Welcome to:

International Test and Evaluation Association

The Greater San Diego Chapter

www.itea-sd.org

April 12, 2007

Our Speaker:

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Commanding Officer
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BOEING

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Discussion on Electronic Kill Chain Modeling and Simulation

Navy Center
for Tactical Systems Interoperability
(NCTSI)

April 12, 2007

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Slide Flow

- Intro / Vision
- Modeling and Simulation
  - Electronic Kill Chain
- Network Enabled Weapons
- Implementation: System Development
- Summary

This brief has been given to C7F J6, USFJ J3 and J6, ASN RDTE Chief Systems Engineer, and NMSO

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NCTSI Core Mission and Function

- **Configuration Management** of Navy, Joint, and Allied documentation, data formats, and message standards. Navy spokesperson for interoperability requirements in Joint and Allied forums.

- **Fleet Support** Assess unit-level, datalink readiness (operator proficiency, hardware operation, and software), during the FRTP.

- **Network Design Facility** Design, build, test, and distribute Link 16 networks for all USN platforms (load files), for all L16 Networks.

- **Interoperability Certification Testing** and development of interoperability criteria for Navy C4I and data link systems, issue certifications, and Participating Test Unit Coordinator (PTUC) for Joint testing at Joint Interoperability Test Command.

Modeling, Simulation, and Mission Planning Vision

- An Operational Level Mission Planning and Modeling / Simulation tool that comprehensively captures, for all nodes, the Electronic Kill Chain parameters, enables tailoring of enemy and coalition (friendly) forces, and exhaustively evaluates the kill chain:
- From the NMCI / Shipboard desktop.

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EKC
Discussion Points

- **M & S Capability Gap**
  - **Tailoring a Force or a Threat**
  - **M&S a scenario quickly**
  - **Costs of Synthetic "Simulation" based Training**
- **Proliferation in growth of L16 Platforms**
  - **More platform types**
  - **More nodes in the EKC**
  - **Lack of Service Oriented Architecture**
    - **Requires proprietary architecture**

Current JFCOM Joint Mission Thread Test for Close Air Support (JMTT CAS) has a 2 year timeline, delivering incremental results.

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Inputs to Key Stakeholders

- **Mission planning / simulation tool:**
  - **Fast: Concept to Results**
  - **Tailor-able**
    - **Show Results of multi-variable analysis**
    - **Tailored force, tailored threat, many scenarios**
    - **Support a specific mission focus**
      - **Maritime Interdiction or Close Air Support**

Return on Investment: provide inputs to

a) **Fleet Commanders / JTFs. Evaluation / Refinement of TTP**
b) **Acquisition processes for field engineering solutions**
c) **Training and readiness organizations**

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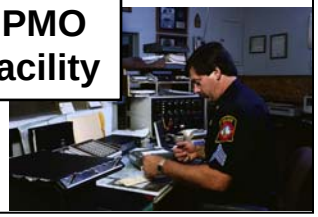
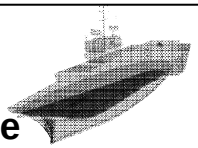
Current Simulation Environment

Simulator Based Training Environment: Requires Networked Mission Equipment, Qualified Personnel, Planning, Execution, and Analysis: Difficult and Expensive.

Shore PMO Test Facility

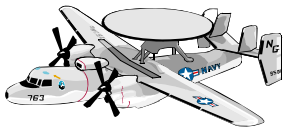


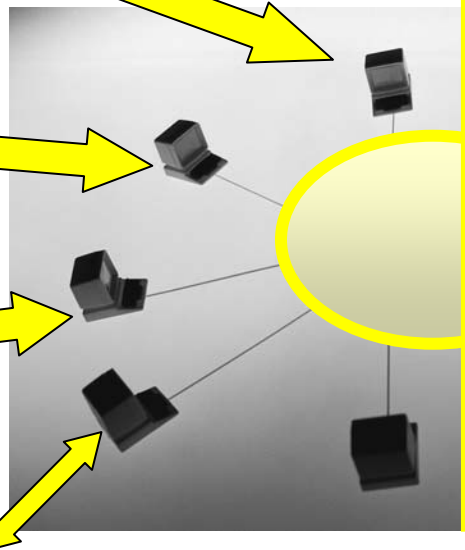
BFTT Pierside
Battle Force Team Trainer



BFTT Pierside

EDRT
Electronic Deployable Readiness Trainer





Game Floor
Game Control

Outputs

- Hotwash
- Hot Items
- Data Extract
- Analysis
- Report Out

Great Training
Limited Findings
Limited Flexibility
Not M & S

Timeline = 3 to 4 months

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Electronic Kill Chain Analysis

- Very limited EKC simulation capability
- No electronic mission planning capability
- Tools
  - Inconclusively capture all parameters
  - No tool captures what happens inside the cockpit
- Current environment
  - Pencil / paper planning (Fleet Mission Planning))
  - Fleet Synthetic Training: (Readiness Training)
  - Interoperability Test Infrastructure: (Acquisition)

Significant level of effort to get results at the platform Combat System / OFP level.

