



Warfare Systems Engineering Challenges and Test and Evaluation Approaches

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Presented by:

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Outline of Presentation:

DoN T&E Challenges & Strategies
NAVSEA Core T&E Functions
NAVSEA T&E Initiatives
(Integration, Interoperability, M&S, Undersea Tracking Ranges and T&E capabilities, Human Capital Strategy)



Challenges

- The growing need for the **large scale joint** and dynamic test environment of the future, e.g. Net Centric Warfare, FoS/S, coalition operations.
- The increasing technological complexity and tightly **integrated interoperability** across weapons systems.
- Current information and accounting systems do not provide adequate visibility of T&E events and costs to maintain and improve process and capability.

Strategies

- The **Joint Capability Integration Development Requirement** and the budget process needs to be better synchronized to reduce unanticipated cost changes.
- The use of combined **Integrated** DT/OT is one of the successful “innovative” T&E approaches by Navy program managers to cut testing costs.
- Increased **use of M&S** can reduce Acquisition programs costs and improve the value of DT and OT data.
- The return of M&S across programs can be enhanced through investments in **common infrastructure**, policies, and standards and reuse.

Navy T&E Initiatives

Navy T&E Board of Directors

- Established by DASN/RDA
- RADM Landay (co-chair) and COTF (co-chair), OPNAV N091 (Exec Sec), PEOs, N1, N4, N6, N8, SYSCOMs, MCOTEAs and CFFC
- Strategic Priorities
 - Establish governance
 - Inventory the domain
 - Define metrics
 - Create value by optimizing resource utilization
- N43 Range Contribution to Readiness Effort
- PEO T&E Forum
 - Coordinates T&E actions across PEOs
 - Identify opportunities for efficiencies
- PEO Ships T&E Working Group
- NAVSEA Warfare Center T&E Working Group
 - Representatives from each WC division
 - Forum for:
 - WC leadership in joint initiatives
 - Knowledge sharing, synergy/efficiency initiatives
 - Recommendations for T&E policy formulation
 - Coordination of NAVSEA T&E action items

Renewed focus and attention on T&E



DoN Integrated Testing Strategies

- FY07 Nat'l Defense Authorization Act, Sect 231. directed USD and DOT&E to review DOD policies and practices on T&E.
- Integrated testing major theme
 - Goal: early detection & correction of program deficiencies
- Navy Proposed Draft DoD IT definition: Integrated testing is the collaborative planning and collaborative execution of test phases and events to provide data in support of independent analysis, evaluation and reporting by all stakeholders (government, contractor, operational test communities).

- PM identifies program as “Integrated Test” program
- Establishes a test team to collaboratively create and manage the TEMP
- Identify test parameters, data, and resources required for development of DT/ OT test plans, and certifications, to **optimize test data collection** while minimizing test resource required.
- MDA provide formal direction establishing the Test Team in the program's first ADM
- Contractor full participation in the IT planning and execution included in RFP and contract.

NAVSEA T&E Initiatives In Support of DoN Directives

- **Implement Integrated T&E Strategies**
 - Combined DT/OT
 - Synergy DT/OT with Fleet Training Events
- **Implement Interoperability T&E**
 - Distributed Engineering Plant
 - Joint T&E Distributed Engineering Plant
 - Coalition T&E
 - Integral Fire 07
- **Promote Consolidated T&E Capability**
 - Undersea Tracking Range Collaboration and Roadmap Development
 - Synthetic Environments to Enhance ASW Operational Effectiveness
 - Test Assets & M&S
 - T&E Human Capital Strategy
- **Establish Strategies for Transformational T&E**
 - Establish Rapid Response CREW T&E
 - Establish M&S Accreditation Process
 - Establish Open Architecture T&E

Combined DT/OT Initiatives: NAVSEA Supporting CFFC SEA TRIAL

Virtual SYSCOM Sea Trial Collaboration Team

- *NAVSEA, NAVAIR, and SPAWAR, with support from NWDC*
- *Share knowledge of the SYSCOMs' Experimentation processes, tools and venues*

3rd Fleet conducted a Sea Trial Symposium for Sea Shield Experimentation

- Identified Fleet Warfighting gaps
- Aligned and prioritized experimentation documented in STIMS
- Use experimentation to fix the short term gaps
- Provide representation to the STESG

NAVSEA develops initiatives to rapidly solve gaps and cost

- Provide Engineering review of initiatives and gaps
- Provide operation & system architecture views

PEO PM's provide DT & OT event activity to NWDC

NWDC vet experiments through SYSCOM's prior to Fleet Collaborative Team action*

- Support Sea Trial Information Management System (STIMS)

**Sea Strike - 2nd fleet - NAVAIR
Sea Shield - 3rd Fleet - NAVSEA
Forcenet - NETWARCOM - SPAWAR
Sea Base - 2nd Fleet - NAVAIR**

