

Compact Vertical Gun System (CVGS) for **Submarines and Surface Ships**

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*Mr. Theophil A. Kuriata, Director, Large Caliber Armament Systems
Dr. Martin T. Soifer, Principal Engineer, Advanced Concept Formulation*

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Agenda

- Why a CVGS?
- Objective and Payoffs
- Concept of Operations
- Key Features
- Armament and Ammunition Magazine Subsystems
- Development Plan
- Summary

Mission Need

- Naval Surface Fire Support (NSFS) Doctrine *today* dictates:
 - Voluminous
 - Timely
 - Accurate
 - Deep
 - Highly Survivable

Fires for Amphibious Forces Ashore

- Submarine Fleet seeks New Missions in Post-Cold War World

Alternative Solutions

- **Material Solution Required**
- **New Start Advanced Gun System (AGS)**
...meets the need but takes time to introduce
- **Missiles and Rockets** such as Tomahawk, LASM, and NTACMS ...can do the job but are costly against area targets
- **PIP using Gun Technology** ...available and cost-effective solution for point and area targets

CVGS Objective and Payoffs

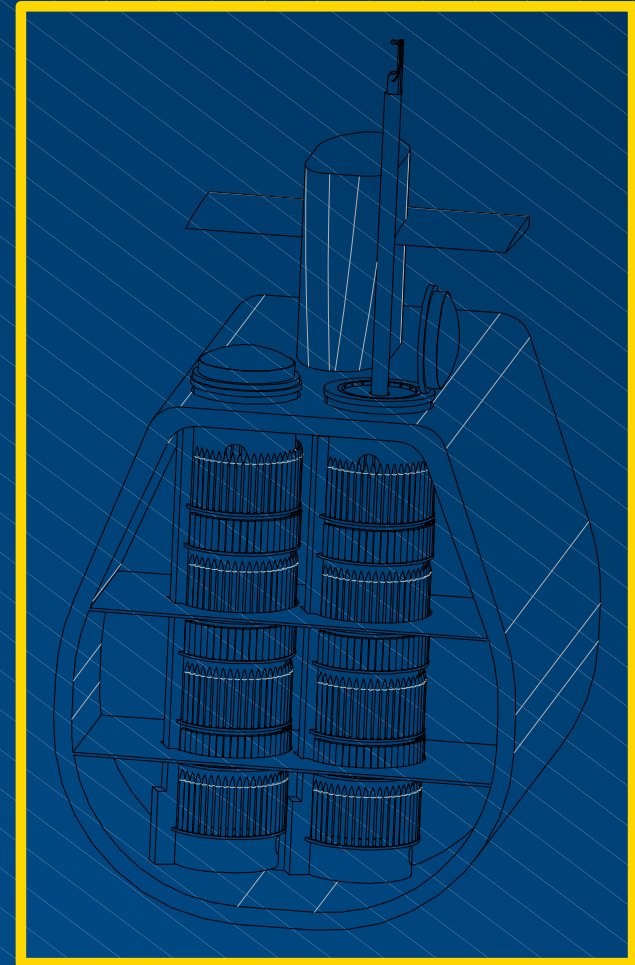
- **Objective:** Develop a fully-automated, high rate-of-fire Gun System for Application on Existing and Future Small Ships and Submarines
- **Payoffs**
 - New Role for Existing Ships and Boats
 - Timely, Accurate, Voluminous Fires from a Stealth Platform
 - Firepower Equivalency of 24-Gun, 155mm M198 Howitzer Battalion

CVGS Concept of Operation

- Submerged Submarine in littoral waters receives target list / call-for-fire
- Goes to Periscope Depth or Surfaces ...delivers guided munitions at 10 rounds per minute within 30 seconds of receipt of call-for-fire
- Submerges and remains on station for next call-for-fire or rendezvous with supply ship to replenish at sea