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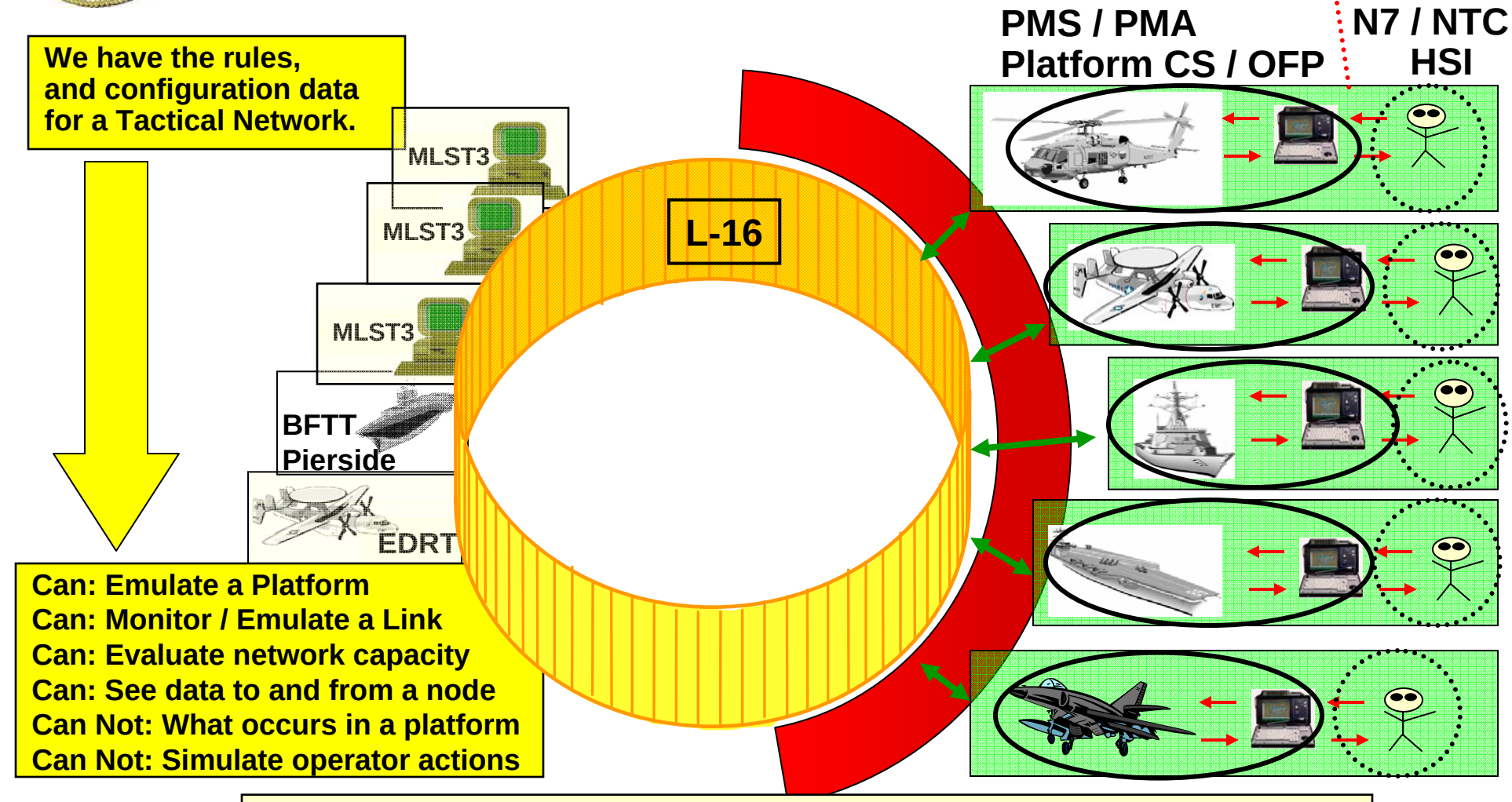
Electronic Kill Chain
M&S Capability Gap



Without Mission Equipment We have NO ability from the NW interface thru the platform and back.

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Future Actions

- M&S PG School: Student thesis
  - Evaluate Operational Level Mission Planning and Modeling / Simulation Capability Gap
- Brief Fleet J6's, CFFC N7, OPNAV N81, ASN RDTE
- Assign Lead Agent
  - Identify Partnerships and Stakeholders
  - Key Actions / Critical Path
  - Functional Area Analysis / Functional Needs Analysis
- Establish and Prioritize as a requirement
  - FFC, ASNRDA, CNO
- Develop EKC Modeling and Sim capability

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Thesis Objectives

- Verify the M&S / MP Gap in Capability
- Identify resources available today
  - Tools / Applications
  - Organizations / People
    - Distributed Engineering Plant
- Inputs and Outputs
- Customers and Stakeholders
- Project Plan
  - Critical Path
  - Notional Timelines
  - Technical Requirements
- Return on investment

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Global Detachments
Fleet Readiness

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Fleet Support Department Mission

- **Aircraft Carrier Training and Readiness Manual**
  - CNAFINST 3500.20A 10 Mar 2005
- **TDL Operational Verifications (TOVs)**
  - CVs: Twice per FRTC.
  - CVW-embarked aircraft: Once per FRTC.
  - FDNF (CVs and aircraft): Once every nine months.

