ Test Capability 2008
- Feasibility Demo 2011
- System Demo 2015
- IOC 2020-2025



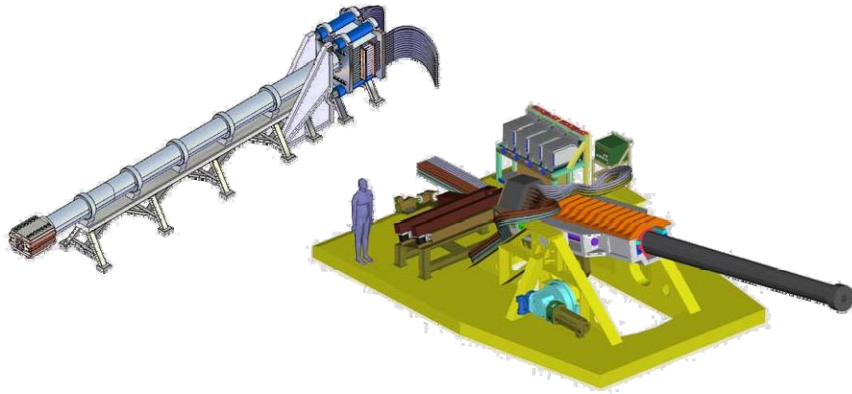
# EM Railgun – Game Changing



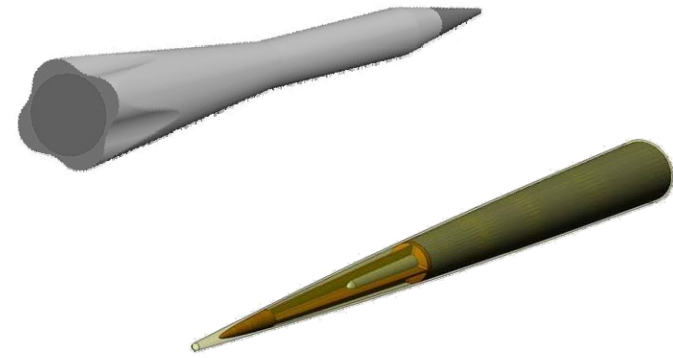


# Naval Railgun – Key Elements

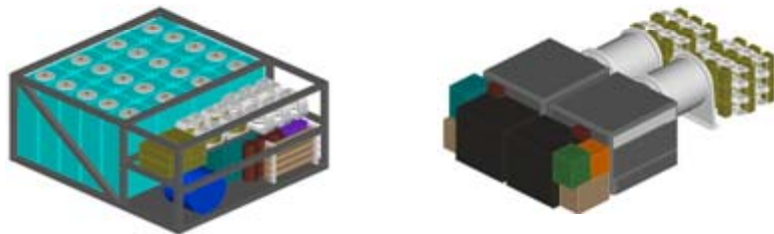
## Launcher



## Projectile

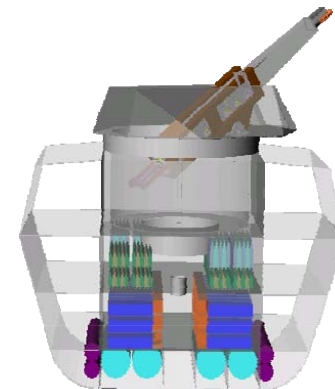


## Pulse Forming Network (PFN)



Capacitors or Rotating Machines

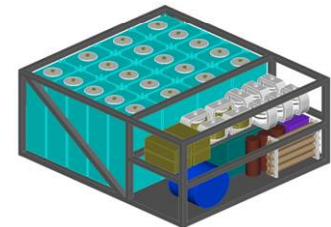
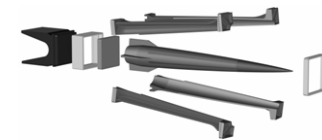
## Ship Integration





