



NORTHROP GRUMMAN

Integrated Systems



Industry Independent Research and Development (IR&D) Investments

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DEFINING THE FUTURE

Outline ...

- IR&D Overview
 - DoD Regulation & Policy
 - Discretionary Resource Summary
- IR&D Application and Management
 - Allocation Process & Strategy
 - Measures of Effectiveness
- Examples of Successes
- Summary



IR&D Overview

- **DoD Regulation & Policy Encourages Contractors to Undertake IR&D Activities That May Further National Security in a Broad Sense, May Lead to a Superior Military Capability, or May Lower the Cost and Time Required for Providing That Capability.**
- **IR&D is a Critical Investment Resource That Allows Contractors to:**
 - **Meet Current and Future Warfighter Needs**
 - **Foster Company Growth & Competitiveness**

What is IR&D?

Regulation & Policy (Excerpt)

Federal Acquisition Regulation (FAR) 31.205-18(a)

"Independent Research and Development" is R&D initiated and conducted by defense contractors independent of DoD control and without direct DoD funding. IR&D includes: (1) basic research, (2) applied research, (3) development, and (4) systems and other concept formulation studies. IR&D does not include R&D performed under grant or contract from the Government or third parties and does not include technical effort specifically to support bid or proposal activities.

DoD Instruction 3204.1, "Independent Research and Development," May 10, 1999

Under Section 2372 of 10 U.S.C. (reference (b)), contractors shall be encouraged to undertake IR&D activities that may further national security in a broad sense, may lead to a superior military capability, or may lower the cost and time required to provide that capability. IR&D activities intended to accomplish any of the following are of potential interest to the Department of Defense:

- Enable superior performance of future U.S. weapon systems and their components.
- Reduce acquisition costs and life-cycle costs of military systems.
- Strengthen the defense industrial base and the technology base of the United States.
- Enhance the industrial competitiveness of the United States.
- Promote the development of technologies identified as critical under Section 2506 of 10 U.S.C. (reference (b)).

Industry Independent Discretionary Investment

Non-Contractual Technical Activity (NCTA)

Overhead Technical Activity (OTA)

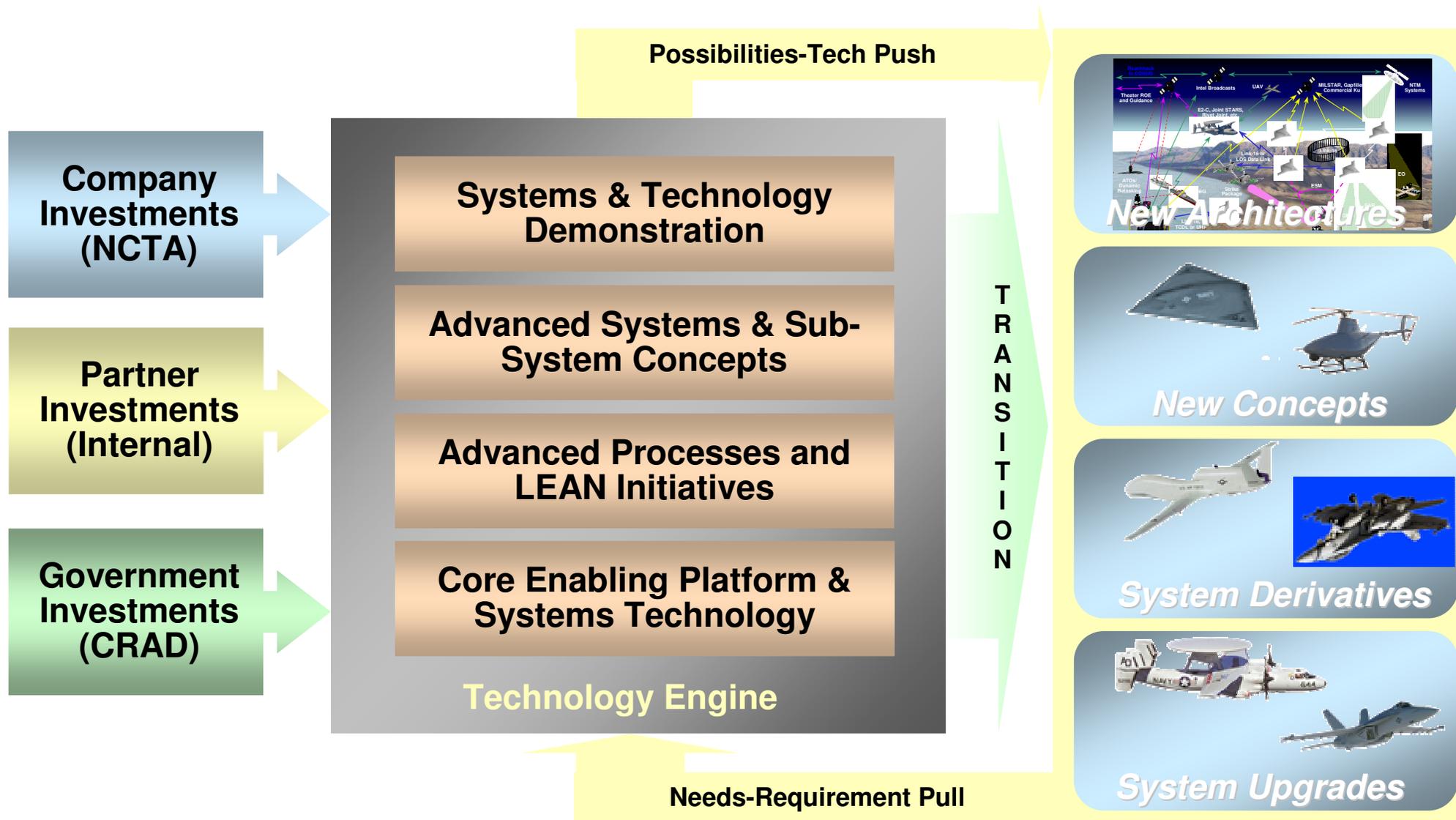
- Independent Research & Development (IR&D)
- Bid & Proposal (B&P)