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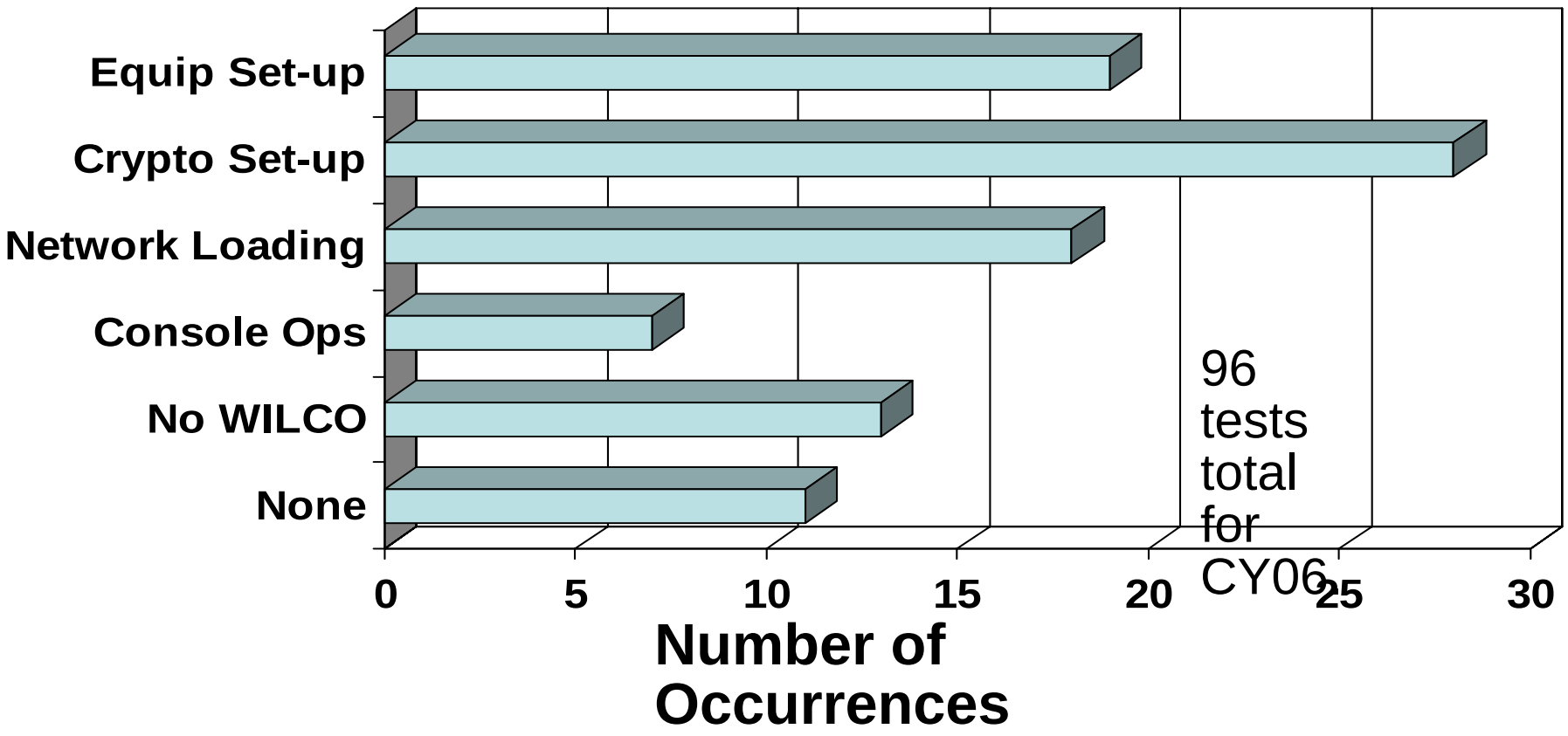
Datalink Readiness Metrics Example