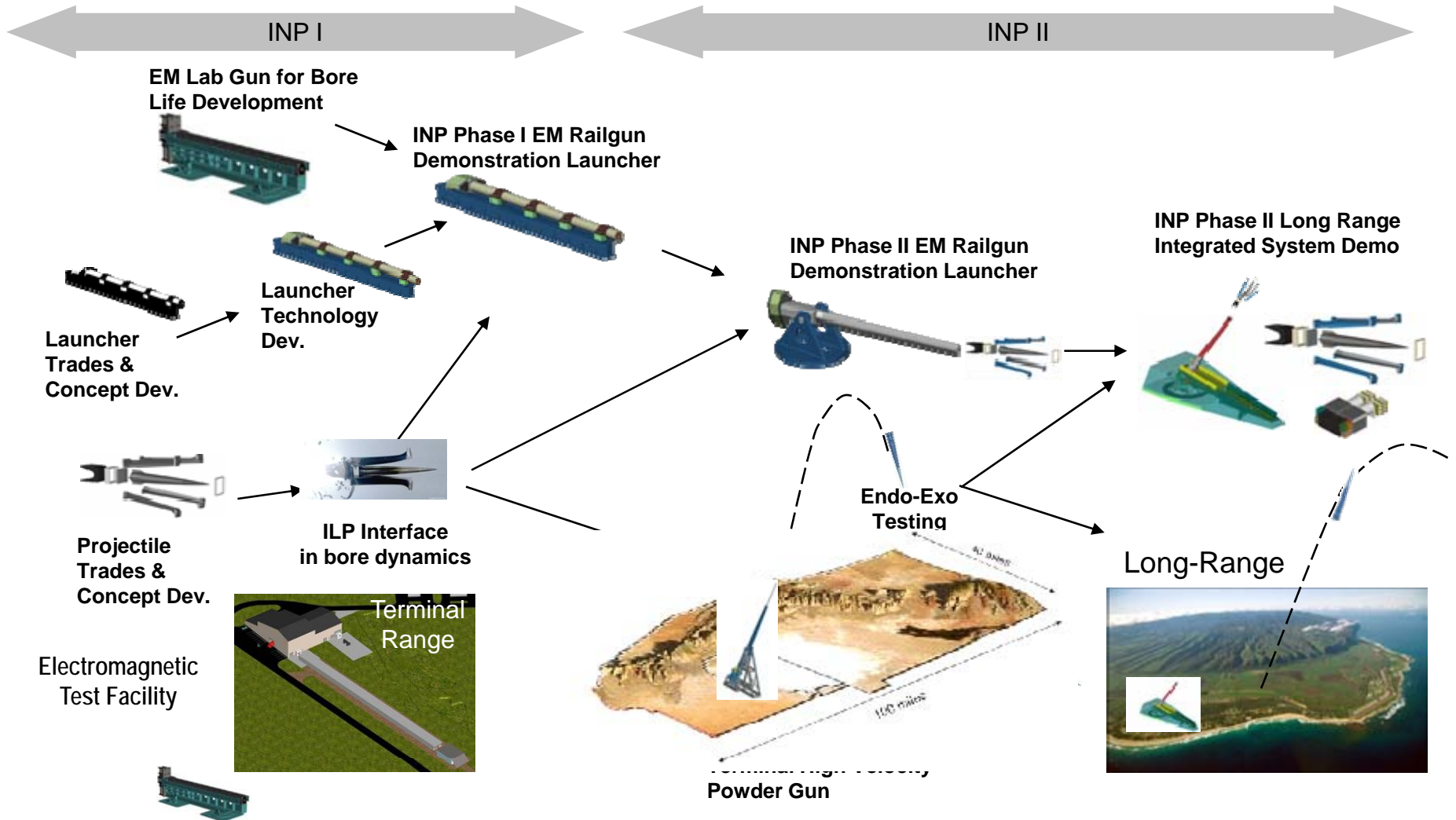
# S&T Technology Challenges

- Launcher
  - Multi-shot barrel life
  - Barrel construction to contain rail repulsive forces
  - Scaling from 8MJ (state of the art) to 32MJ → 64MJ Muzzle Energy
  - Thermal management techniques
- Projectile
  - Gun launch survivability (45 kGee acceleration, Electromagnetic Interference Potential)
  - Hypersonic guided flight for accuracy
  - Lethality mechanics
- Pulsed Power System
  - Energy Density
  - Rep rate operation & thermal management
  - Switching
  - Torque management and multi-machine synchronization (rotating machine)