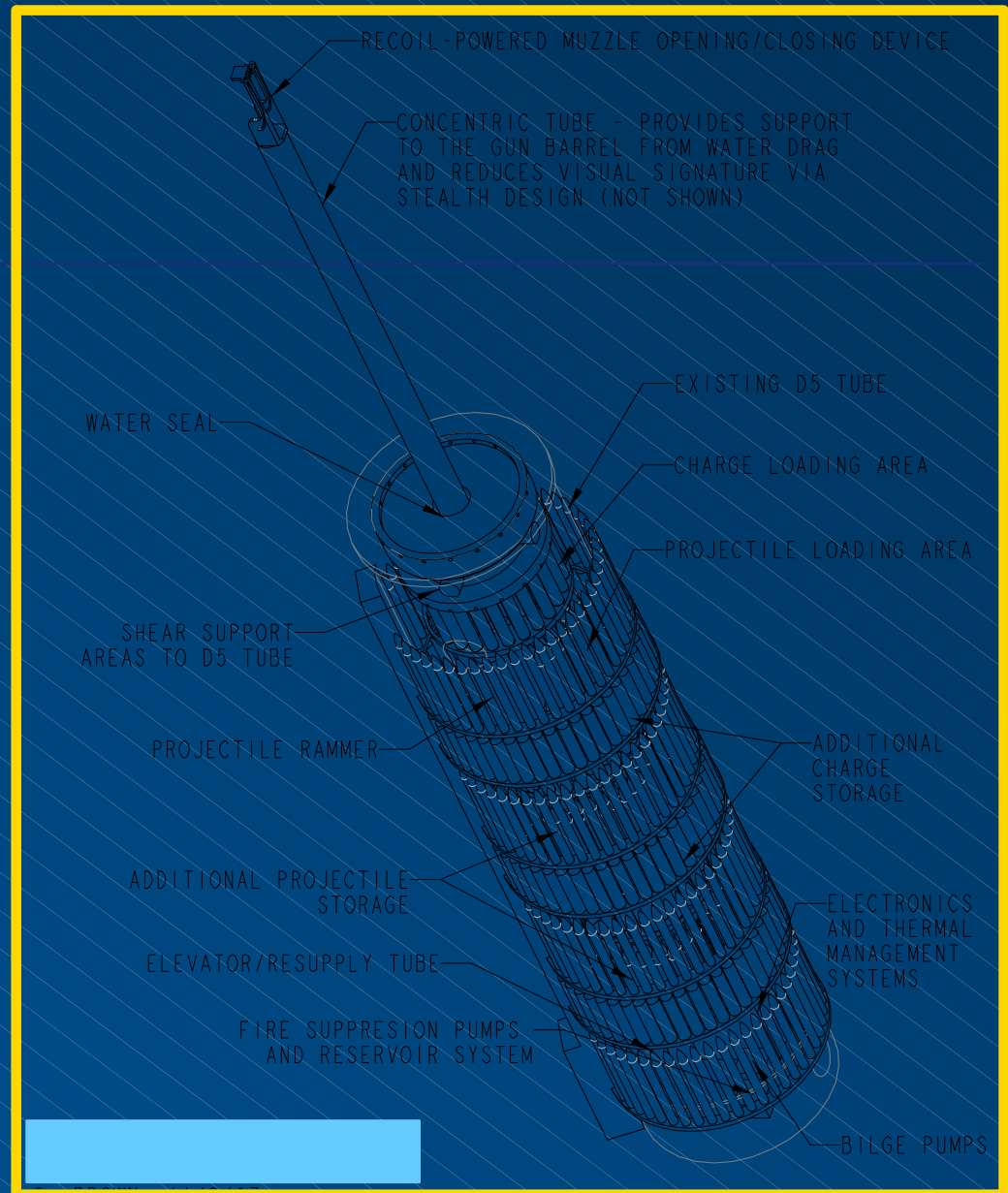
CVGS Major Subsystems

- Armament
- Ammunition Magazine
- C4ISR
- Module Structure
- Auxiliary Equipment (Platform Specific)
- Guided Munitions and Conventional Propelling Charges



CVGS Features

- 5-inch Armament
- 200 # projectile / 45 # propelling charge
- 303 projectile / 231 propelling charges
- 130,000 # System Weight
- Fully-Automated Design
- Fires Guided Munitions
- Fires while Submerged
- Strikedown at Sea
- Bolt-in, Bolt-out System (D-5 Missile Tube or SSES "A" or "B" Module)
- Adaptable to Other Calibers



