

Unmanned Air
Vehicles
for
NDIA

Hugh Montgomery, Tech Dir
www.mcwl.quantico.usmc.mil





Outline



- MCWL and USMC S&T Overview
- Significant Naval UAV Programs/Recent History
- USMC Roadmap
 - 3 Tier Approach
- Dragon Eye
- Dragon Warrior
- The Next Generation



Commandant's Guidance



- A process for rapid military innovation while meeting current commitments
- A means for insertion of science & technology to enable the warfighter
- Operating Forces are our focus of effort
- Need intermediate initiatives within the framework of existing technologies to remain relevant



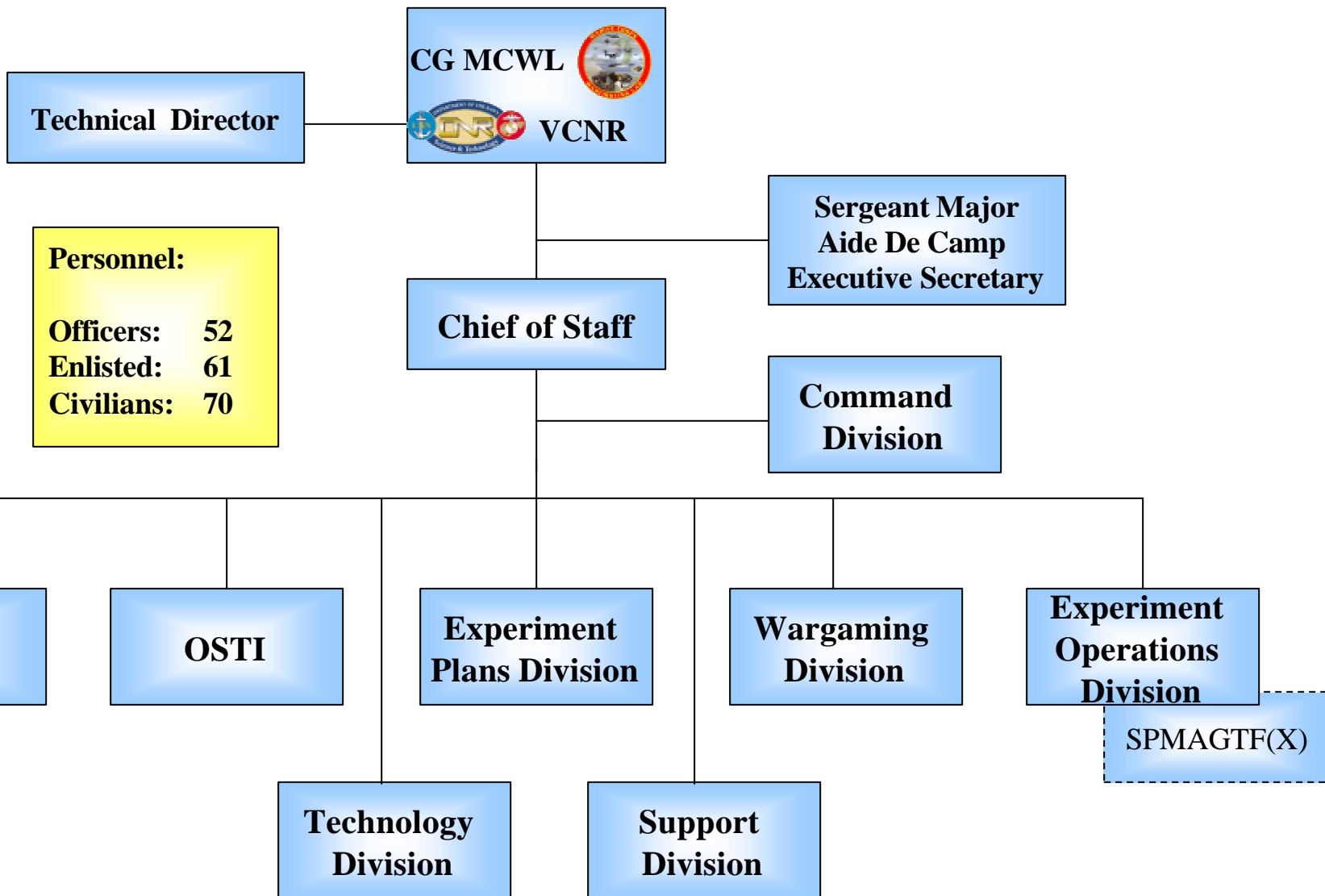
MCWL Purpose



- To improve Naval expeditionary warfighting capabilities *across the spectrum of conflict for current and future operating forces*, MCWL:
 - Supports Advocates, Warfighting Development and Integration Division, Training & Education Command, Systems Command, MARFORLANT and Joint Concept Development and Experimentation
 - Conducts wargames and experimentation to evaluate new tactics, techniques, procedures, and technologies
 - Forwards results of experimentation to Combat Development System with recommendations for action



MCWL Organization





Navy / Marine Corps Innovation Tradition



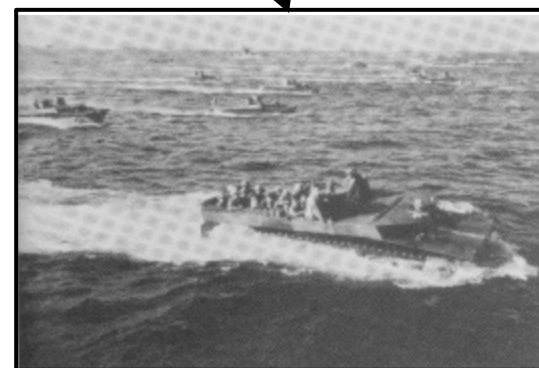
Early Concept



Fleet Experiment



Wargaming



Warfare Capabilities



Experimentation Philosophy



- Innovation more than technology; must consider tactics, organization and training.
- Small, focused experiments.
- Wargame before physical experimentation.
- Combine analytical rigor and operational assessment.