Overhead Technical Support (OTS)

- Marketing & Sales (M&S)
- Manufacturing Technical Activity
- Information Technical Activity
- Environmental Technical Activity
- Current Technology Documentation Cost

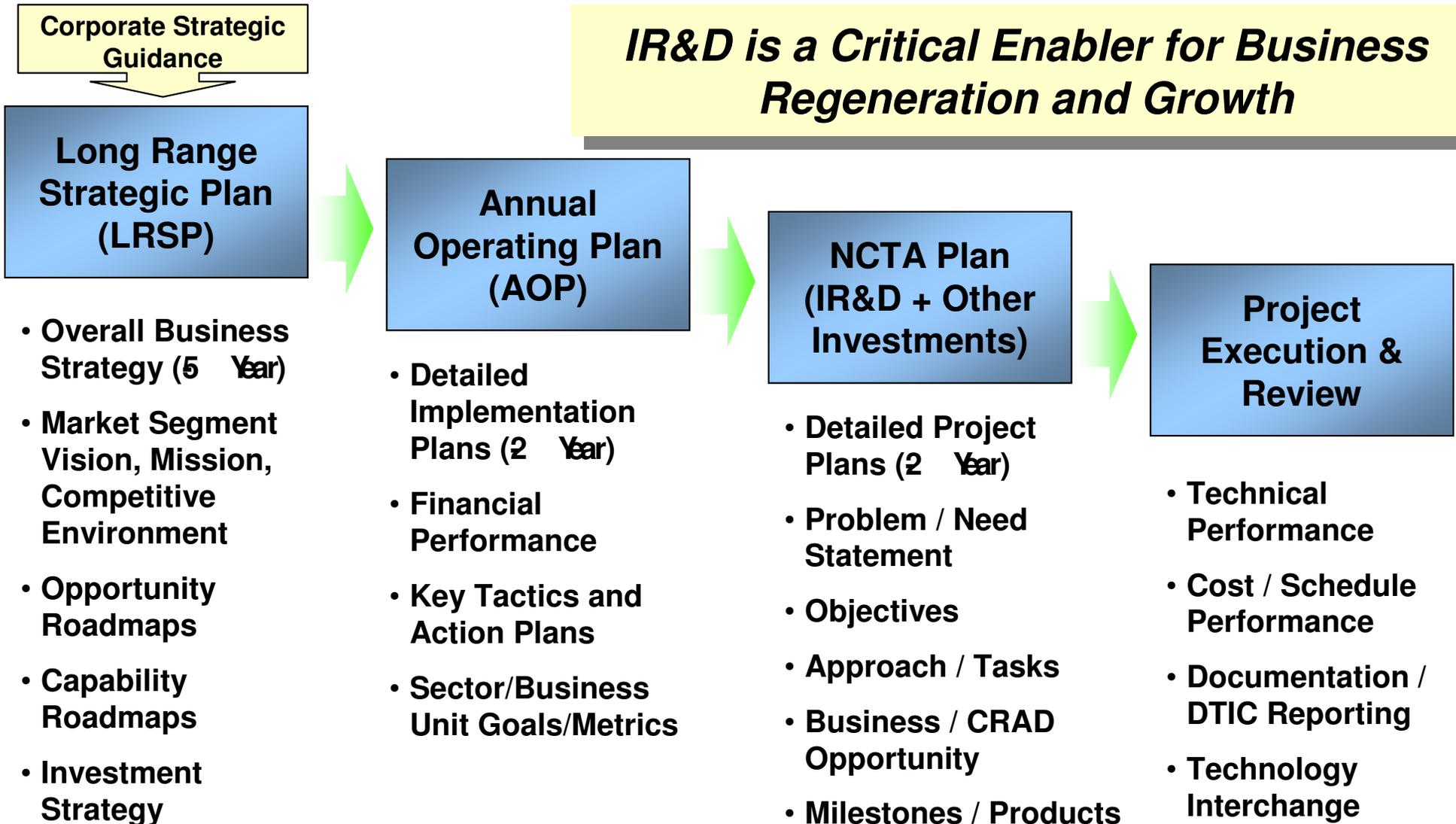
Total Discretionary Resource Includes Several Classes of Funding That Contribute to Technology / Program Development & Transition