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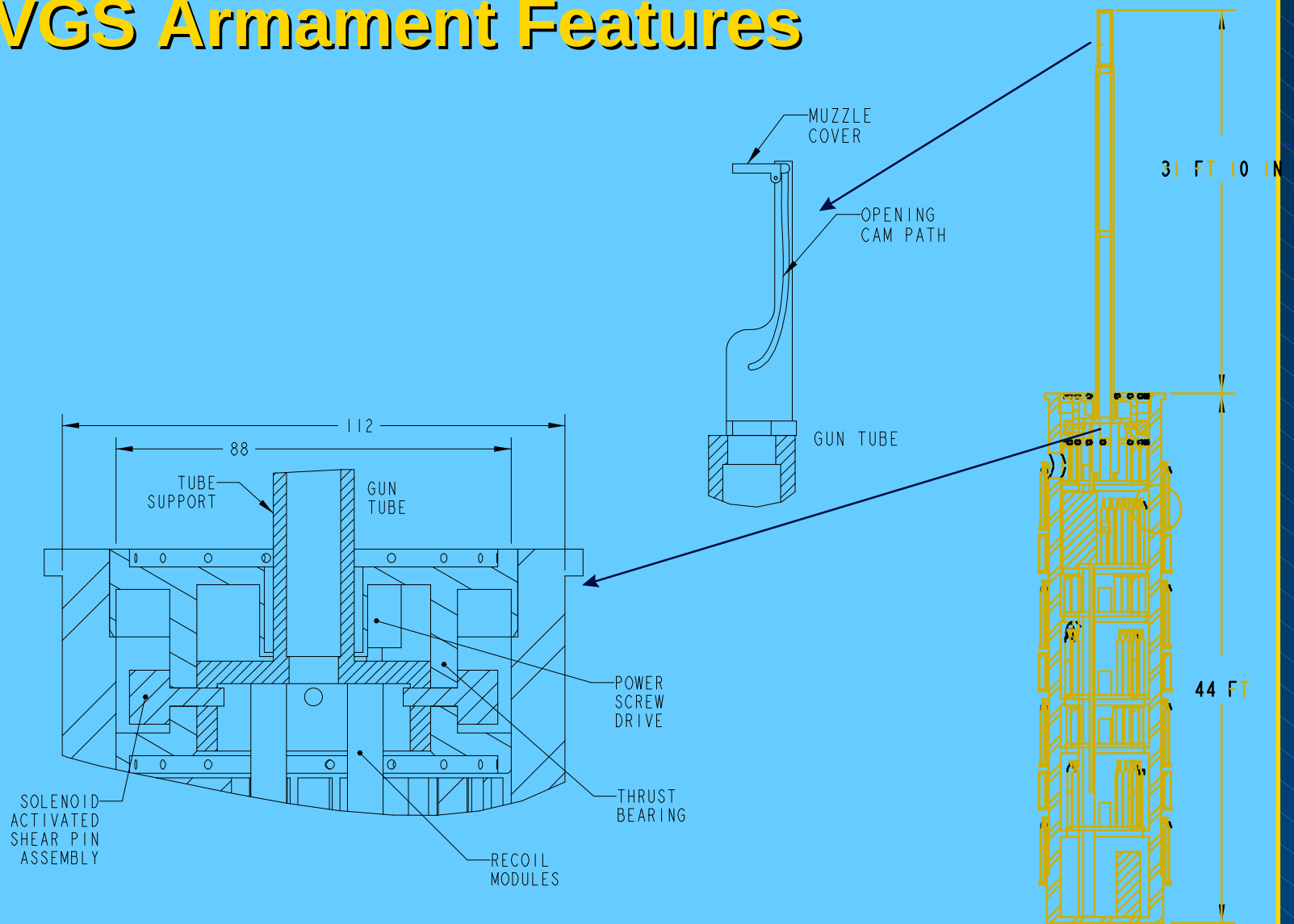
CVGS Armament Subsystem

- 98-caliber, two-piece, smoothbore, plated Tube (89-caliber projectile travel)
- Interrupted Thread Breech ...simultaneous loading of projectile and propelling charge
- Conventional, concentric recoil system
- Active cooling system for tube and recoil
- Laser ignition system
- Forced air Scavenger System
- Muzzle Closing System

CVGS Armament Attributes

Attribute	130 # Projectile	200 # Projectile
Max Chamber Pressure	55 Ksi	55 Ksi
Muzzle Velocity	3060 fps	2425 fps
Muzzle Energy	25 MJ	25 MJ
Max Projectile Loading	7000 g's	4800 g's
Recoil Stroke	42 inches	42 inches
Max Recoil Loading	270,000 lbs	300,000 lbs
Gun Impulse	19,900 lb-sec	22,614 lb-sec
Drag Induced Tube Bending	0.2 inch	0.2 inch
Heat Load per Shot	4780 BTUs	5000 BTUs