# Path to Integrated System Demo





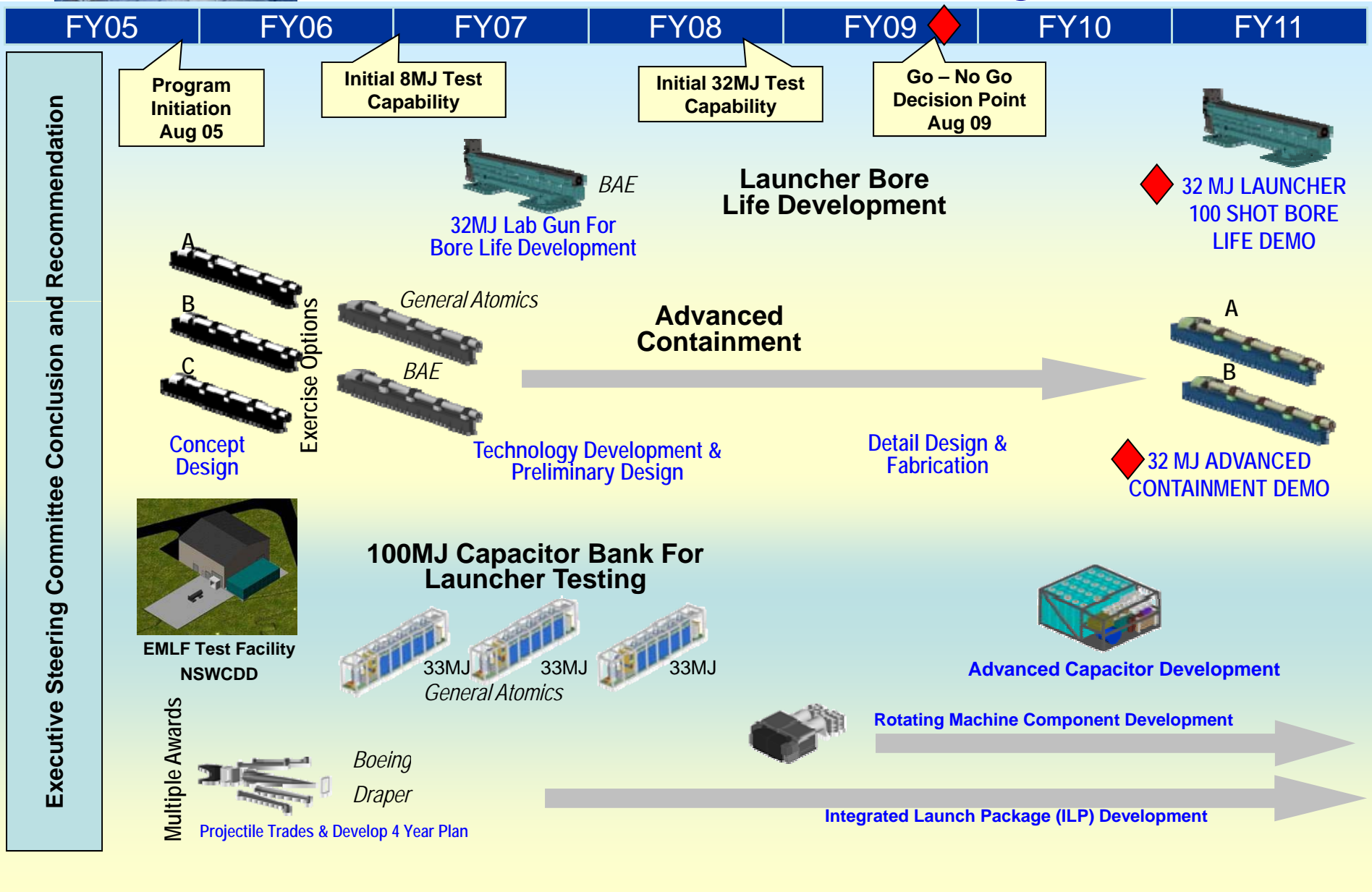
## ONR INP Phase 1 Objectives

- **Traceability** to 64MJ, 6-10 round / min indirect fire weapon system
- **Bore Life**
  - 32 Mega-Joule (Muzzle Energy) EM Lab Launcher
  - 10kg launch package; full muzzle velocity of 2.5km/sec
  - 20kg launch package with full current of ~5.5MA
  - Demonstrate more than 100 shot bore life
- **Containment**
  - 32 Mega-Joule Advanced Containment Launcher
  - 10kg launch package; full muzzle velocity of 2.5km/sec
  - 20kg launch package with full current of ~5.5MA
  - 1000+ round predicted containment structural barrel life
  - Design for thermal management at a rate of 6 round / min
  - Design launcher for minimal round dispersion
  - Transportable on pallets and/or in sea containers,
  - Consider marine environment