Feedback provided to COs, ISICs, and programming centers

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Joint Mission Thread Test

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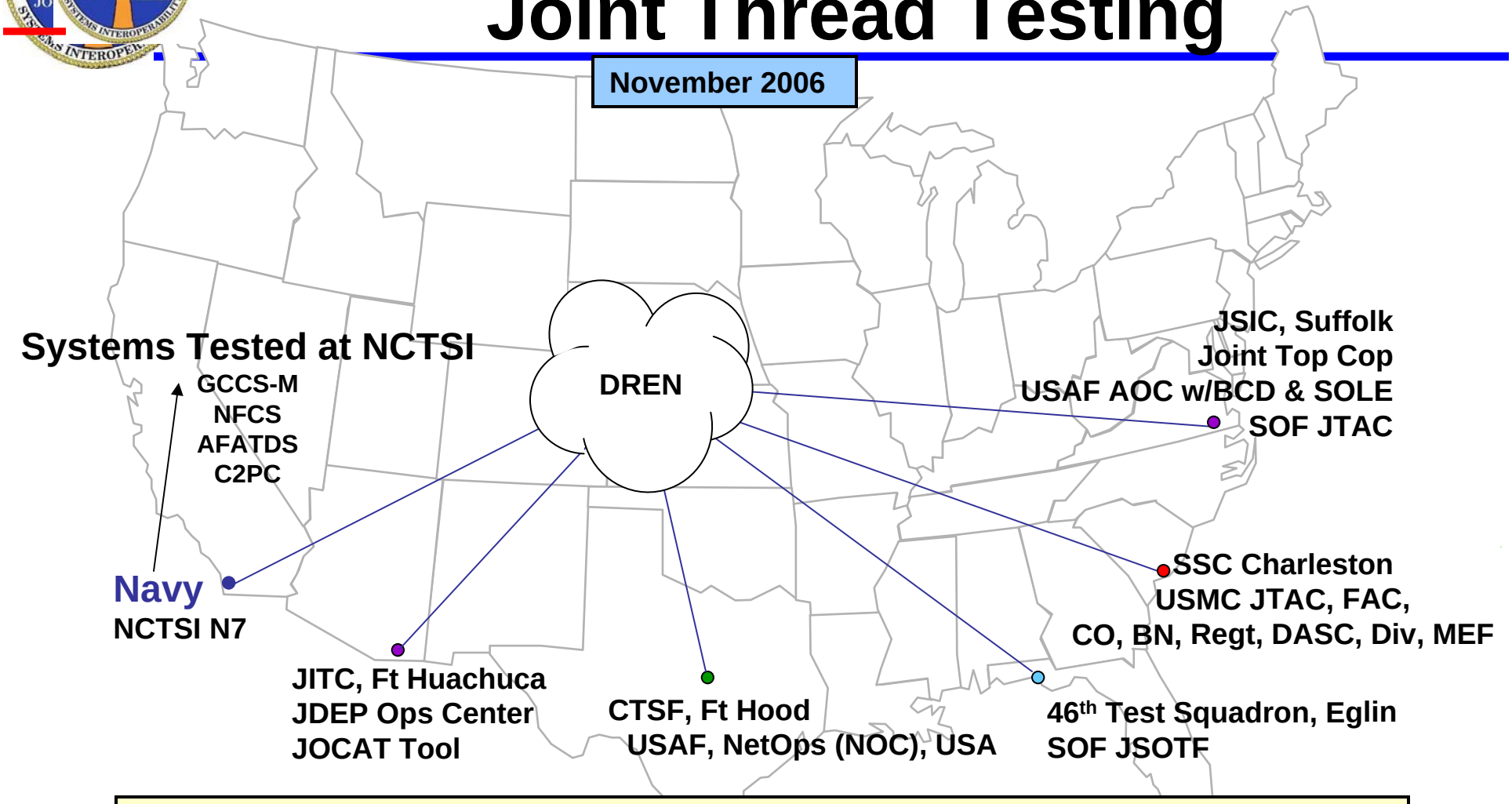
JBMC2 JCAS (Event 2)
Joint Thread Testing

November 2006



Results: a) Successful test in distributed, joint environment,
b) Layed foundation for persistent C2 evaluations,
c) Supported goals of Federated Distributed Certification Environment

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Network Enabled Weapons

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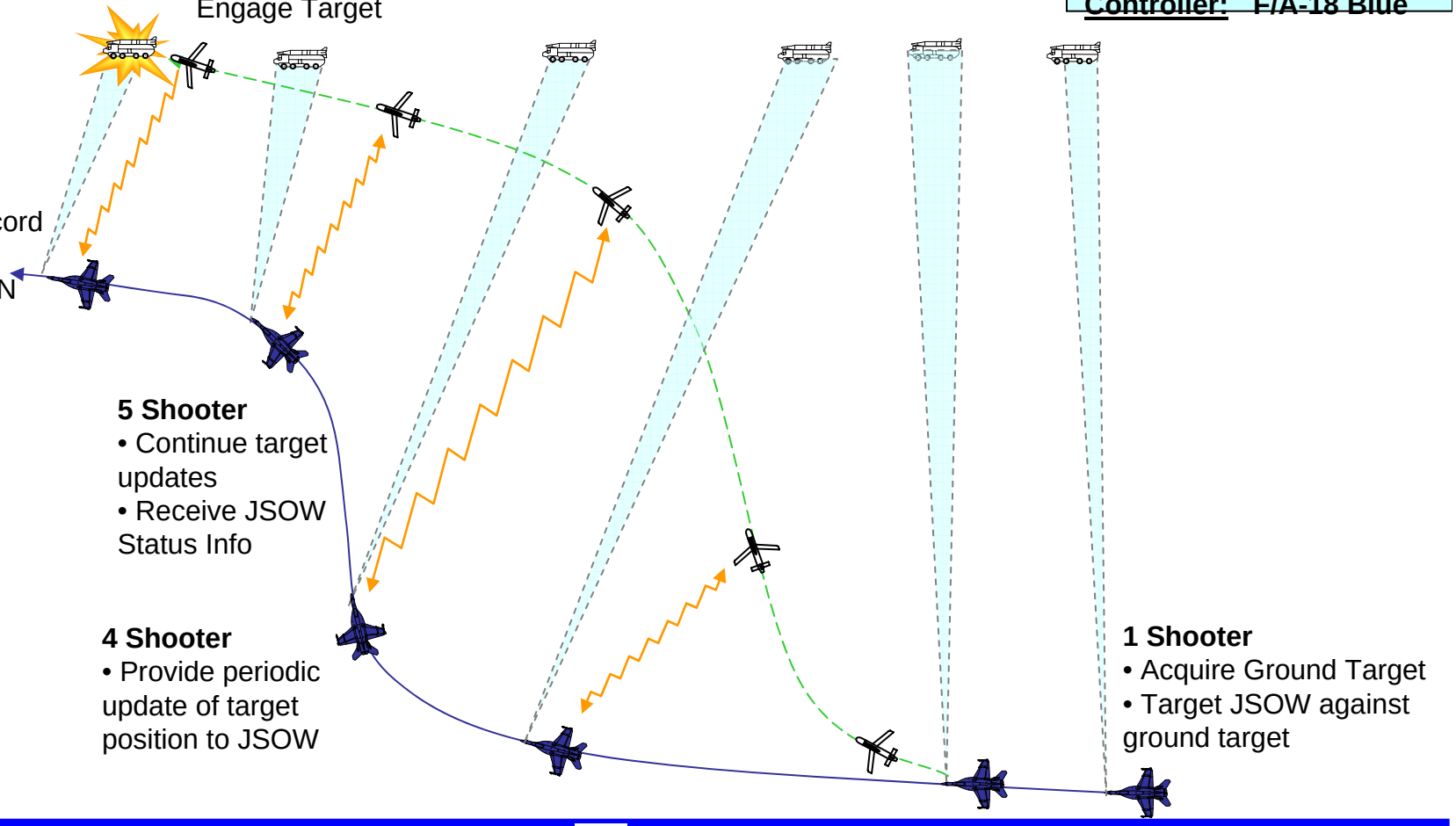
NEW: Moving Target Engagement Single Ship