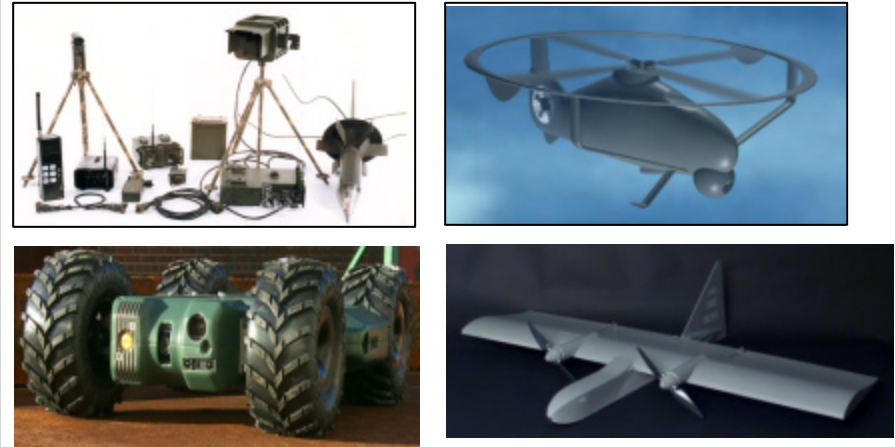
MCWL Core Competencies



Experimentation



Technology Development



Wargaming

The Wargaming Program is a comprehensive and innovative effort focused on advanced policy, concept, and operational exploration at several levels.



Emerging Threats & Opportunities



Identify emerging threats, explore concepts, and determine capabilities and solutions to meet future challenges



Transformation



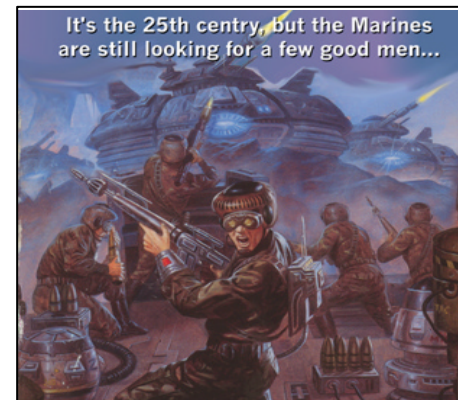
The Three Worlds of Innovation and Transformation



Solving Immediate Problems



The Next Service



The Service After Next

Marine Corps Experimentation and S&T supports Naval Transformation Roadmap



Science and Technology

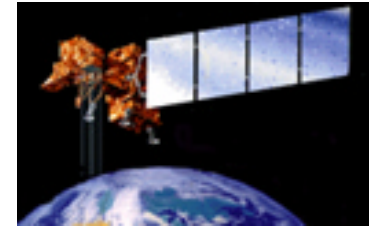
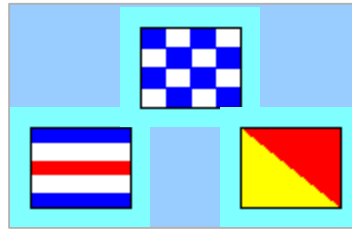