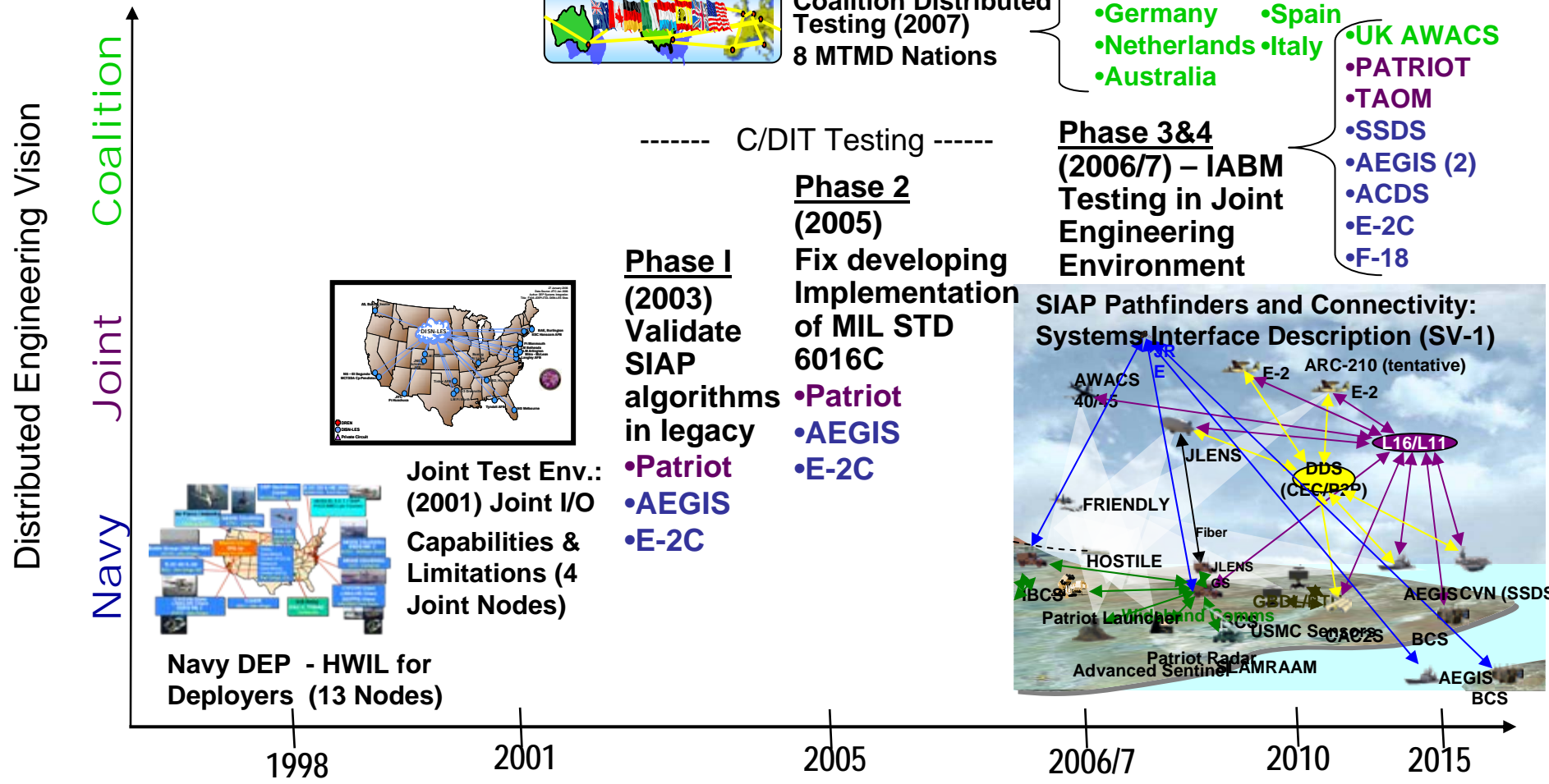
Distributed Engineering Plant Overview (NSWCDD)

- The Distributed Engineering Plant (DEP)
 - Critical element of the Navy's response to Battle Force Interoperability
 - Formed by Federating Combat System Sites Dispersed Around the United States
 - HITL CS suite to evaluate how systems interact with CEC and TADIL environments
 - All ship baselines require DEP evaluations prior to deployment
 - A High-Fidelity, Shore-Based distributed Force Test bed
 - Demonstrated utility for Industry participation
 - Demonstrated utility for industry participation
 - Established foundation for and compatible with JDEP
- Primary mission to provide Shore-based Force-level testing of deploying CSGs/ESGs.
 - Force Interoperability Assessment
- The mission has evolved to support the entire acquisition cycle.
 - Force-Level Performance
 - Prototype Evaluation
 - Developmental Systems
 - Force Problem Resolution



DEP Goal is to Enable Navy Acquisition Decisions Based on Sound Force System Engineering

Navy Joint and Coalition Interoperability Challenge



Joint, Distributed Engineering finds problems early, reduces costs, and improves interoperability: the “Force Multiplier” for the 1,000-ship Navy.

(AF-ICE, USJFCOM J89, SIMAF, JMETC, JC2 JCAS, JTEM, NSWC DN)

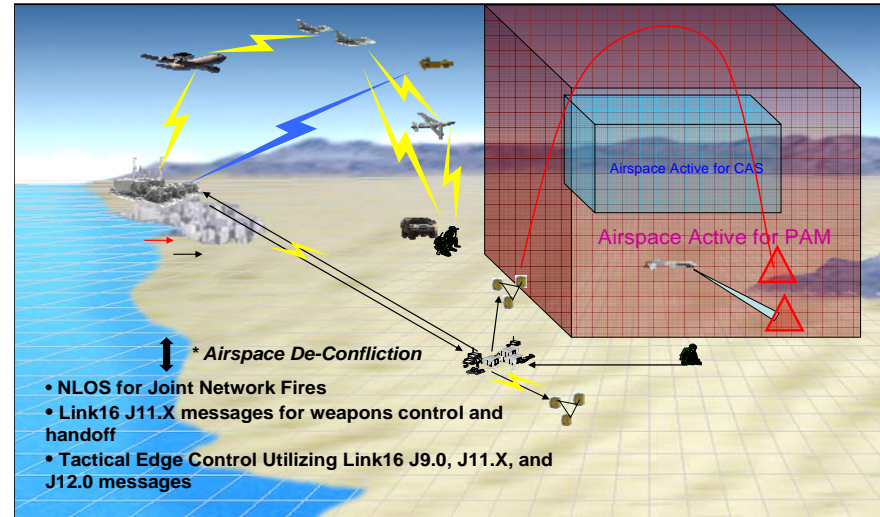
Integral Fire 07

Description: establish a Joint persistent test environment to support Joint Command and Control (JC2), Joint Close Air Support (JCAS) Assessment for USJFCOM; and Air Force Secretary on the Warfighter Warfighter Forwarder (WWF) integration