Shooter: F/A-18 Blue
Targeteer: F/A-18 Blue
Controller: F/A-18 Blue

6 JSOW
• Send BHI data and Engage Target



7 Shooter
• Receive and record BHI data
• Terminate WDLN updates

5 Shooter
• Continue target updates
• Receive JSOW Status Info

4 Shooter
• Provide periodic update of target position to JSOW

1 Shooter
• Acquire Ground Target
• Target JSOW against ground target

3 Shooter
• Begin Post-launch communication with JSOW

2 Shooter
• Launch JSOW against ground target

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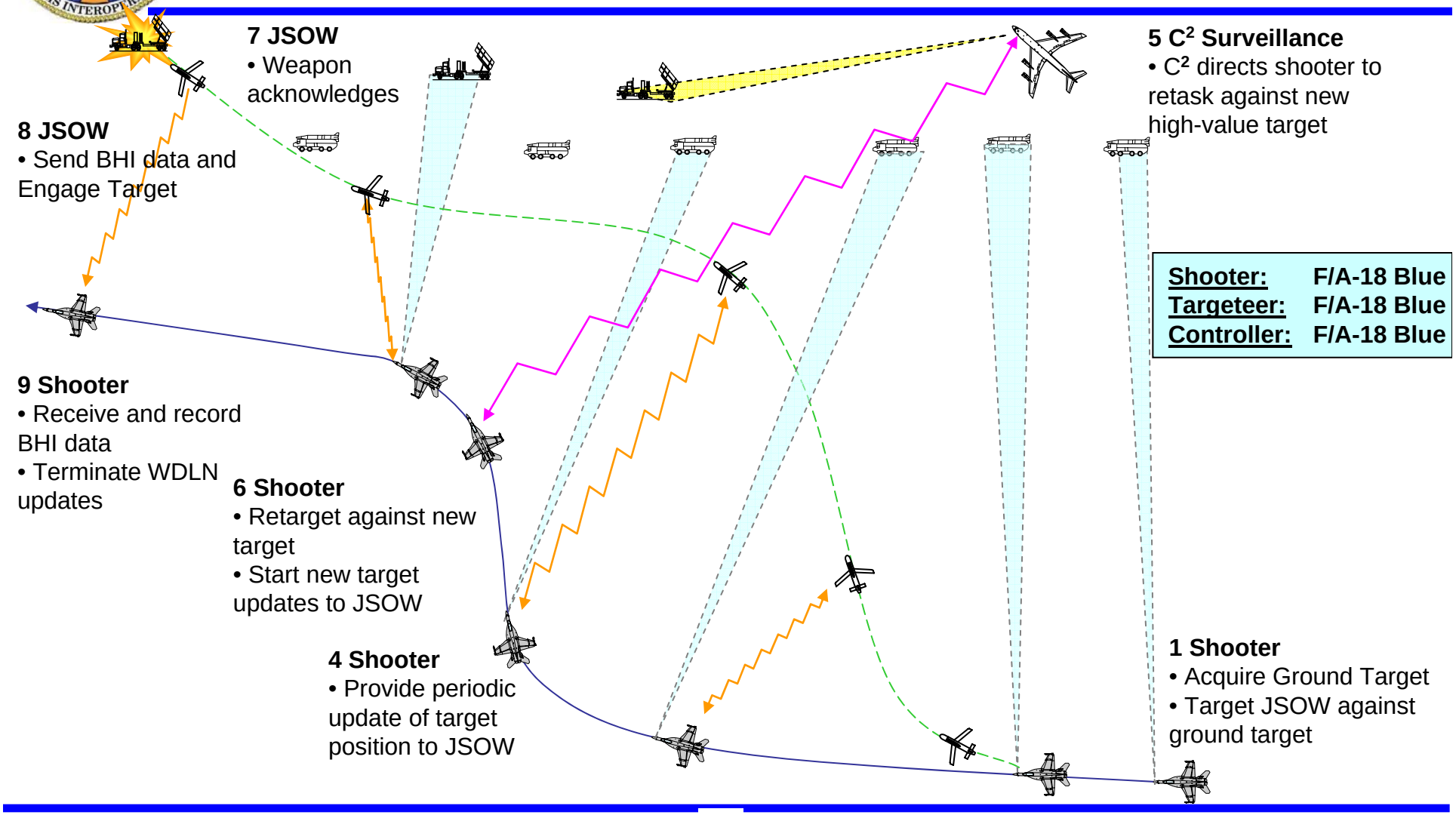
NEW: In Flight Tasking