WWII

Vietnam

Desert Storm

Command, Control
& Surveillance



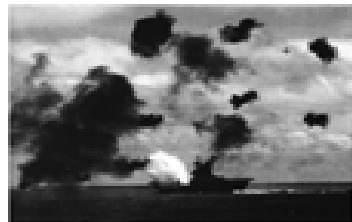
Battlespace
Dominance



Force
Sustainment

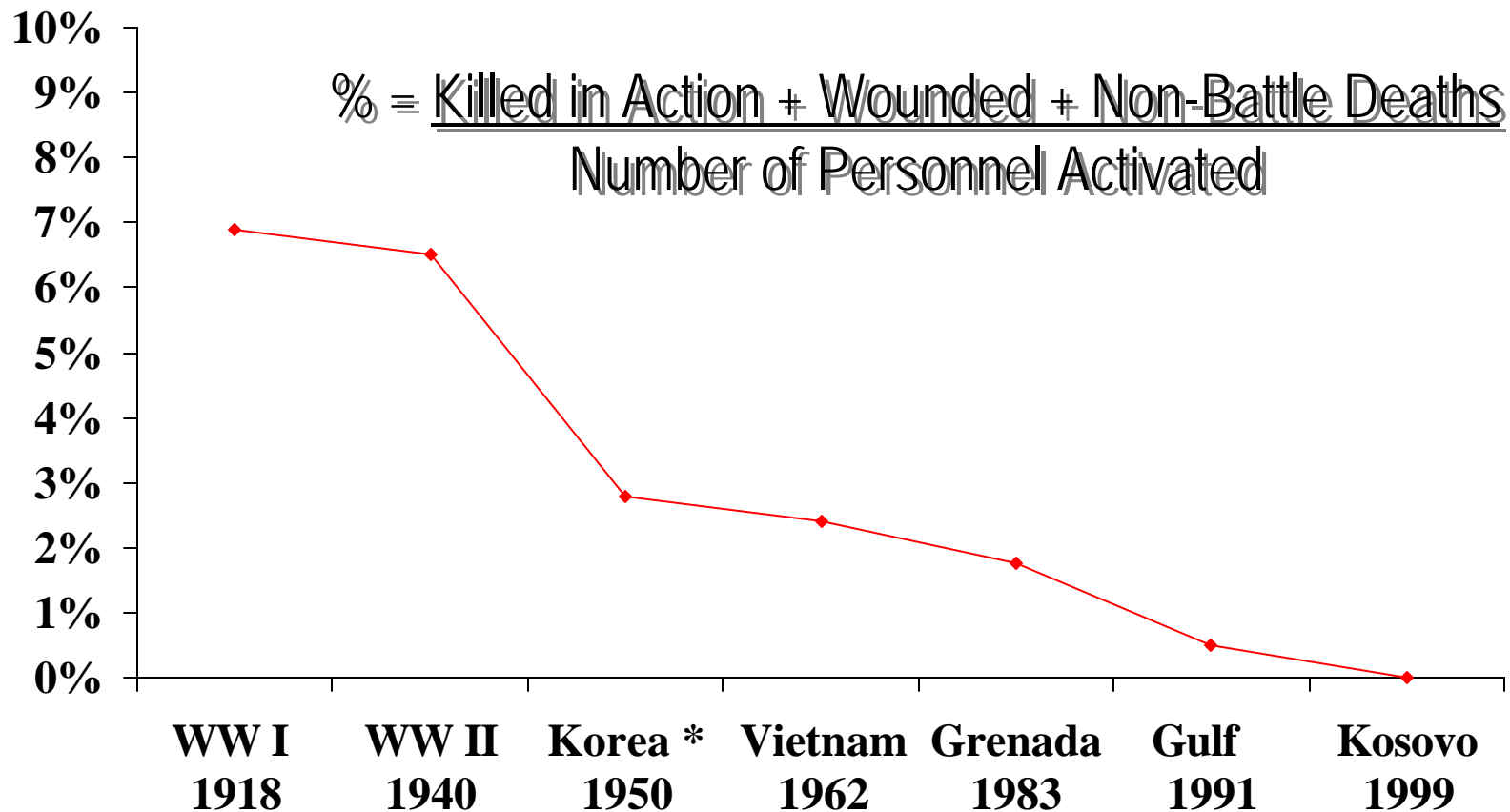


Power
Projection





Combat Casualties



Source: Army History Office

* Non-Battle Deaths Estimated



PIONEER (RQ-2A)



Program Characteristics

RSTA Missions

Fixed-Wing – 1985 Technology

Max Altitude – 15,000 feet

Airspeed – 85 knots

Range – 185 km

Endurance 4-5 hrs, Time on Station @ 185 km 2-3 hrs

90 lb Payload Capacity

Sensors: EO/IR

System: 5 Aircraft, (4) 5 Ton Trucks, 2 HMMWVs & Trailers

Shipboard Capable

Program Cost: Estimate \$1.0B since 1986

Status: Interim Solution 1986 to Present. Multiple Deployments. Awaiting Replacement



OUTRIDER

“Joint Tactical UAV”



Program Characteristics

2 May 1996 – Alliant Techsystems won ACTD Contract

2 yr ACTD

RSTA and Combat Assessment (CA) at brigade/battalion & regiment/battalion

Fixed-Wing

Max Altitude - 15,000 feet

Airspeed – 90 knots

Range – 200 km

Endurance 7.5 hrs, Time on Station @ 200km 4 hrs

Payload Capacity – 40 lbs

Sensors: EO/IR

System: 4 Aircraft, 2 HMMWVs and Trailers

Program Cost – \$53M ACTD, \$83M LRIP

Status: ACTD Never Transitioned to Formal Acquisition

Fully Joint Program Could Not Be Realized Due to Modification of Joint Requirements



FIRESCOUT (VTUAV)



Program Characteristics

ISR Missions

VTOL Technology

Max Altitude – 15,000 feet

Airspeed – 115 knots

Range – 200 km

Endurance 5 hrs, Time on Station @ 110 nm 3 hrs

200 lb Payload Capacity

Sensors: EO/IR/Laser Target Designator

System: 3 Aircraft, 2 HMMWVs, Trailers, 1 Ground Data Terminal, 2 Remote Data Terminals

Deploy with ARG/CVBG/DDG/CG/DD-21

System Cost: \$14M

Program Cost EMD Phase - \$93M

9 February 2000 – Northrop Grumman won Contract

**Status: Program Cancelled Beyond EMD. Survivability Issues. Deck Space Issues.
One Year Program Delay and Cost Growth**



POINTER



Program Characteristics

Small Unit Reconnaissance and Surveillance Missions
Man Portable System
Fixed-Wing – 1985 Technology
Battery Powered (requires two batteries)
Hand launched, UAV Pilot Required, Auto Land Recovery
Airspeed – 43 knots
Range – 5 km
Endurance – 90 min
Payload Capacity – 2 lb
Sensors: EO/IR
System: 2 Aircraft, 1 Ground Control System
System Cost – \$107K



Status: Deployed to Desert Storm. Conducted Experimentation during MOUT ACTD.



RAVEN



Program Characteristics

Small Unit Reconnaissance and Surveillance Missions
Man Portable System
Smaller Version of Pointer
Currently in Development
Battery Powered
Projected Range – 5-10 km
Projected Endurance – 80 minutes
Projected Payload Capacity – .5 lbs
Hand launched, UAV Pilot Required, Auto Land Recovery
Projected System – 1 Aircraft, 1 Ground Control System
Projected System Cost - Undetermined





SHADOW (TUAV)