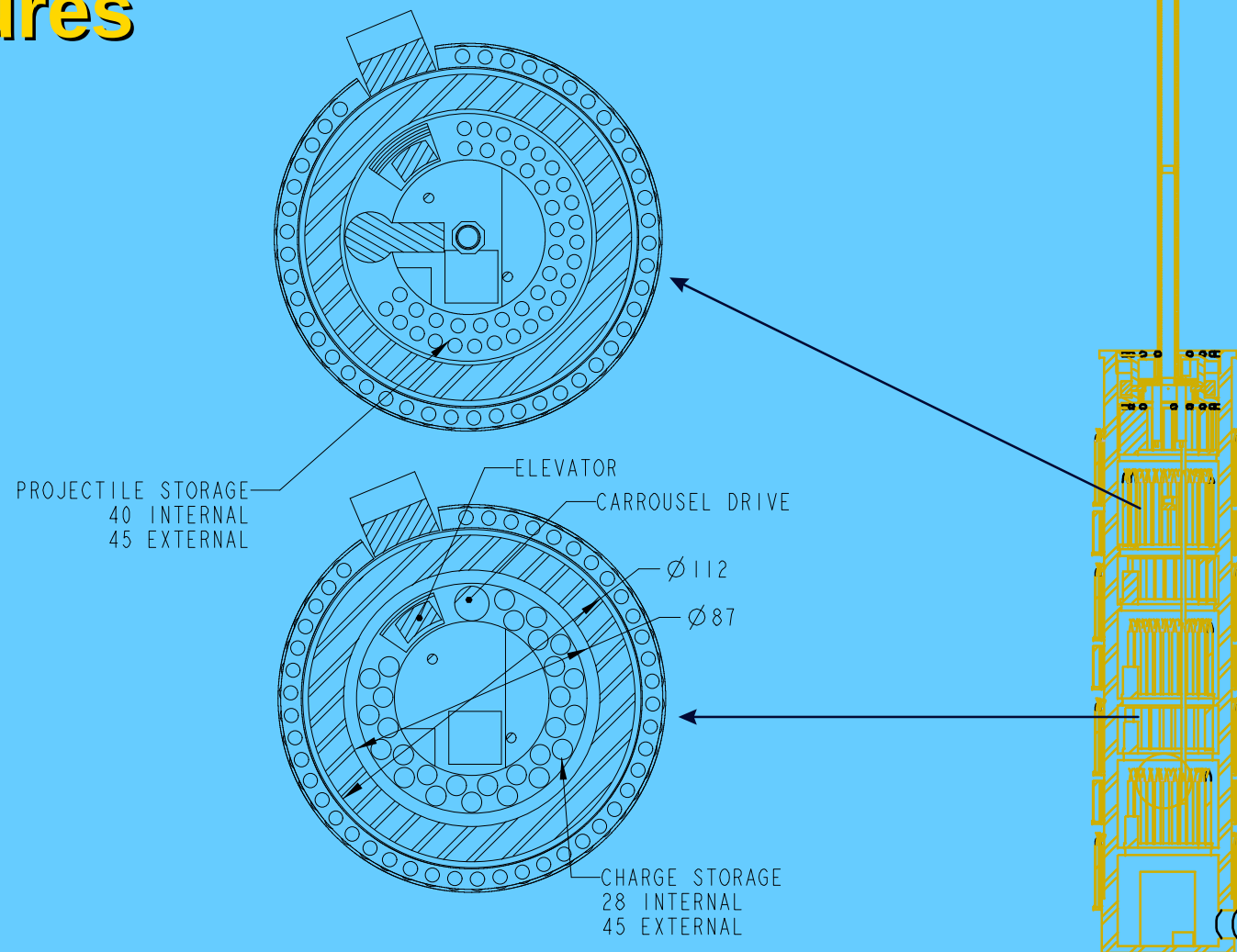
CVGS Armament Features



CVGS Ammunition Handling System

- Carousel-based Storage System
- Separate, tiered storage of projectiles and propelling charges
- Supports 10 rounds per minute rate-of-fire
- Optional External Storage Racks to Increase Ammunition carrying capacity
- Elevator provided to transfer ammunition from bottom racks to ready-storage rack
- Automated ammunition strikedown at Sea