Transitioning Technology to the Warfighter

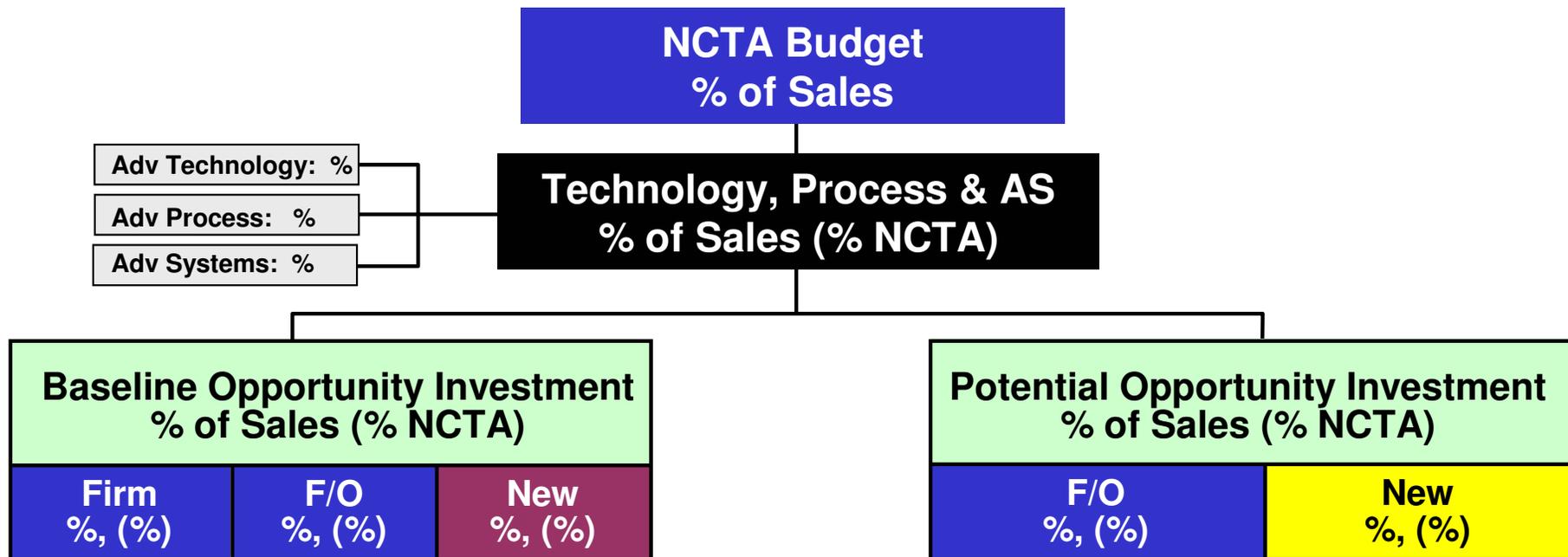


IR&D Application and Management

Integrated Strategic Planning & Development



Top-Down Allocation Strategy (Example)