Program Characteristics

ISR Missions

Fixed-Wing

Max Altitude – 15,000 feet

Airspeed – 123 knots

Range – 200 km

Endurance 5+ hrs, Time on Station @ 200 km 3 hrs

60 lb Payload Capacity

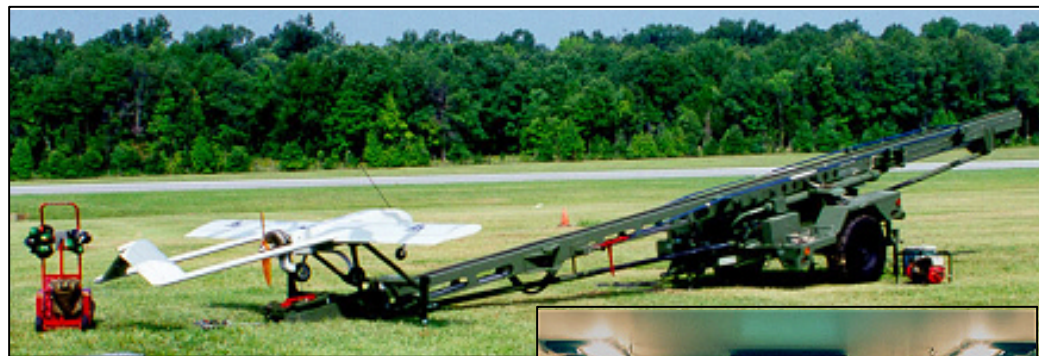
Sensors: EO/IR

System: 3 Aircraft, 6 HMMWVs & Trailers, 4 Remote Video Terminals

System Cost: \$9M

Program Cost to Date - \$83.6M

Army Contract Award – \$400M Procurement





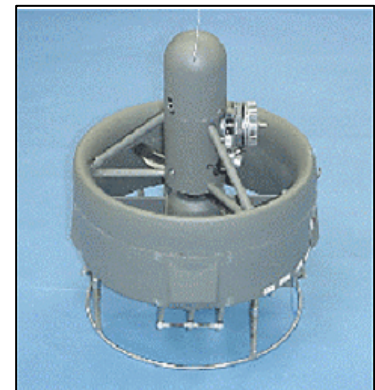
DARPA



- Tactical Technology Office (TTO)
 - Advancements in Unmanned Systems, Space Systems, and Tactical Multipliers
 - Canard Rotor Wing (CRW)
 - A160 Hummingbird Warrior VTOL UAV (3700+ km)
 - Unmanned Combat Air Vehicle (UCAV)
 - UCAV-N
 - FCS OAV (Organic Air Vehicle)



**A160 Hummingbird
Warrior**



FCS OAV



UAVs In Service Today



Hunter



Shadow



Pioneer



Predator



Global Hawk



UAV Past Concerns



- Unrealistic Program Goals/Expectations/
Schedules
- Requirements Creep
- One Size Fits All
- Is UAV System a Sensor or Aircraft?
- Who is the Advocate? (Who pays?)



UAV Status



- DARPA, Defense Agencies, DoD & Contractors Developing UAVs
- Limited “Tactical” UAV Options
- Weaponized Systems Deployed
- Multiple Powerplants
 - Heavy Fuel Engines
 - Turbine Engines
 - Rotary Engines
 - Aviation Gasoline
 - Electric Motors
- Training Issues
- Shipboard Compatibility Issues
- VTOL Technologies Emerging, But None in Service



GCS Status



- TCS Capabilities and Standardization Emerging
- TCS Shipboard Integration Planned
- Still Have “Large” Footprints
- Dissemination of Sensor Data and Sensor-to-Shooter Connectivity Still Need Work
- Costs Still Too High



Where Is USMC Heading?



- Fully Autonomous Aircraft
- VTOL/Shipboard Compatibility for Tier II
- Small/Expeditionary Footprint
- TCS Compliancy
- Minimal Training Requirements
- Streamlined Acquisition
- Affordable Systems



Dragon Eye Small UAV

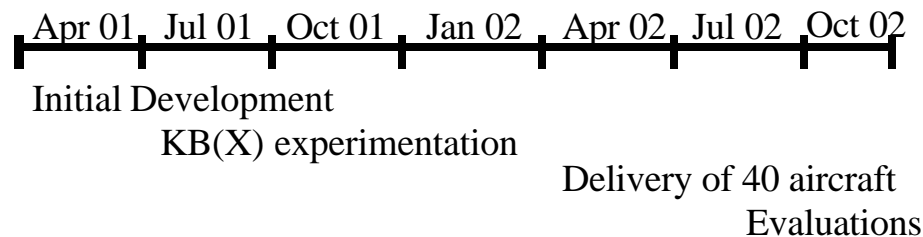


Plans & Status



- **Based on the ISURSS ORD**
- **Funded by ONR, built by NRL, managed by MCWL**
- **Conducted first fully autonomous flight Feb 01**
- **Conducted experimentation during Kernal Blitz 2001**
- **Contactors deliver 40 Dragon Eye aircraft Apr 02**
- **Operator Evaluations Jun-Jul 02**
- **Down select, prime contract award Dec 02**
- **Initial Operational Capability (IOC) Spring 03**

Schedule



Funding Expenditure ONR and MCWL:

- FY01 \$3.0 M
- FY02 \$2.2 M

- **Fully back-packable UAV system**
- **5 lb air vehicle w/electric propulsion**
- **12 lb Ground control station**
- **Fully autonomous flight capability**
- **50+ min flight endurance**
- **Greater than eight km link range**
- **Interchangeable, modular 1 lb payloads**
- **EO daylight color; EO low light b/w**
- **Planned upgrade to uncooled IR**



Dragon Warrior VTOL UAV

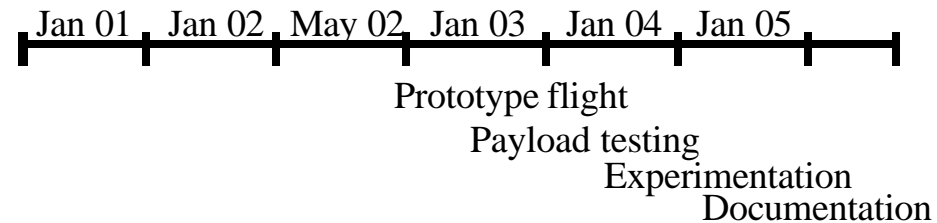


Plans & Status



- Based on the Close Range UAV ORD
- Completed flight test of 50% scale RC prototype
- Conducting detailed design of full scale system
- Conducting digital flight simulations for autopilot
- Conducting wind tunnel performance tests
- Full scale prototype first flight Oct 02
- FMF experimentation (Olympic Challenge) Aug 04
- Transition to NAVAIR/MCSC late FY04