7 JSOW
• Weapon acknowledges

5 C^2 Surveillance
• C^2 directs shooter to retask against new high-value target

8 JSOW
• Send BHI data and Engage Target

Shooter:	**F/A-18 Blue**
Targeteer:	**F/A-18 Blue**
Controller:	**F/A-18 Blue**

9 Shooter
• Receive and record BHI data
• Terminate WDLN updates

6 Shooter
• Retarget against new target
• Start new target updates to JSOW

4 Shooter
• Provide periodic update of target position to JSOW

1 Shooter
• Acquire Ground Target
• Target JSOW against ground target

3 Shooter
• Begin Post-Launch Communication with JSOW

2 Shooter
• Launch JSOW against ground target

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Developing Systems that Use Tactical Data Links

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System Development

- What I send and who needs it
- Tactical Data Link (TDL) Implementation
  - Describes transmission and reception of TDL messages exchanged digitally on the network
  - No platform processes all of the L16 message standard
- ID/ Solve problems before production / EDM's are produced

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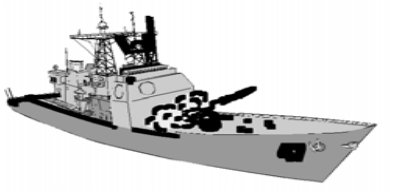
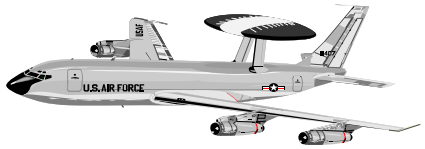
Easy Interoperability?



Surface C2



Air C2

Fighter

Fighter/Attack

J3.5	=	J3.5	=	J3.5	=	J3.5
J3.5I		J3.5I		J3.5I		J3.5I
J3.5E0		J3.5E0		J3.5E0		J3.5E0
J3.5C1		J3.5C1		J3.5C1		J3.5C1
J3.5C2		J3.5C2		J3.5C2		J3.5C2
J3.5C3		J3.5C3		J3.5C3		J3.5C3

"Surveillance Points Message" implementation across several systems

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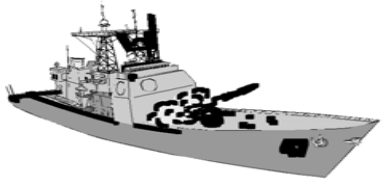
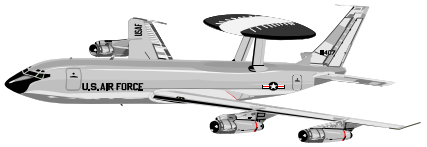
Easy Interoperability?



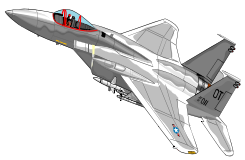
Surface C2

J3.5
J3.5I
18 Elements
J3.5E0
8 Elements
J3.5C1
9 Elements
J3.5C2
2 Elements
J3.5C3
12 Elements



Air C2

J3.5
J3.5I
9 Elements
J3.5E0
5 Elements
J3.5C1
9 Elements
J3.5C2
2 Elements
J3.5C3
2 Elements



Fighter

J3.5
J3.5I
8 Elements
J3.5E0
3 Elements
J3.5C1
5 Elements
J3.5C2
2 Elements
J3.5C3
2 Elements

Fighter/Attack

J3.5
J3.5I
16 Elements
J3.5E0
5 Elements
J3.5C1
10 Elements
J3.5C2
2 Elements
J3.5C3
11 Elements

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iSMART

- iSMART: A process involving early analysis, uniform documentation and transaction based requirements
- Tools: Exist or in development which will aid PMO's
- New -vs- Legacy: iSMART can apply to both
- iSMART Handbook: A Joint Service Roadmap
- iSMART Status:
  - Submitted to CNO N6F and JFCOM ISO JBMC2 Roadmap
  - Briefed to CNO N6F, JSJ6 IP, Pending MCEB schedule