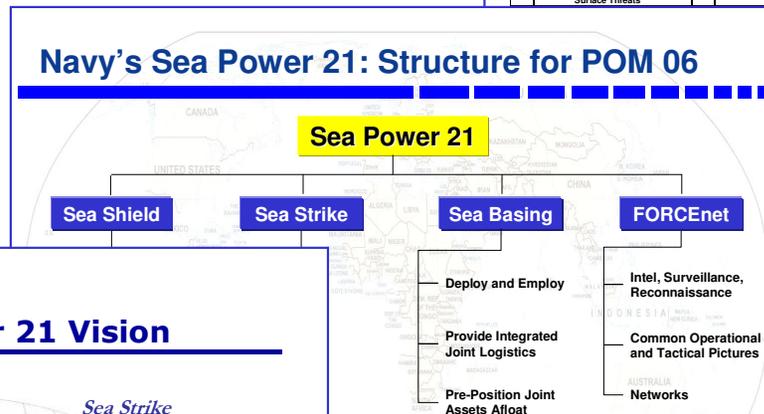
Business Unit Top-Down Allocation Strategy Based on LRSP Planning Guidance and Strategic Direction

Sea Power 21 Structure



Sea Power 21 Capabilities

Sea Shield	Sea Strike	Sea Basing	FORCEnet
Protect Against SOF and Terrorist Threats	Conduct Strike Ops: Fixed Land Targets	Close the Force and Maintain Mobility	Provide Communications Infrastructure
Mitigate Effects of CBRNE	Conduct strike Ops: Moving Land Targets	Provide at Sea Arrival and Assembly	Provide Network Protection
Provide Self-Defense Against Surface Threats	Conduct Special Ops: Precision Targeting	Allow Selective Offload	Provide Network Synchronization
	Special Ops: Direct Action	Reconstitute and Regenerate At Sea	Provide Information Transfer
	Intensive Information Jamming	Provide Sustainment At Sea	Conduct Sensor Management and Information Processing
	Intensive Information Work Attack	Provide Sustainment for Operations Ashore	Detect and ID Targets
	At-Sea Survivability	Provide Focused Logistics	Provide Cueing and Targeting Info
	Decision Fires	Provide Shipboard and Mobile Maintenance	Assess Engagement Results
	Volume Fires	Provide Force Medical Services	Provide Mission Planning
	Extended Range Fires	Provide Advanced Base Support	Provide Battle Management Synchronization
	Repositioning, Resupply, and Support	Integrate and Support Joint Personnel & Equipment	Provide Common PNT and Environmental Info
	Use of Gravity and Inertial Navigation	Provide Allocated C2 Physical Infrastructure	Integrate and Distribute Sensor Info
	Pre-Positioned Follow-on Operations	Provide AFSS Capability for Joint Operations	Track and Facilitate Engagement of Time Sensitive Targets
	Pre-Positioned (Strategic) Strike		Track and Facilitate Engagement of Non-Time Sensitive Targets
	At-Sea Survivability		



- § 4 Naval Capability Pillars
- § 14 Mission Capability Packages
- § 56 Underpinning Capabilities
- § 3 Cross-Cutting Operational Processes

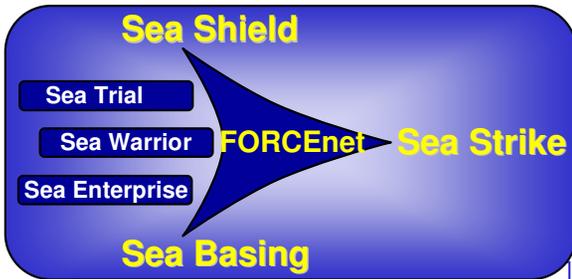
USN Sea Power 21 Vision

- Sea Shield**
Projecting Global Defensive Assurance
- Sea Strike**
Projecting Precise and Persistent Offensive Power
- Sea Basing**
Projecting Joint Operational Independence
- FORCEnet**
Architectural Construct for Naval Warfare in the Information Age