Schedule



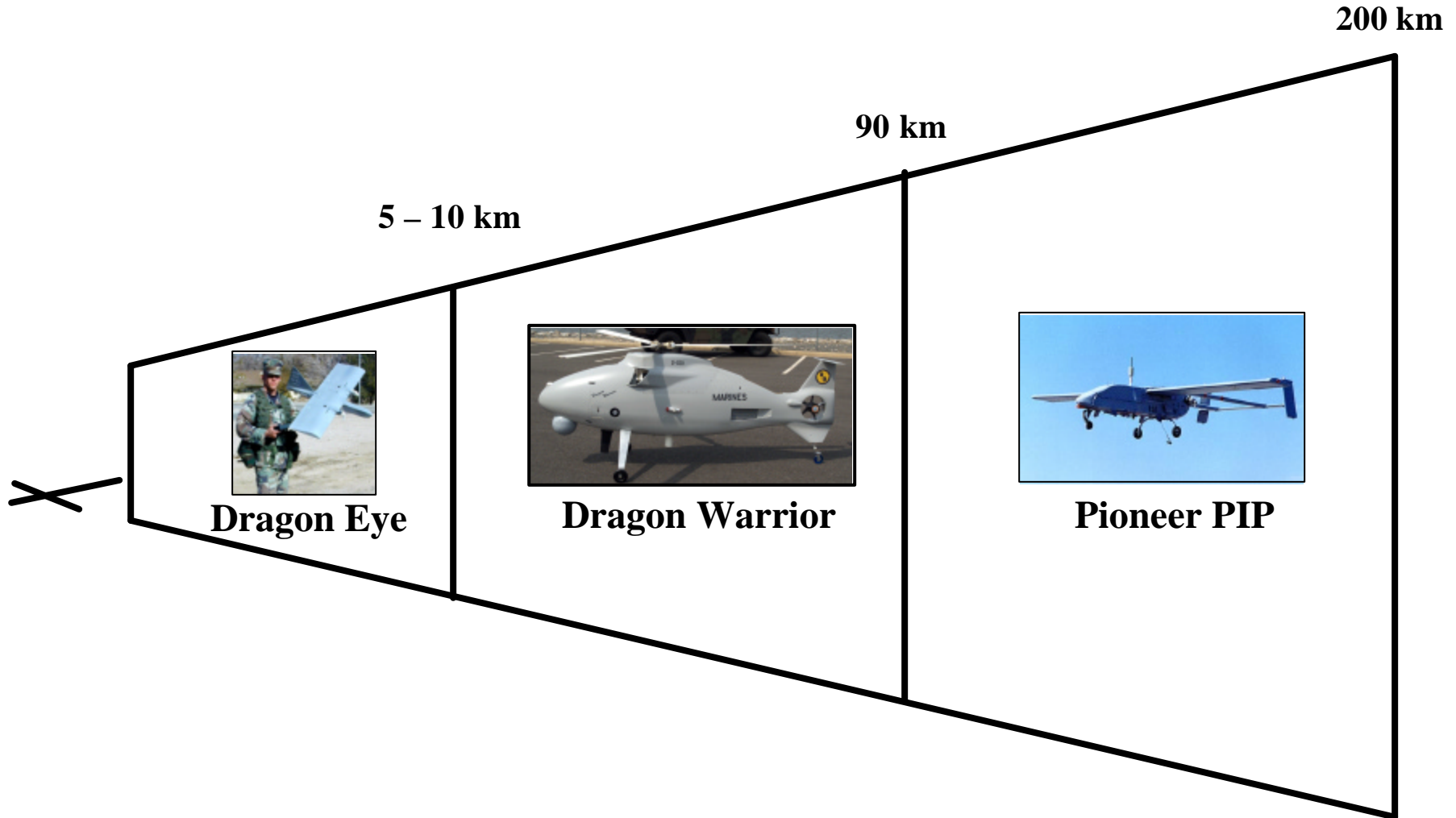
Funding Expenditure ONR and MCWL:

- | | |
|-----------------|---------------|
| • FY01 \$3.4 M | FY02 \$8.3 M |
| • FY03 \$10.2 M | FY04 \$10.5 M |

- Shipboard compatible VTOL UAV
- Payloads: EO/IR w/laser rangefinder and Wide band comm relay (planned upgrade to laser designator)
- Fully autonomous flight capability
- 3-5 hour flight endurance
- 50 nm link range
- Portable in a single HMMWV and trailer



USMC Unmanned Air Systems - Approach

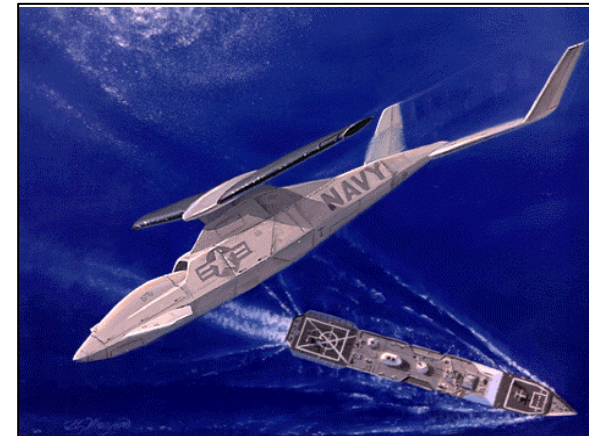




Unmanned Air Systems “The New Era”