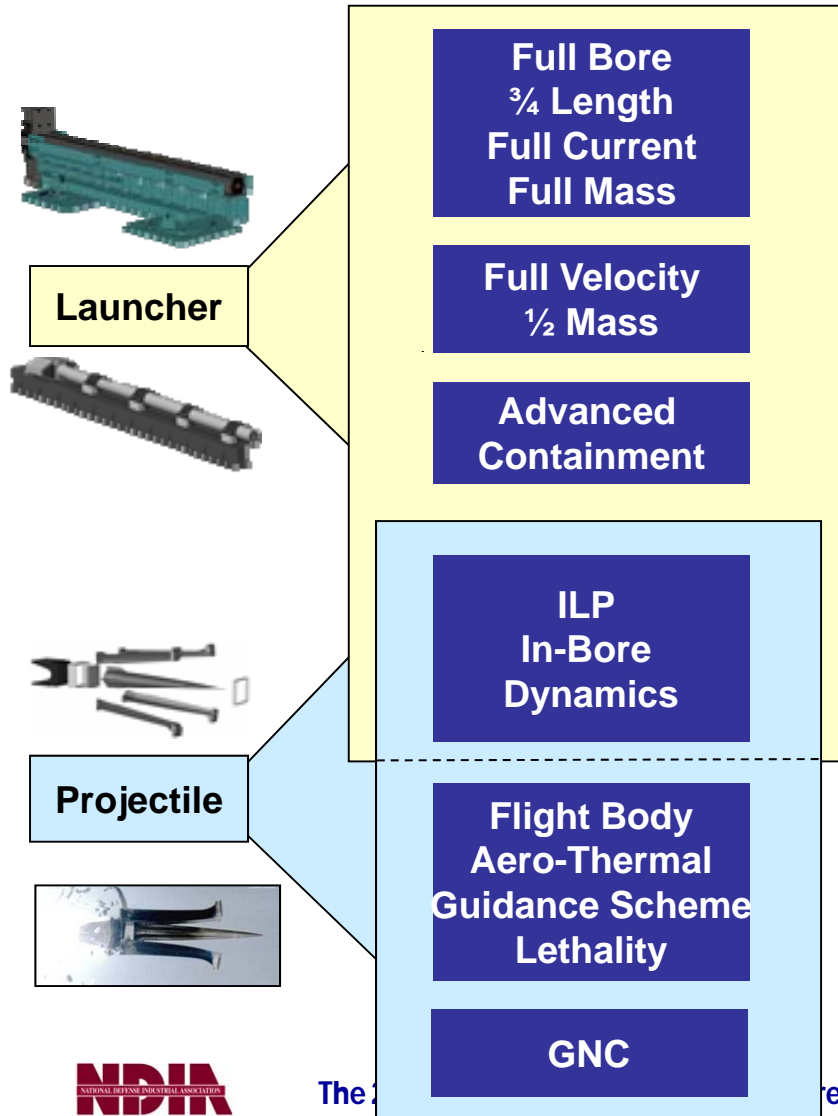


# ONR INP Phase I Program





# Launcher and Projectile Thrusts



- Launcher Technology
  - Bore materials and geometry
  - Advanced containment techniques
- Develop Integrated Launch (ILP)
  - Armature
  - Sabot, bore riders
  - Nominal projectile shape
- Critical Focus Areas
  - Launch survivability
  - Hi-Gee GNC
- Leverage Other Programs
  - Conventional Guided Munitions
  - Re-entry Flight Body Vehicles



## Summary

- Naval EM Railgun is a “Navy after Next” Game Changer
- Navy EM Railgun INP Program is Established
- 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*



## Railgun INP Contact Information

**We need your help in moving this innovative effort forward. Ideas/comments/etc. should be sent to:**

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