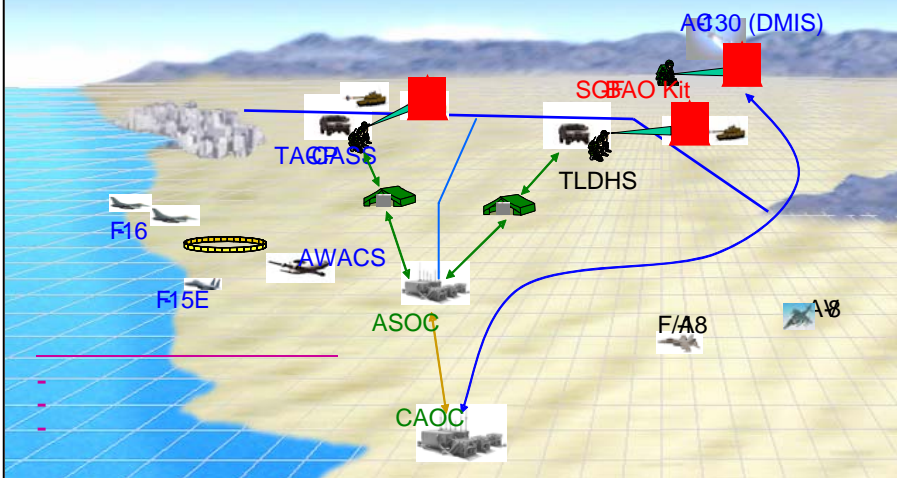
Objectives:

- Conduct a technical assessment of JCAS in response to real time requests.
- Evaluate Methods and Processes C2 airspace de-confliction between Army NLOS and Net enabled weapon (NEW) (Air Force and Navy).
- Machine to Machine re-tasking of strike platforms and NEW from the Air Operations Center (AOC).

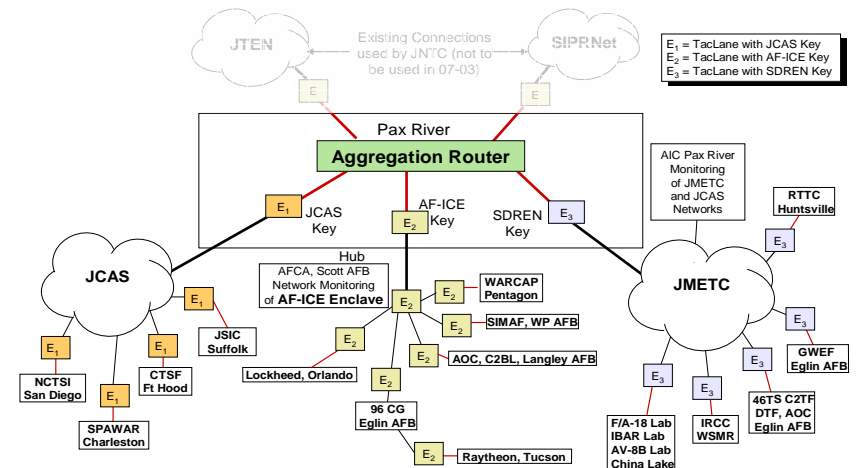
JTEM (Non Line of Sight NEW) Warplan Warfighter Forwarder



JSIC JC2 JCAS: Assess data exchange between AF/Army, Marine, and SOF Terminal Air Controller digital ground kits to coordinate Close Air Support