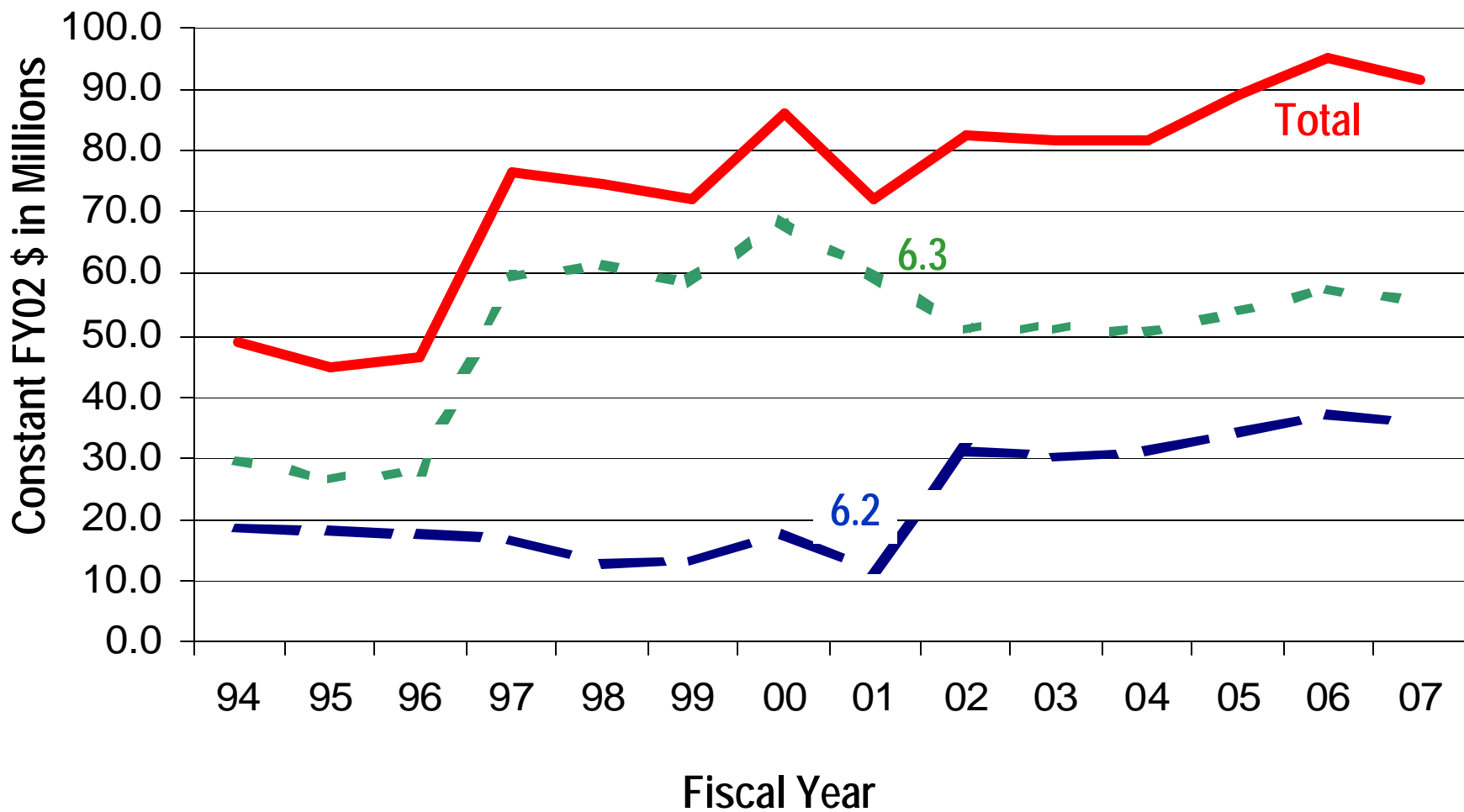


- Continue Current Missions (RSTA, Comm Relay, etc.)
- Exploration of New Mission Areas (SEAD, Deep Strike)
- MRE UAV
- UCAV/UCAV-N – Unmanned Combat Vehicles
- New Technologies/Designs for Flight
 - E.G. CANARD Rotor Wing UAV