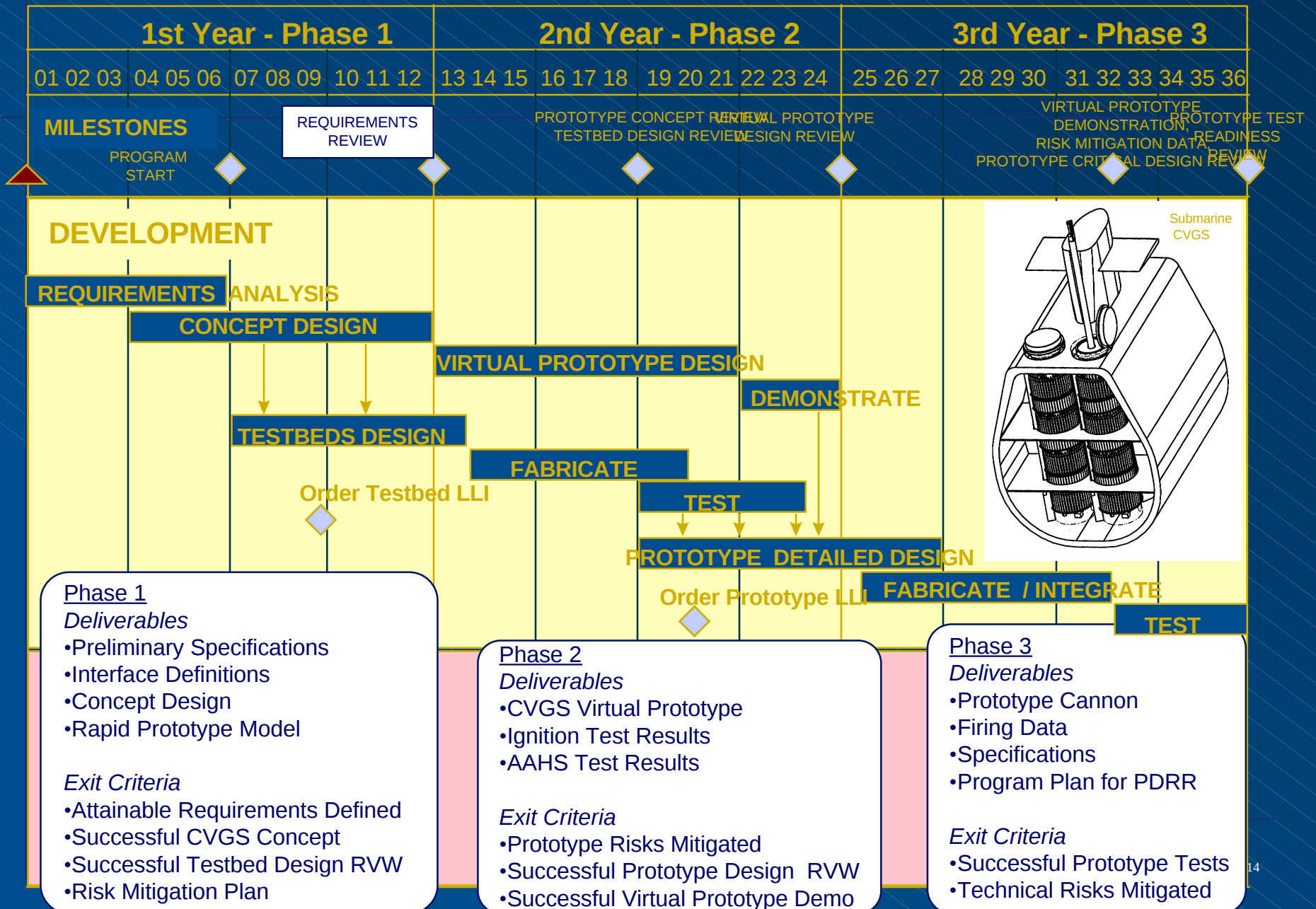
CVGS Aummunition Magazine Features



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Development Plan



Summary

- Proposed CVGS provides:
 - Stealth
 - Low-cost
 - Accurate, Voluminous, and Timely
- NSFS for Amphibious Forces
- Provides New Role for Small Surface Ships and Submarines in Early-Entry Operations
- Infuses Existing Technology ...lowest risk
- Adaptable to Other Calibers