LVC JME Infrastructure



T&E Facility Examples

Ocean & Coastal Ranges and Facilities

Pacific Northwest Range Complex



Narragansett Bay Shallow Water Test Facility



Potomac River Test Range



Surface Combat Systems Center



Southern California Offshore Range

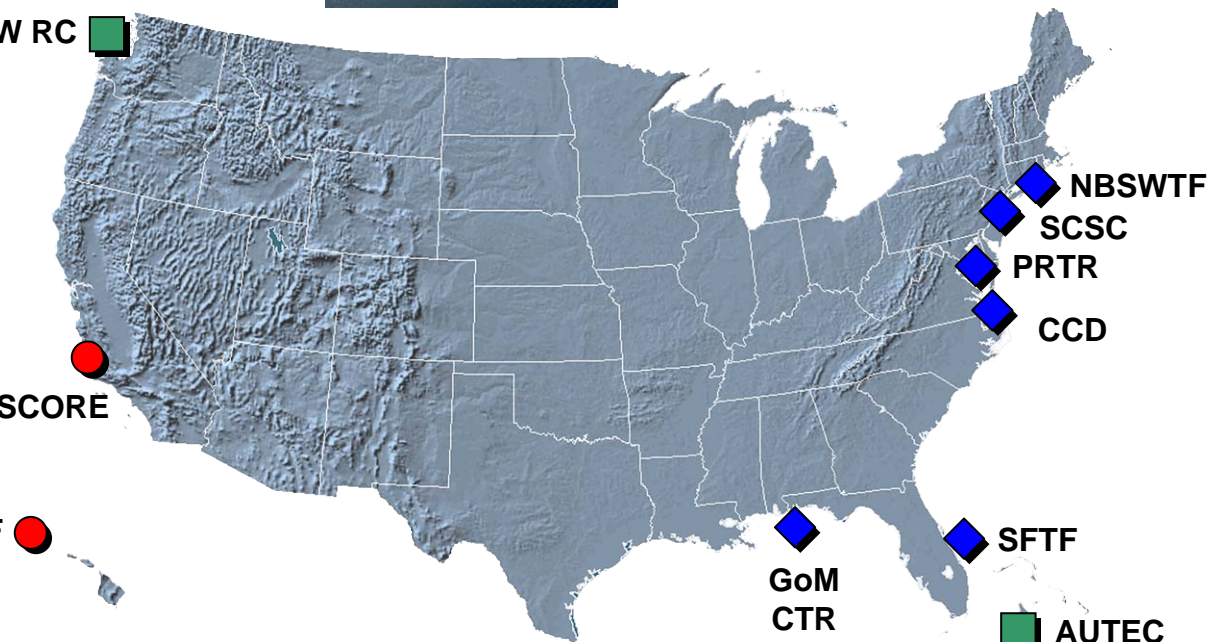
PNW RC

SCORE

PMRF



Pacific Missile Range Facility



● Fleet Ranges
 ◆ T&E Ranges
 ■ T&E/w MRTFB Components



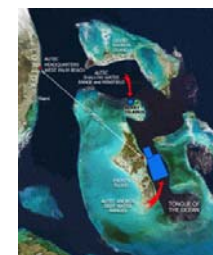
Combatant Craft Division



South Florida Test Facility



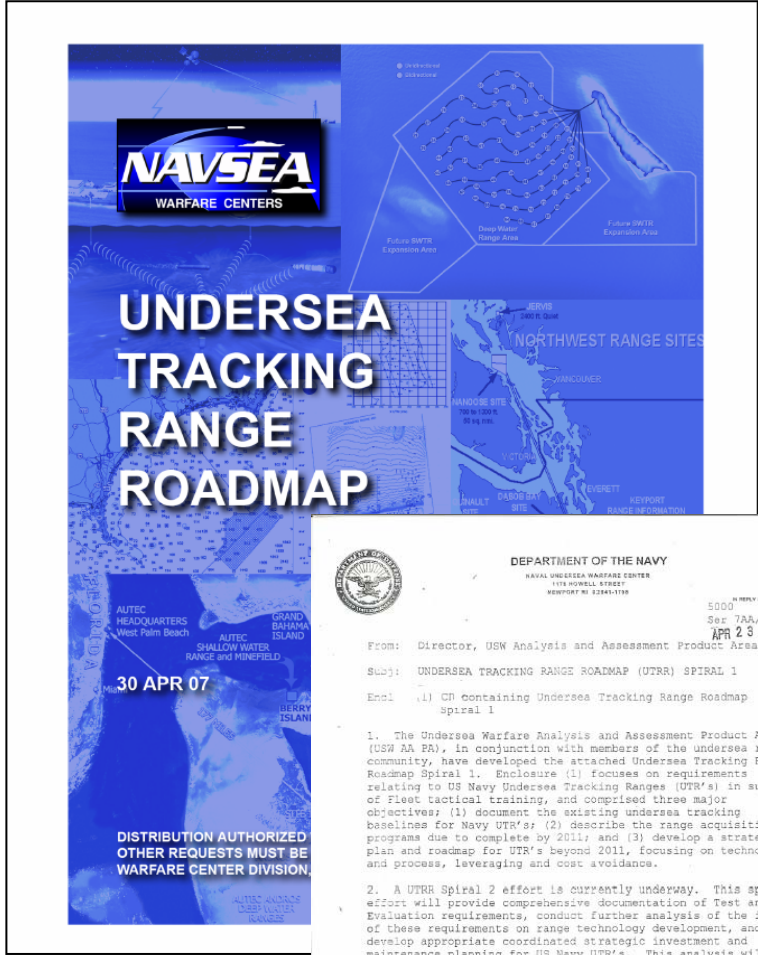
Gulf of Mexico Coastal Test Range



Atlantic Undersea Test and Evaluation Center

Undersea Tracking Range Roadmap

- Comprehensive roadmap of USW tracking range requirements (T&E & Training)
- Held UTR T&E requirements forum with PEO's, COTF, FFC
- Provides investment guidance for near, mid, and long term
- Identifies shortfalls or gaps in resources and shared approaches to USW ranges technology
- Completed Phase 1, conducting Phase 2
- Documents efforts required for the current ranges out to FY20.
- Proposes potential technologies and range architecture



NAVSEA WARFARE CENTERS

UNDERSEA TRACKING RANGE ROADMAP

30 APR 07

DISTRIBUTION AUTHORIZED
OTHER REQUESTS MUST BE
WARFARE CENTER DIVISION.