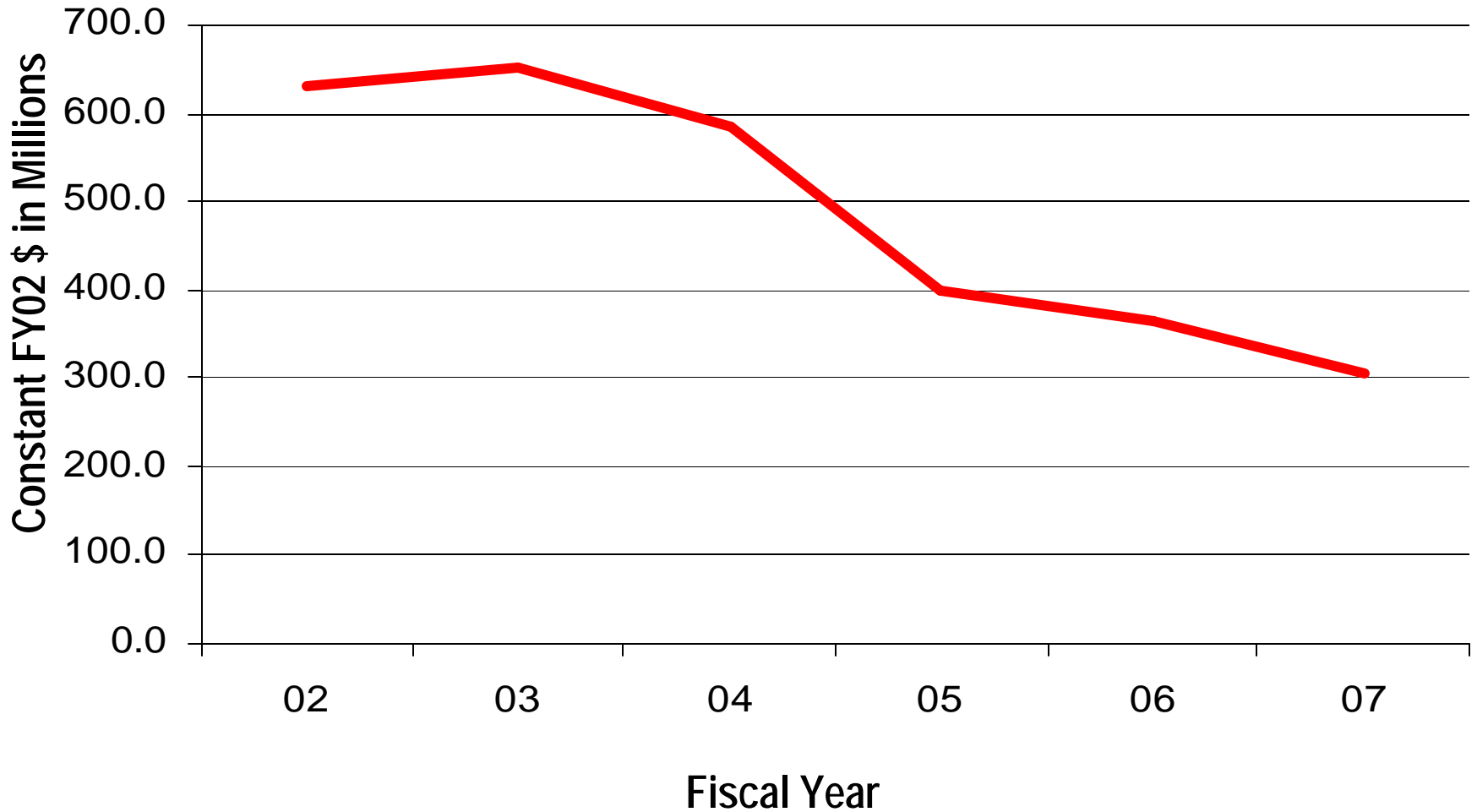


Marine Corps S&T Budget





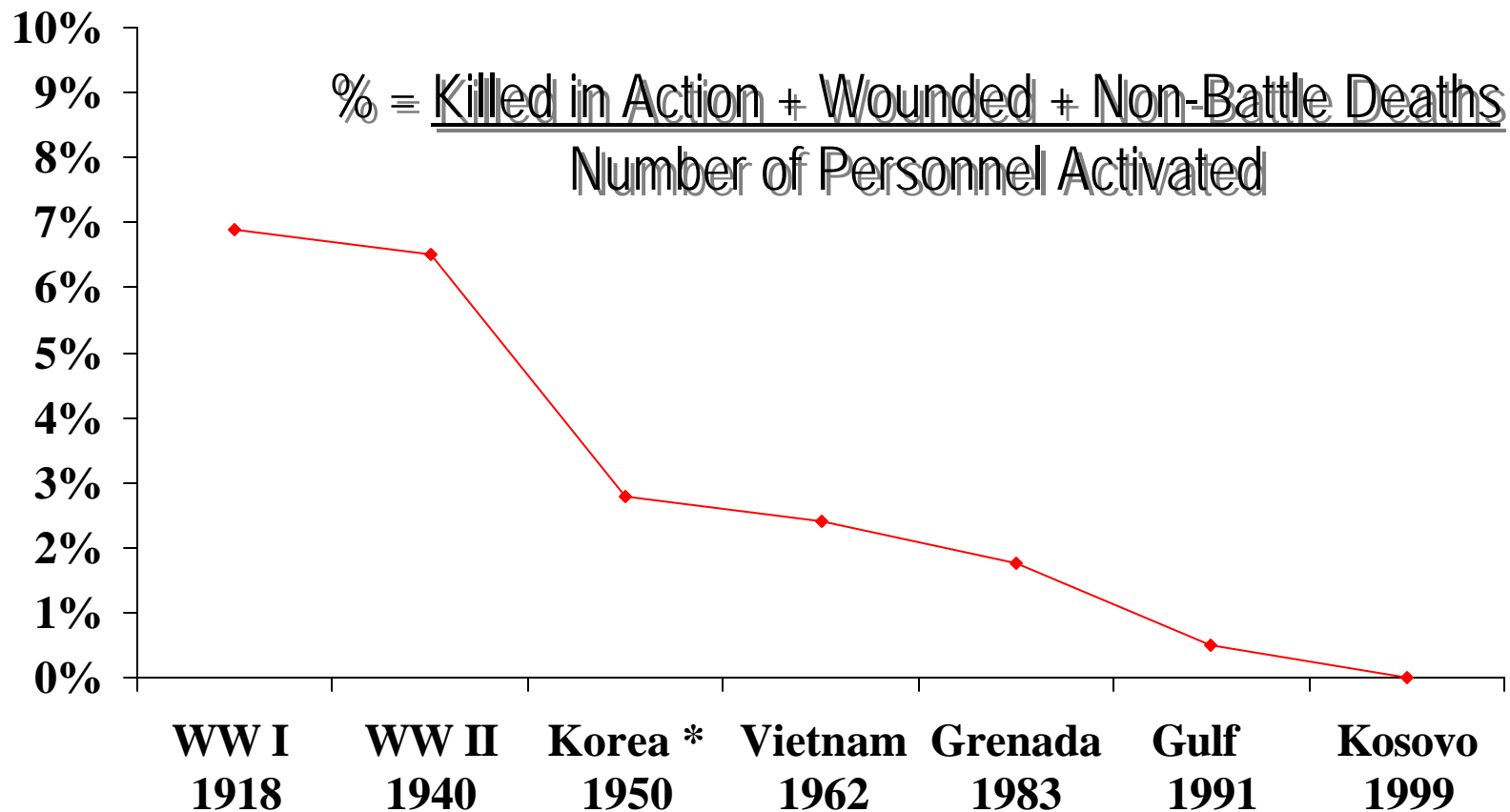
Marine Corps RDT&E Funding



Source: President's Budget FY03



Combat Casualties



Source: Army History Office

* Non-Battle Deaths Estimated





Questions/Comments?