Managing TDL implementation for DOD

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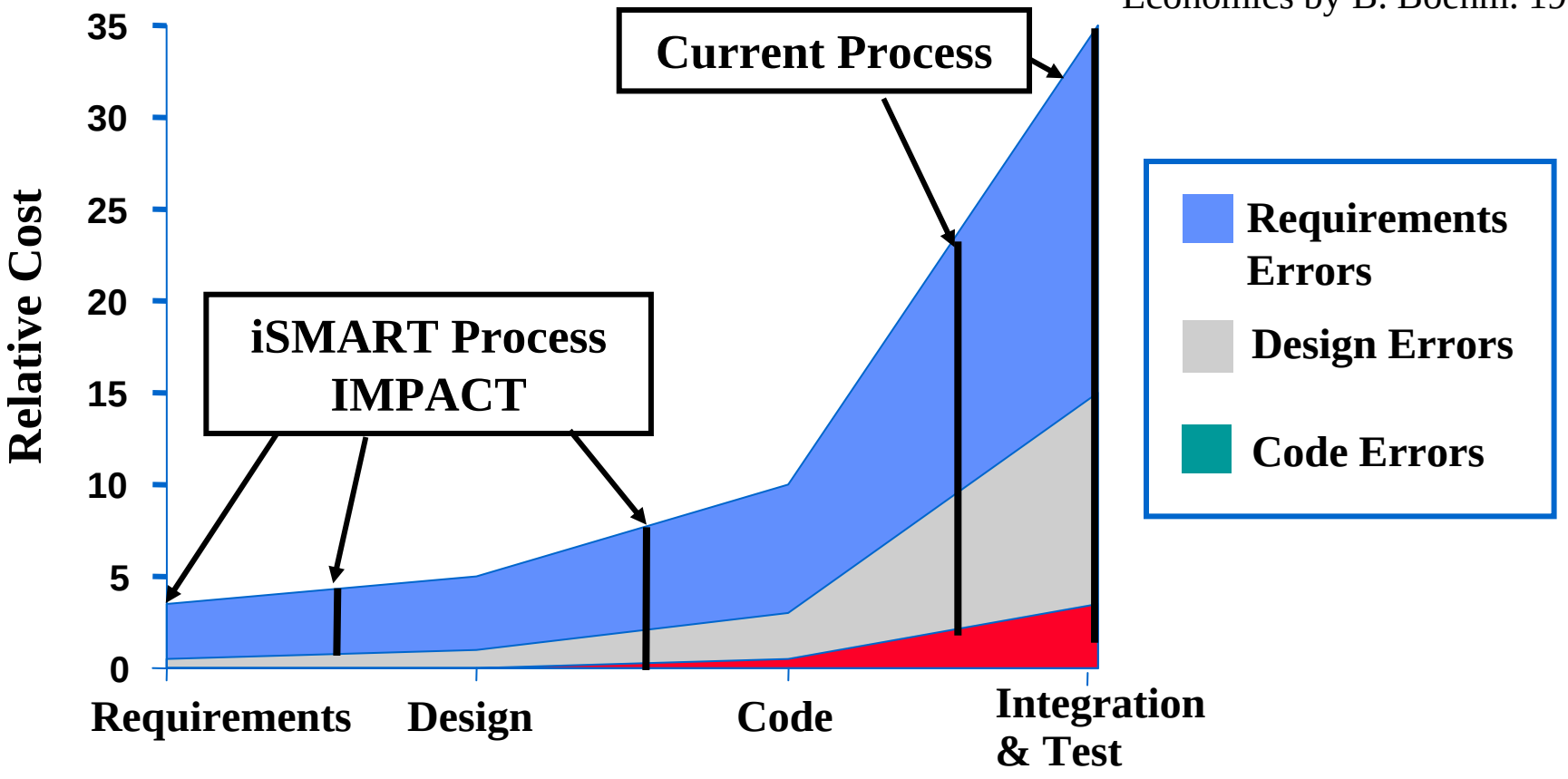
Cost of Resolving Software Errors

Source: Software Engineering Economics by B. Boehm. 1981



Early error detection = better quality at FOC, lower costs to mitigate.

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System Development and iSMART