DEPARTMENT OF THE NAVY
NAVAL UNDERSEA WARFARE CENTER
1574 HOWELL STREET
MONTGOMERY, AL 36117-1574

5000
Ser 7AA/4
APR 23 2007

From: Director, USW Analysis and Assessment Product Area

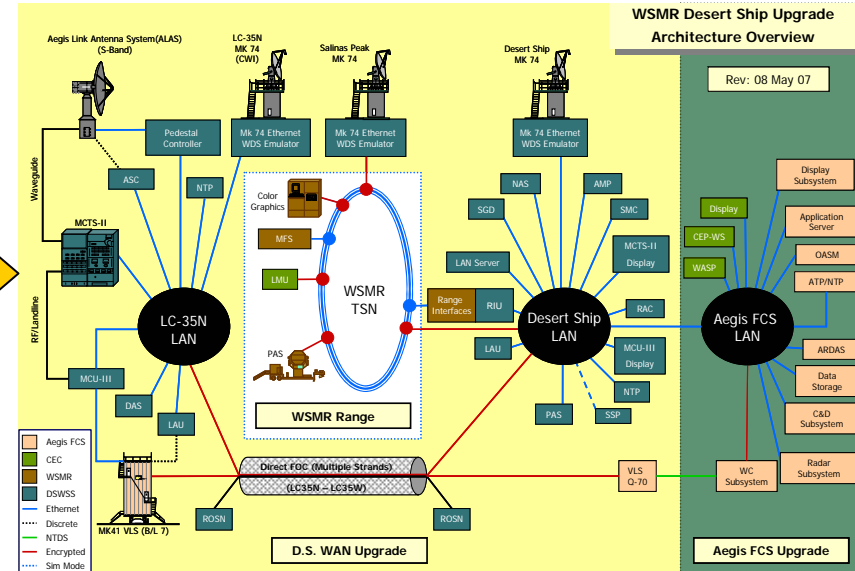
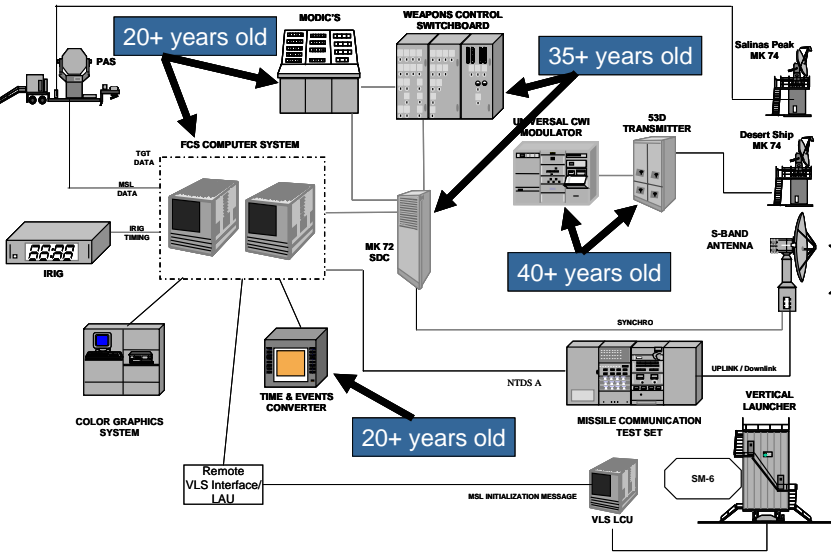
Subj: UNDERSEA TRACKING RANGE ROADMAP (UTRR) SPIRAL 1

Encl: (1) CD containing Undersea Tracking Range Roadmap spiral 1

1. The Undersea Warfare Analysis and Assessment Product Area (USW AA PA), in conjunction with members of the undersea range community, have developed the attached Undersea Tracking Range Roadmap Spiral 1. Enclosure (1) focuses on requirements relating to US Navy Undersea Tracking Ranges (UTR's) in support of fleet tactical training, and comprised three major objectives: (1) document the existing undersea tracking baselines for Navy UTR's; (2) describe the range acquisition programs due to complete by 2011; and (3) develop a strategic plan and roadmap for UTR's beyond 2011, focusing on technology and process, leveraging and cost avoidance.
2. A UTRR Spiral 2 effort is currently underway. This spiral effort will provide comprehensive documentation of Test and Evaluation requirements, conduct further analysis of the impact of these requirements on range technology development, and develop appropriate coordinated strategic investment and maintenance planning for US Navy UTR's. This analysis will include a detailed examination of all future Undersea Warfare (USW) programs being developed by the various Program Executive Offices and being executed by the various Program Managers Sea, and Program Managers Air. The effort shall include periodic stakeholder meetings and industry day briefings, enabling industry and stakeholder input, and facilitates stakeholder review and consensus building.
3. The UTRR is expected to be a living document to be updated periodically. The UTRR will be a top-level document comprising a comprehensive long term investment and maintenance planning strategy for USW tracking ranges. It will be fully integrated with USW test and USW training and will be used to provide investment guidance. Questions concerning the UTRR may be directed to the following undersea range customer advocates: for Spiral 1, Robert Reid at (401) 832-5797 and for Spiral 2, Trevor Kelly-Bissonnette at (401) 832-3152.

Paul J. Lefebvre
P. J. LEFEBVRE
By Direction

Initiative: White Sands Missile Range (WSMR) Desert Ship Upgrade



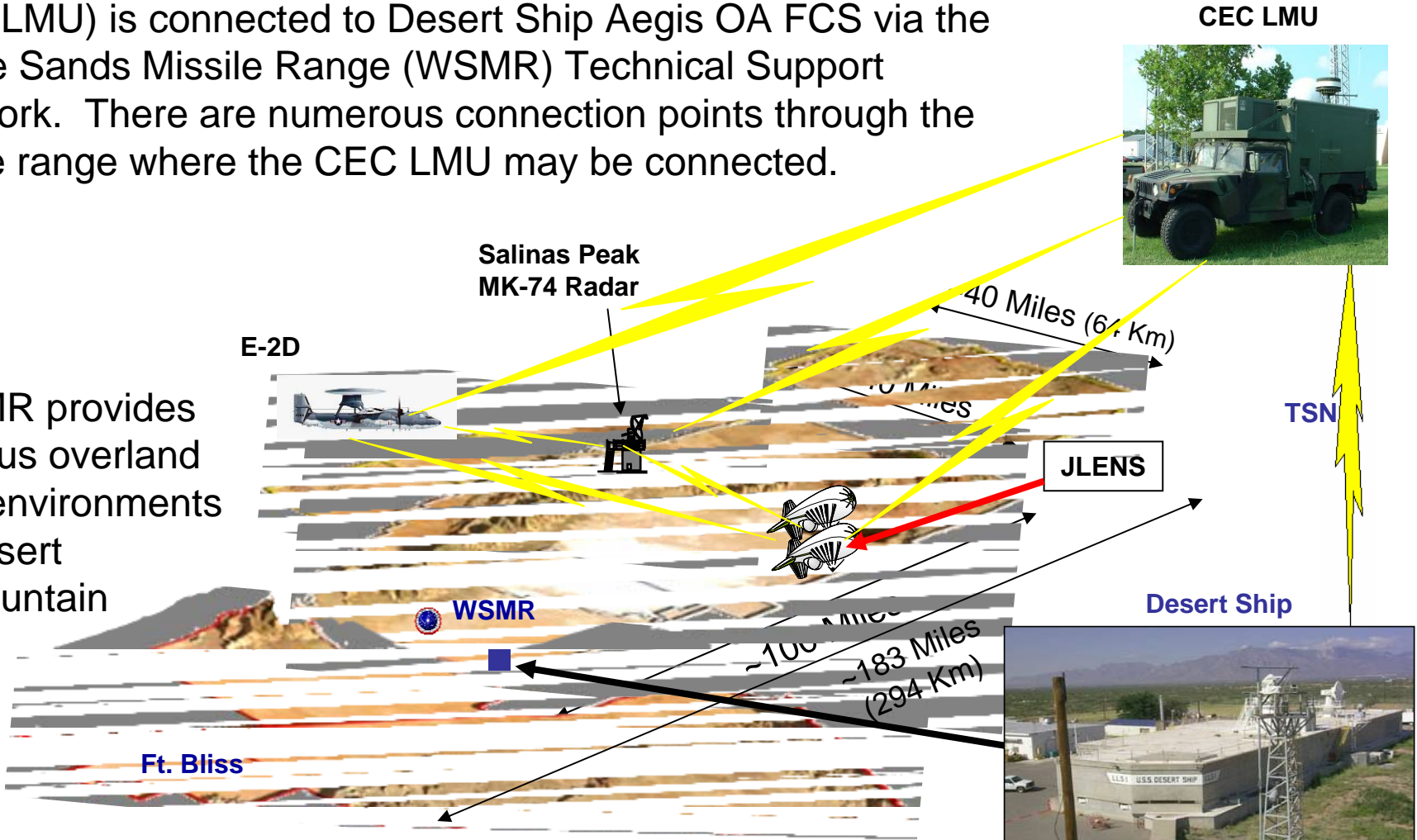
- Transitioned 20-40 year old specialized Fire Control System (FCS) equipment to an Aegis Open Architecture FCS and COTS based approach.
- Supports current and future Integrated Fire Control (IFC) tests to demonstrate Naval and Joint Capabilities
- Reduces overall Desert Ship system maintenance cost
- OA and COTS approach reduces future upgrade costs