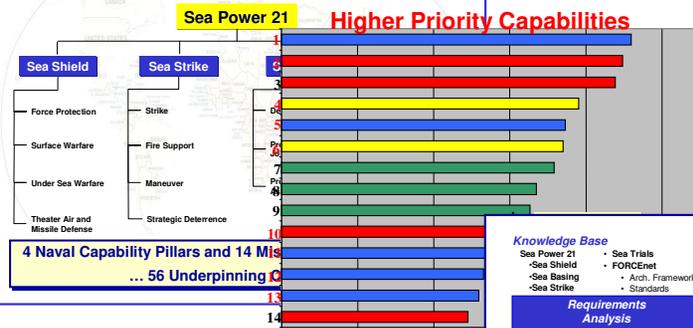
USN Prioritization of Sea Power 21 Capabilities Provided Strategic Guidance for POM 06 Funding Decisions

Sea Power 21 Integration Process

Customer's Vision



Navy's Sea Power 21: Structure for POM 06



... Aligning with Our Customer's Required Capabilities

Investment Roadmaps

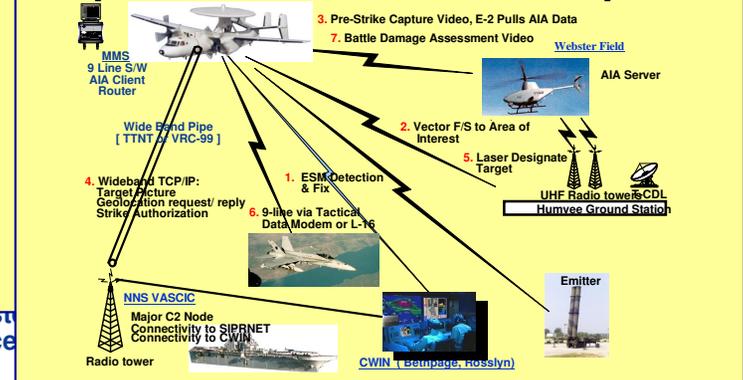
Technology Maturation Roadmaps

Products / Systems Roadmaps

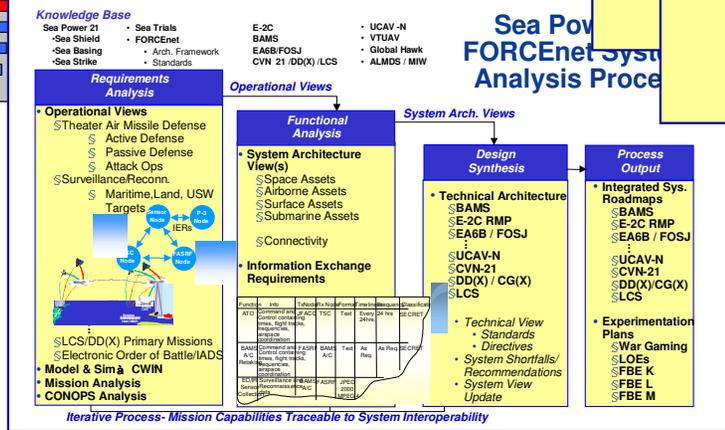
Systems Architecture Roadmaps

Experiment & Demo Roadmaps

Linkage



... Defining the Future!



Iterative Process- Mission Capabilities Traceable to System Interoperability

... Systems Engineering The Opportunity Space

Measuring How We're Doing...