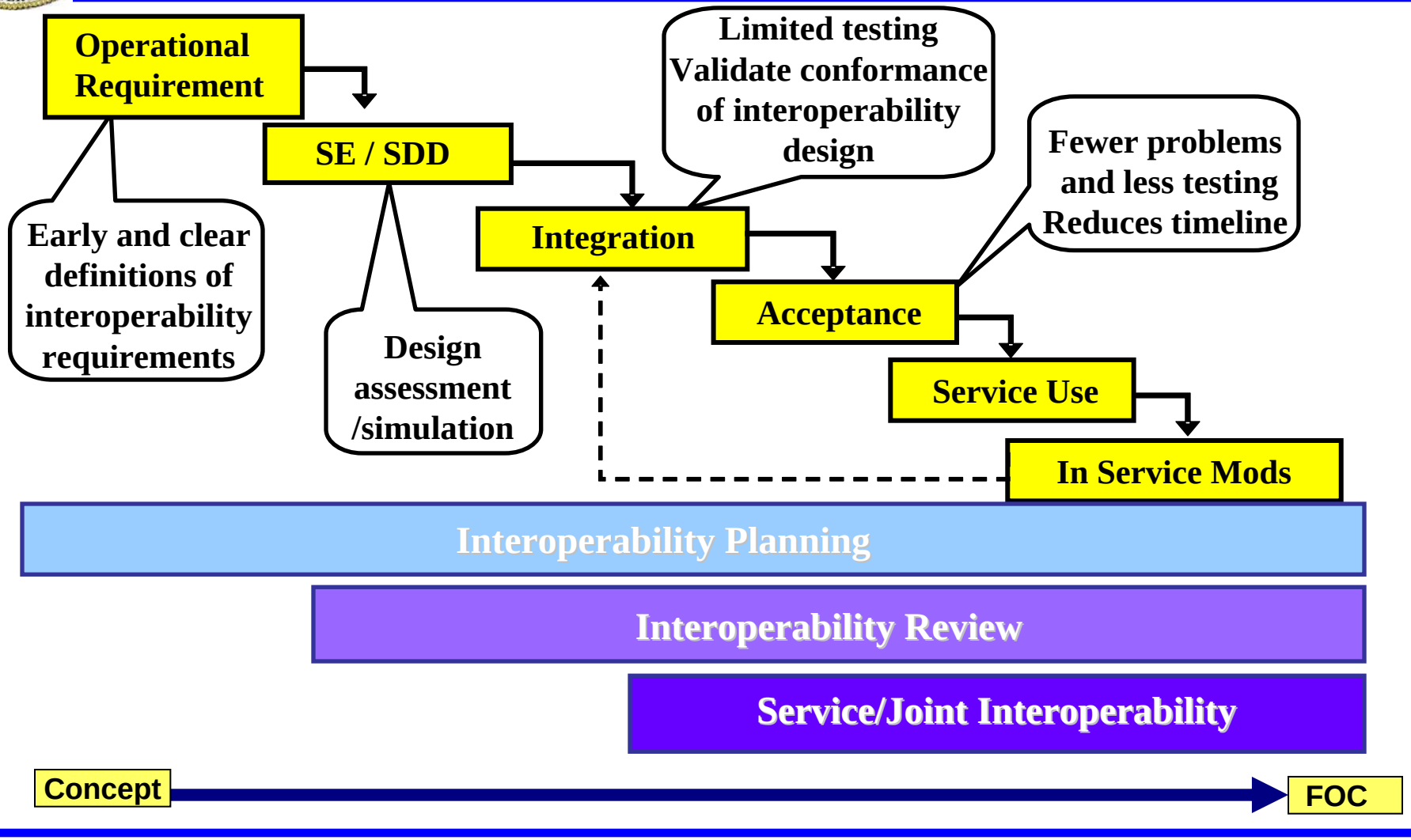

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Figure 6-1

US Navy iSMART Platforms

- EA-6B
- MMA (P-8A)
- EP-3
- AEGIS BMD
- JSF (F-35)
- MMH (MH-60)
- BAMS
- F/A-18
- JSS
- CLIP

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Engineering for Success

March 2007: MMH is in DT. No Tactical Data Link Implementation problems noted.

MMH (MH-60)

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QUESTIONS?

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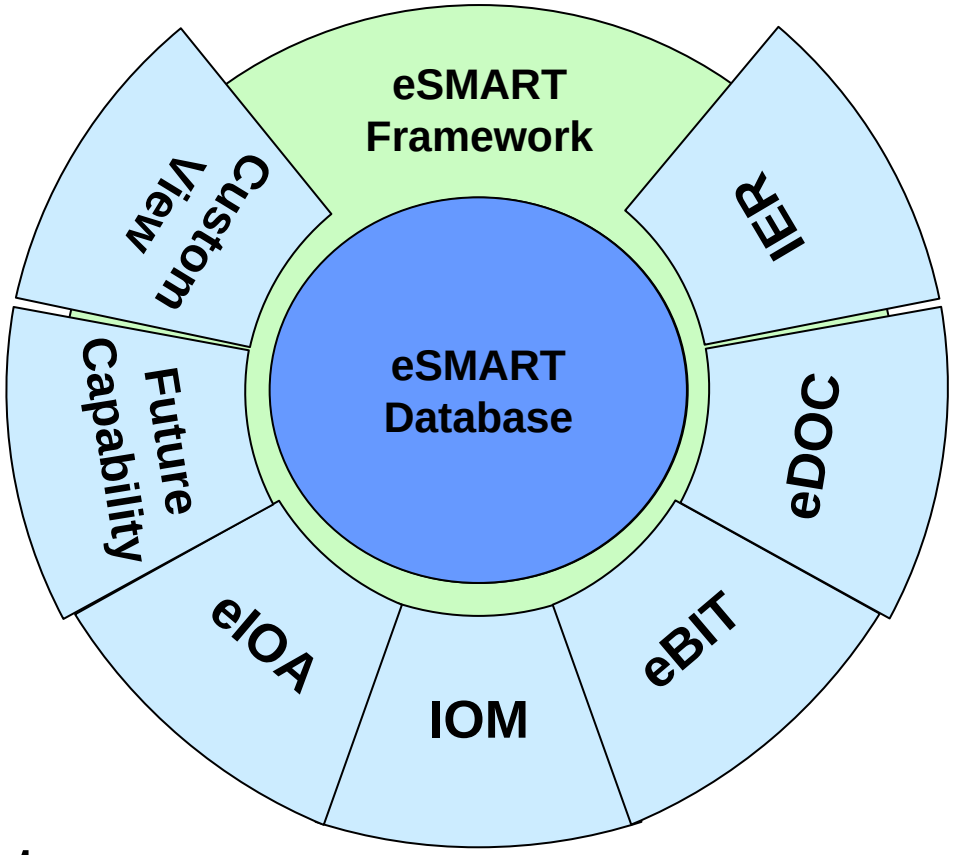
eSMART Tool Set

- **Software tools to support iSMART**
  - **A central repository of**
    - **platform capabilities**
    - **interoperability issues**
  - **Automation**
    - **reduce manpower requirements**
    - **Reports and analysis**
- **USAF Lead developer**
- **USN endorses**
- **Configuration Management migrating to DISA**



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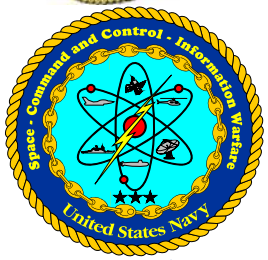
Organizational Structure



ADDU for CM & Test

One Two Four Five Detachments

NATO

JOINT

USCOMPAC

NAVSEA

NAVAIR

SPAWAR

DISA

JITC

COMUSNAVEUR

COMSECONDFLT

COMTHIRDFLT

COMFIFTHFLT

COMSIXTHFLT

COMSEVENTHFLT

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