Potential Future IFC Test Configurations

The Cooperative Engagement Capability (CEC) Land Mobile Unit (LMU) is connected to Desert Ship Aegis OA FCS via the White Sands Missile Range (WSMR) Technical Support Network. There are numerous connection points through the entire range where the CEC LMU may be connected.

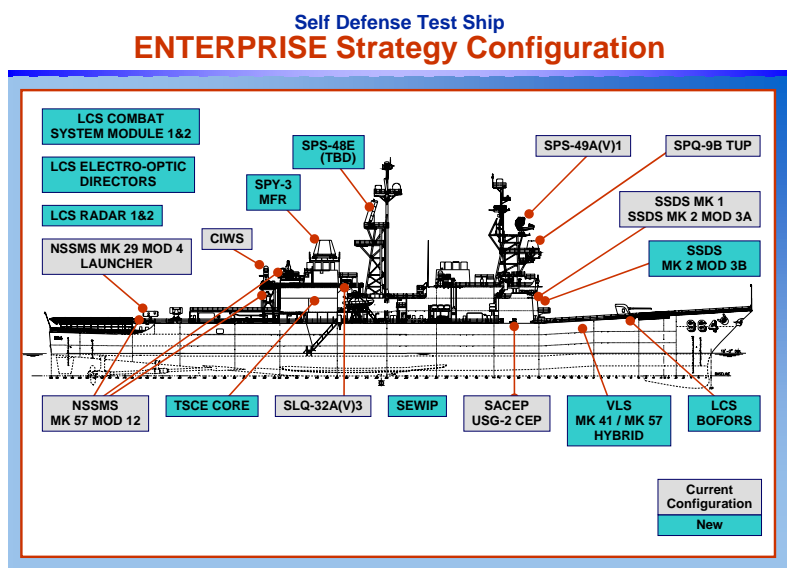
WSMR provides various overland test environments

- Desert
- Mountain

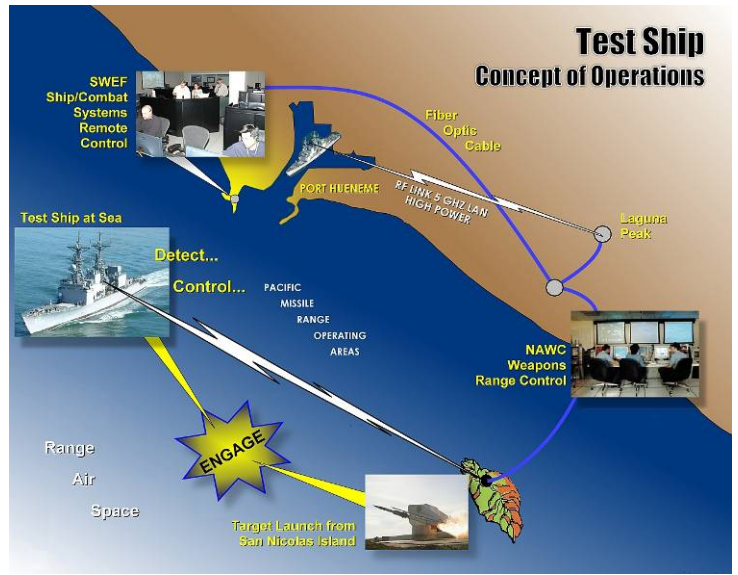
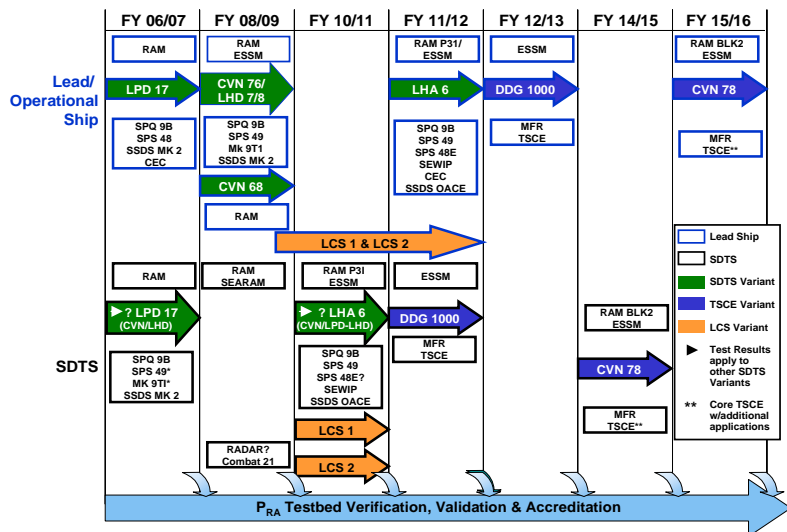