Strategic / Business Unit Level

- Compound Annual Growth Rate (CAGR)
- Warranted Equity Value (WEV)*
- CRAD Generation (Portfolio Level)
- Competitive Win/Loss Ratio

Measures:

- Success of the Enterprise
- Customer Satisfaction
- Shareholder Value

Tactical / Project / Technology Level

- Technical Performance vs Objectives
 - Measurable Technical / Capability Impact
 - Cost Benefit / Impact
- Cost/Schedule Performance
- Technology Readiness Level (TRL)
- Risk Level (P_o , C_f)
- CRAD Generation
 - Tangible Customer Interest

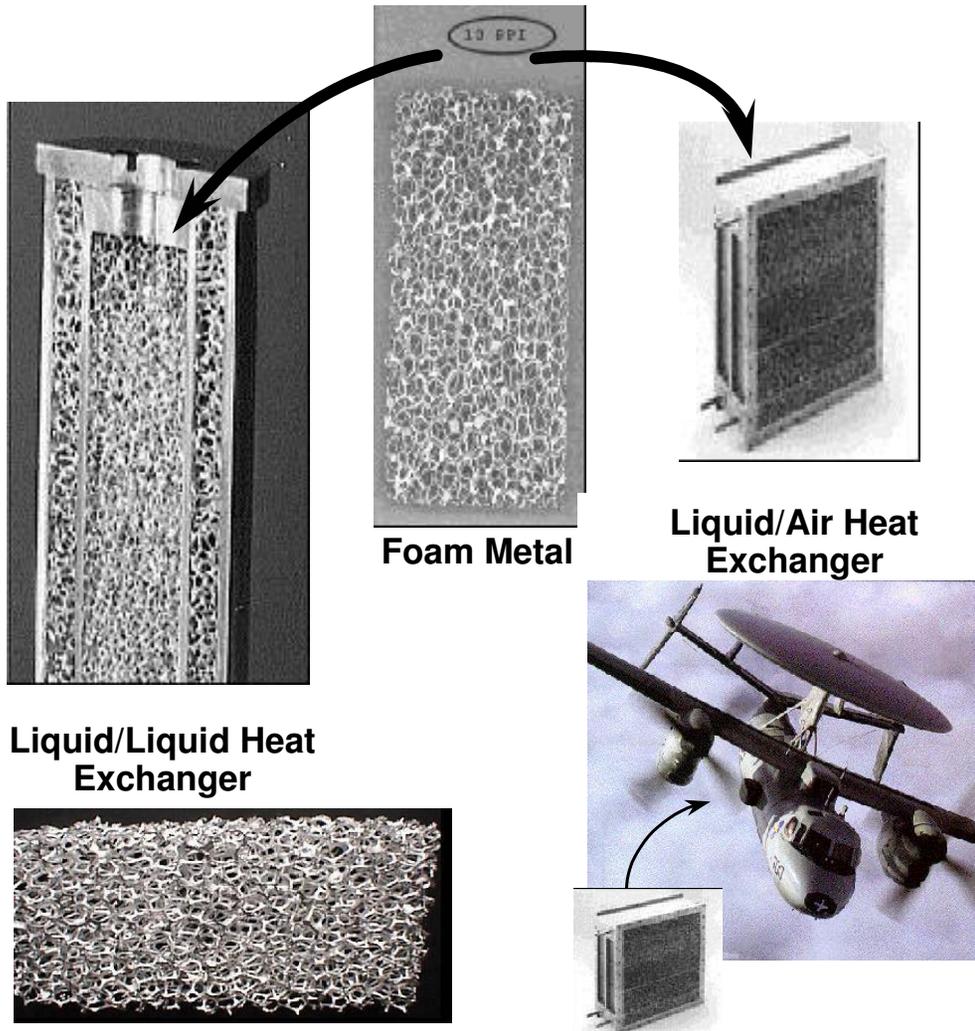
Measures:

- Technology Influence/Value
- Technology Maturity/Risk
- Project Status vs Plan
- Customer Interest

* WEV Addresses Net Income, Cash, Working Capital, Fixed Capital

Example: Systems-Level Benefit

High Efficiency Porous Metal Heat Exchangers



- **Problem/Need**
 - Three Fold Increase in Advanced E-2C Heat Load Will Require More Efficient Heat Exchangers
- **Approach**
 - Foam Metal Heat Exchangers Offer 2-10X Efficiency
 - Typical Sub-System Level Benefits
 - 30% Reduction in Weight
 - 40% Reduced Area/Volume
 - 47% Drag Reduction
 - Typical System Level Benefits
 - 10% SERC
 - 1% Average Altitude
 - 2% Time-On-Station
 - Packaging, Integration, Cost