Dragon Runner

OBJECTIVE:

- Elevate situational awareness / extend limit of human observation (around the corner capability)
- Provide a limited, tactical force protection capability at the small unit level (“Sentry Mode”)
- Provide a man-portable system that will provide observational coverage in confined areas
- Increase real-time feedback to the small unit leader



TRANSITION:

- Technology push
- Solution Planning Guidance given for MNS Draft, April 02

DESCRIPTION:

- 4-wheel, rear-wheel drive, front wheel steer
- System weight 13 lbs (9 vehicle, 4 OCU)
- Length: 15.5” Width: 11.25” Height: 5”
- Low Light Level wide angle video camera
- Infra-red LEDs for night use
- Motion sensors for “Sentry Mode”
- Earpiece for audible alert during “Sentry Mode”
- 2-sided non-active suspension for inverted operation
- Handle for tossing
- Standard military batteries (vehicle / OCU)
- 2-hr full function, 12-hr sentry mode, 200m LOS
- User Interface uses 4” screen for video and home gaming controller for operation

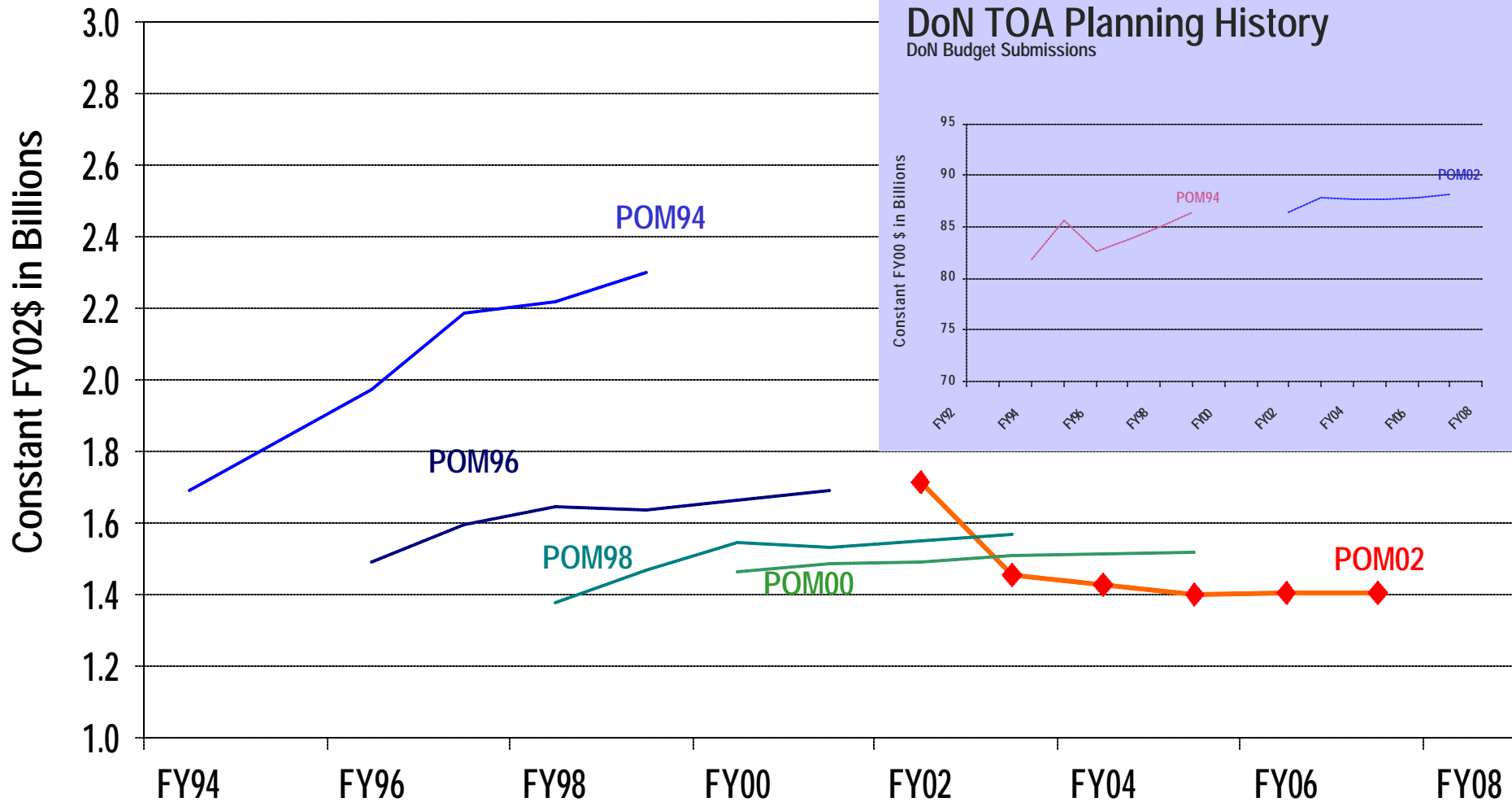
FY02 SCHEDULE:

- LTAs
- Integration (chassis / subsystem)
- Millennium Dragon 02
- Mission Need Statement Draft



Navy S&T Planning History

Navy Budget Submissions





DoN S&T Program History