Initiative: AAW SSD T&E Enterprise

- PEO IWS Initiative to apply an enterprise approach to program T&E strategies
- Integrates SDTS and Lead ship at-sea test events, and P_{ra} Testbed across combat system variants
 - Applicable to LPD 17, LHA 6, DDG 1000, CVN 78, LCS
 - SSDS, RAM, ESSM
- Eliminates duplication and optimizes testing; element TEMP(s) still supported



Using an Enterprise Approach



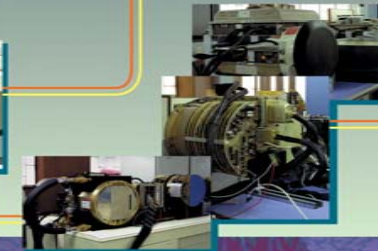
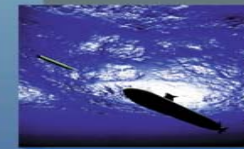
Potential savings of \$240 Million, and reduction of 38 missiles

SUBSCOL NL and NSTCP SMMTT



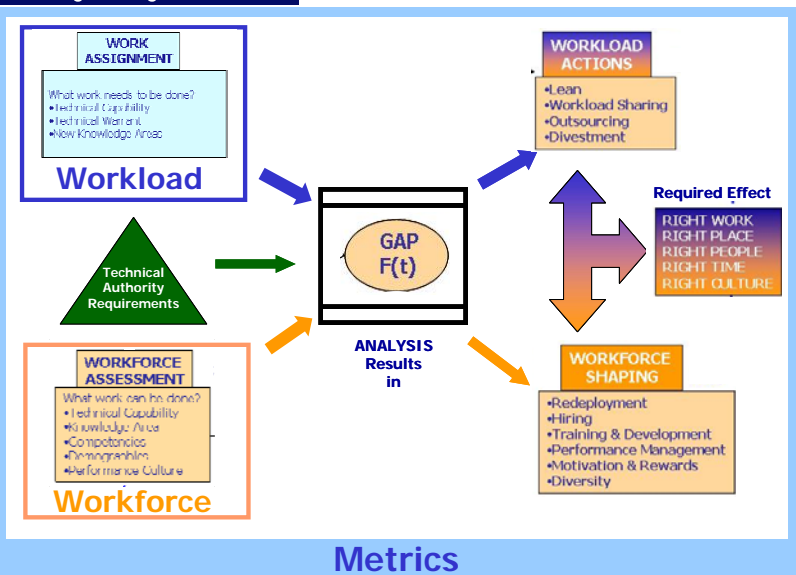
Proven
Connectivity
HLA Interface
ISDN
or use
SIPRNET,T1

NUWC Simulation and Analysis Center for Torpedoes and CMs



- Real Torpedo Hardware in the loop and latest weapon software
- High fidelity threat models, CMs, and high fidelity tactically significant environments
- An excellent test bed to preview, and test Combat Control and APB Weapon System and HSI improvements prior to costly at-sea firings
- Proven HLA connectivity
- Leverage the latest exploitation for training in the employment of the latest torpedoes in operationally relevant scenarios. Used as part of SCC training since Oct 2004. Utilized for mission-specific Pre-Deployment Training

STRATEGY

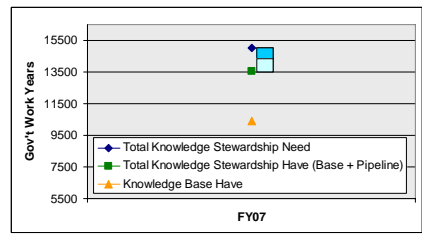


ASSESSING WORKFORCE HEALTH

Workload Area	Technical Authority	Knowledge Area	Skills	Capacity	Performance	Retention	Availability	Retention	Comments
Change Work Test	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Design & System Engineering	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	
Change System Architecture	High	High	High	High	High	High	High	High	

Measure TC Health by Knowledge Area (KA) (e.g. Test & Evaluation)

Yields



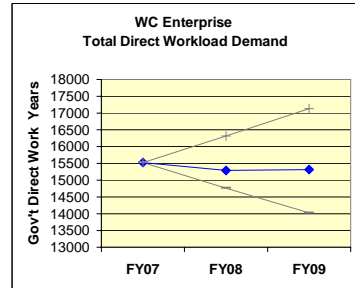
Gap Assessment

ASSESSING WORKLOAD DEMAND

Assign Workload by Technical Capability (TC)

TC Number	TC Name	Demand	Work Being Performed at a Site												Total	Direct	
			ENR	SSR	OSR	LWR	OSR	OSR	OSR	OSR	OSR	OSR	OSR	OSR			
101	Professional Government Engineers & Scientists	17.7				0.9	200.0									200.9	199.0
102	Professional Government Estimators	10.7				0.7	200.0									200.7	199.0
103	Professional Government Estimators	14.0				17.0	200.0									217.0	200.0
104	Professional Government Estimators	12.2					270.0									270.0	267.8
105	Professional Government Estimators	15.9					270.0									270.0	267.8
106	Professional Government Estimators	20.0					270.0									270.0	267.8

Yields



Workload Trends

WORKFORCE SHAPING ACTIONS

Hire Or Redeploy based on TC & KA Health

Human Capital			
FY07 Workforce Hiring by Site TC	FY06 Health Assessment	Planned	Current YTD
S&T		5	1
TC1		30	12
TC2		20	0
TCX		5	0
TCY		4	0
Business Operations		5	1
Total		69	14

Directions: Direct S&T Work is counted in appropriate TC



Develop by 5VM Career Path (e.g. Test & Evaluation)

Counter IED Device Testing

(NSWC Corona, Dahlgren, NAVEODTECHDIV, PMS408)



Tasking

Assessment of effectiveness of CREW systems for dismounted troops, wheeled vehicles, and riverine patrol boats.