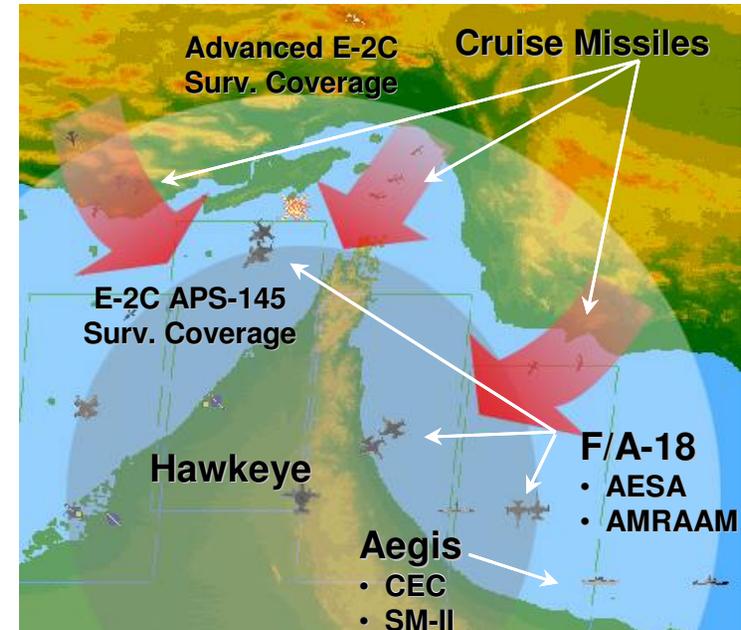
Advanced Porous Metal Heat Exchanger Technology Enables Improved Aircraft Systems Integration & Performance

Example: System-of-Systems-Level Benefit

Networked Systems Contribution to CMD

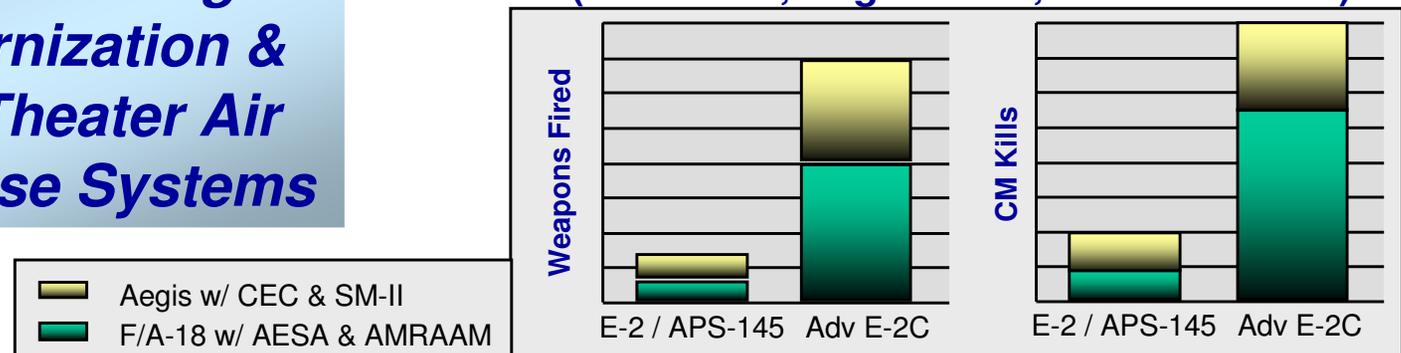
- Airborne Surveillance Provides Greater Detection Volume & Alert Reaction Time & Cueing
- Exploits Aegis / CEC and F/A-18 / AESA Warfighting Effectiveness
 - >150% Improvement in AEGIS Kills
 - >500% Improvement in F/A-18 Kills
- Provides an Effective Deterrent Against Future Threats

South West Asia Scenario

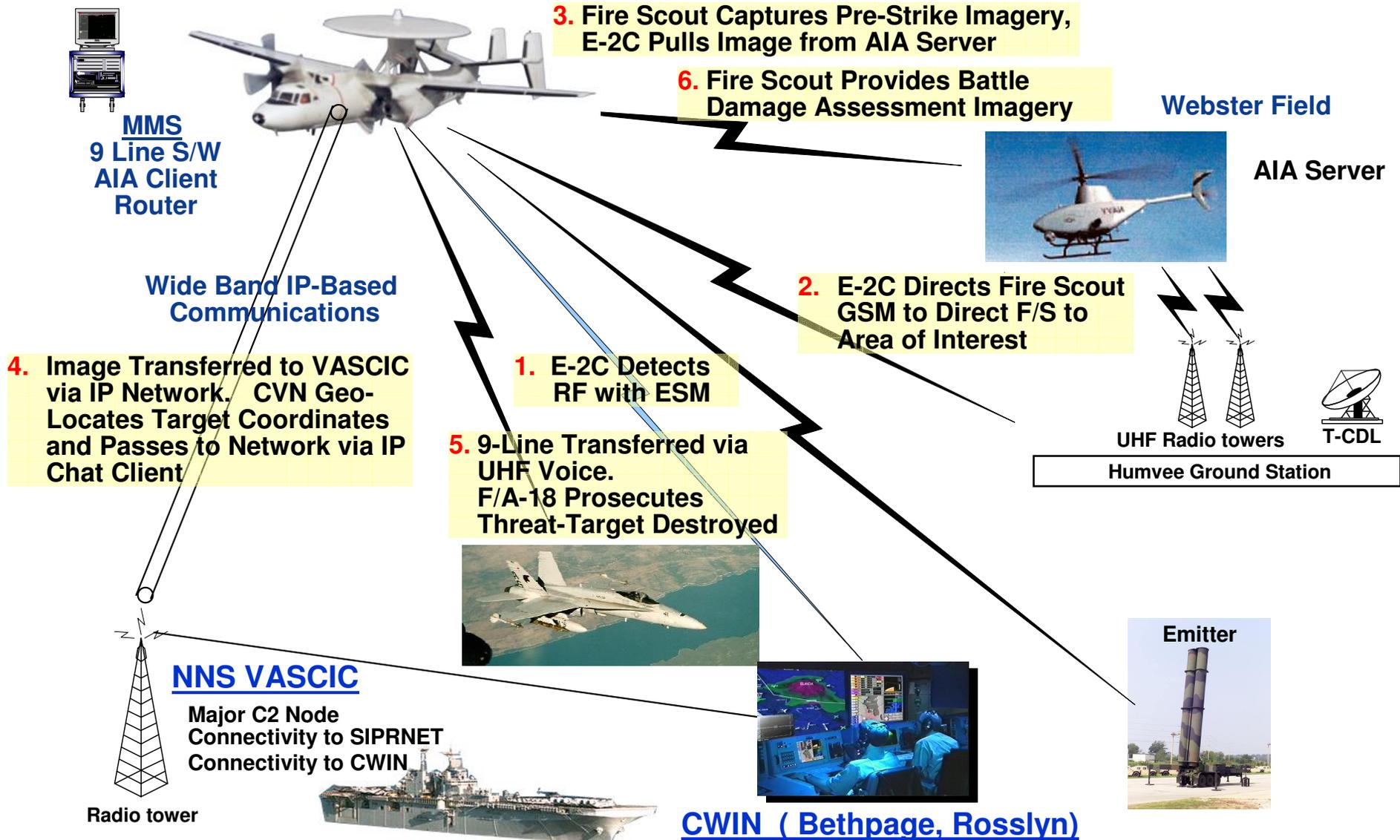


Value-Added Through Radar Modernization & Networked Theater Air Missile Defense Systems

Network Effectiveness vs. Far Term Threat (E-2/CEC, Aegis / CEC, F/A-18 / AESA)



Experimentation Supports Rapid Transition FORCEnet BMC2 / TST Demonstration



Summary

- **IR&D is a Critical Industry Resource that Enables Companies to...**
 - Sustain and Grow their Business
 - Mature Current Products
 - Develop of Future Products
 - Assure a Relevant and Competitive Tech Base
 - Evolve Cost Effective Processes
 - Transition Technology to the Warfighter
- **Allocation of IR&D/Discretionary Resources is the Focus of Intensive Company Processes**
 - Based on Long-Range Strategic Objectives and Near-Term Operating Plans
 - Focused on Alignment with Customer Vision
 - Influenced by Emerging Trends and Approaches (e.g., Capability-Based Planning, JCIDS)
 - Metrics Are Applied to Assure Appropriate Returns on Investments



IR&D / Transition Success Predicated on Effective Government / Industry Communication, Collaboration, Planning, and Resource Management

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