- Quick Reaction Mounted & Dismounted CREW - Counter Remote Control Improvised Explosive Device Electronic Warfare

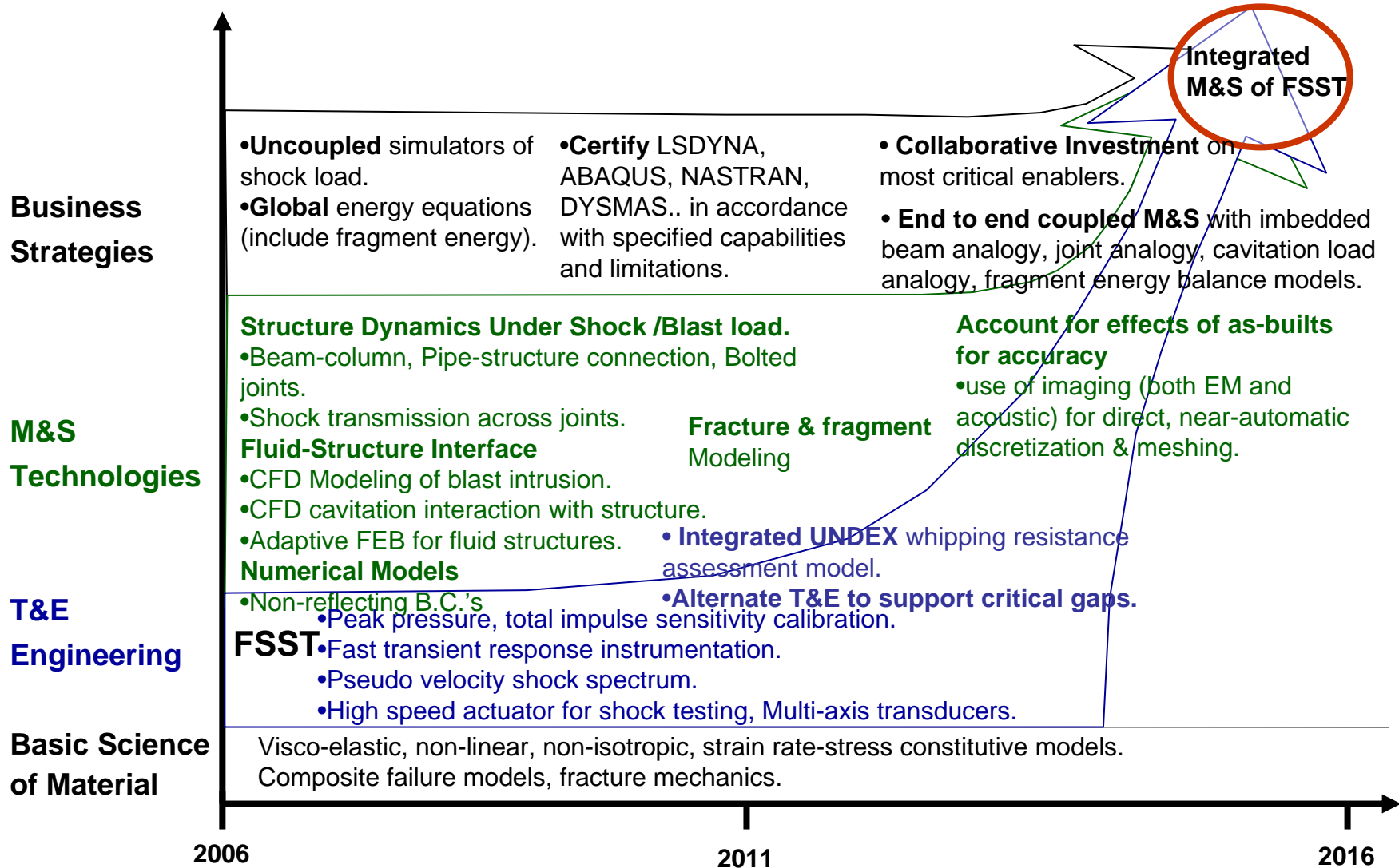
Challenges

- Compressed acquisition process requires demanding OPTEMPO.
- Transform process for assessment of NAVY weapons systems for assessment of systems used in ground combat environment to counter asymmetric threat – IED's.

Accomplishments

- On-site at Yuma Proving Grounds Az, for data collection, analysis & operator support
- Author Effectiveness reports
- Testified as SME at source selection board Feb 07.

M&S Initiative: Envisioned Roadmap Towards M&S of the Full Ship Shock Trial



Mature Test Evaluation & Analysis Competency

- Support Navy T&E BOD **integrated** investment strategies
- Create end-to-end transparency in demand signals, improve execution capacity and efficiency, reduce cost of execution and ultimate deliverables, and improve customer satisfaction

Enable System Engineering To Support Acquisition via Integrated Strategic Planning

- Emphasize enterprise **integrated** solutions versus platform or singular domain focus across PEO T&E Directors, HQ & Warfare Centers T&E Executive activities
- Enable Navy T&E in a **Joint** Environment
- Enable Affordable T&E of Open Architecture Systems