

Status and Future of the Naval R&D Establishment

Public Briefing
September 23, 2010

2010 Summer Study
Sponsored by
Hon. Sean Stackley

Assistant Secretary of the Navy
(Research, Development, and Acquisition)

NRAC



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Executive Summary

This Naval Research Advisory Committee report on the *Status and Future of the Naval R&D Establishment* was first proposed as a study topic in late 2009 by Mr. Sean Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition.) Because its scope was broader than typical NRAC studies, the Panel was expanded by seven consultants to ensure a broad range of expertise was available to obtain and interpret the data – and ultimately to deliberate the findings and recommendations. Over 60 site visits and more than 600 man-days were logged to ensure a comprehensive review of the Naval Research and Development Establishment (NRDE).

The context for the study is one of mixed messages. The Secretary of the Navy (SECNAV) goals of “acquisition excellence” and enlargement of the acquisition workforce play against the assumed downward trend of DoD budgets for the foreseeable future. Also, U.S. dominance in S&T – including its application to modern warfare – is quickly dissipating, as other countries grow their own technology workforce. Never has there been a time when our Naval Forces have relied as much on technology which will be developed offshore.

The Panel was very impressed with the manner in which the entire NRDE continues to perform the critical work of supporting the Force during a critical time of two wars and an agile enemy. Broad use of the Navy Capital Working Fund provides excellent customer-performer feedback in a competition-based environment. A highly motivated workforce furnishes high-quality in-service engineering and program acquisition support.

But, the Panel is very concerned with the long-term viability of the workforce in replenishing critical technical personnel while maintaining the highest quality scientists and engineers. Also, there is concern that the mid and long-term planning, research, and development are less optimized for leveraging global technology options – as well as a lack of organizational directives for harnessing the entire NRDE in collaborative ways to carry out these tasks.

The NRAC panel has developed a set of recommendations in various areas of Technical Competency, Stewardship, Navy-After-Next, and Best Business Practices.

Technical Competency:

- Provide additional meaningful “hands on” work,
- Commit to the National Defense Authorization Act for Fiscal Year 2009 Section 219 funding to the limit authorized by law to provide discretionary funding to be applied via disciplined process,

- Provide greater incentives for both military and civilians to achieve technical expertise,
- Allocate a greater number of technical Senior Executive Service (SES) and Senior Technologist (ST) billets to the warfare centers,
- Increase number of military billets in the NRDE,
- Conduct periodic, independent assessment of the NRDE technical capabilities led at the ASN (RDA) level.
- Widen the aperture of the Technical Community
 - Establish the Naval Research Laboratory (NRL) as a venue for development and experimentation of the methods to scout, shape and exploit global technology,
 - Enhance tools and techniques to expand global technology awareness,
 - Emphasize workforce mobility, agile adoption,
 - Develop a pilot program to exchange personnel among industry, academia and the NRDE,
 - Influence external research agendas & standards to narrow gaps, prepare Warfare Centers (WCs) to close gaps and engage Navy.

Stewardship:

- Strengthen ASN (RDA) stewardship of the NRDE
 - ASN(RDA) designate a *Director of Naval Research and Development Establishment (DNRDE)* responsible for aligning investments across the DON, under the direction of the ASN(RDA):
 - Represent the ASN (RDA) in supervising CNR investments of BA1–3 across Navy & Marine Corps. Provide ASN (RDA) input and oversight in the allocation and execution of all BA-4 accounts across Navy & Marine Corps,

- Support the ASN(RDA) in prioritization issues across BA 1-4 investments among the Chief of Naval Operations (CNO), Commandant of the Marine Corps (CMC), and Chief of Naval Research (CNR),
- Coordinate with Office of the Chief of Naval Operations (OPNAV) to ensure relevance of the Office Naval Research (ONR) investment to Navy-After-Next needs,
- Provide continuity in stewardship of NRDE.
 - Establish a Science Advisor to the CNO
 - Also serve as liaison to ASN (RDA).
- Strengthen ASN (RDA) stewardship of the NRDE (2)
 - Update/reinstate SECNAV Instructions for governance of NRDE (including the Navy Laboratory/Center Coordinating Group-NLCCG) and Technical Authority,
 - Assign technical authority for systems that cut across systems commands (SYSCOMs) and platforms,
 - Increase coordination of the research and development (R&D) activities that support the Navy-After-Next,
 - Establish a process to implement and integrate science and technology (S&T) strategy across the NRDE and SYSCOMs,
 - Create planning, processing, and governance instructions to increase the transition of NRL technology and capability into the Warfare Centers and industry.

Navy-After-Next:

- Establish an office of primary responsibility for the management of the necessary competition of ideas attendant to the confluence of concepts with S&T for the Navy-After-Next.
 - Empower that office to create and implement a process that incubates and assesses promising concepts across DoN. (Further refine the implementation of OPNAVINST 5401.9)

- Assign to CNO-N00X,
 - Ensure NRDE active participation in concept generation and Concept Development Teams,
 - Identify and, where appropriate, champion concepts from other agencies (e.g., the Defense Advanced Research Projects Agency),

Best Business Practices:

- Accelerate physical infrastructure modernization or recapitalization,
- Consolidate NRDE Human Resources, military construction (MILCON), and maintenance responsibilities for NRL and Warfare Centers under a single Regional Commander for MILCON & maintenance, and a single Regional Human Resources (HR) Office for HR,
 - Both must be attuned to needs of R&D organizations,
- Streamline the hiring process for technical personnel and restore local hiring authority.

The Panel summarized recommended actions as follows:

Chief of Naval Operations:

- Work with the stakeholders to develop a process to coordinate concepts and technology for Navy-After-Next,
- Establish a Science Advisor to the CNO,
- Support the consolidation of management for Warfare Center-focused Human Resources, Military Construction, and facility maintenance offices.

Assistant Secretary of the Navy (Manpower and Reserve Affairs):

- Consolidate NRDE HR responsibilities

Assistant Secretary of the Navy (Installations and Environment)

- Consolidate NRDE MILCON and facility maintenance responsibilities

ASN (RDA):

- Designate a *Director of Naval Research & Development Establishment*,
- Ensure the NRDE is investing in Navy technology leadership areas and that future needs are reflected in BA1-4 investments, commit to maximum NDAA 2009 Section 219 funding,
- Update/reinstate NRDE-applicable SECNAV Instructions,
- Conduct biennial assessment of the NRDE technical capabilities,
- Allocate a greater number of technical SES and ST billets to WCs,
- Coordinate with ASN (I&E) to accelerate physical infrastructure modernization or recapitalization.

CNR:

- Enhance tools and techniques to expand global technology awareness.



Terms of Reference

- **Assess Warfare Centers (and UARCs as feasible)**
 - Current technical core competencies
 - Stewardship for core competencies
 - Consider technical quality of workforce and physical infrastructure
- **Identify technical competencies DoN requires**
 - Holds a leadership position
 - Leverages others' expertise
 - Is deficient
- **Identify future technical leadership areas that DoN will need**
 - Indicate likelihood that WCs and UARCs will be able to develop needed capabilities
- **Identify approaches to maximize likelihood of achieving necessary leadership and effective leveraging (within context of constrained future budgets)**



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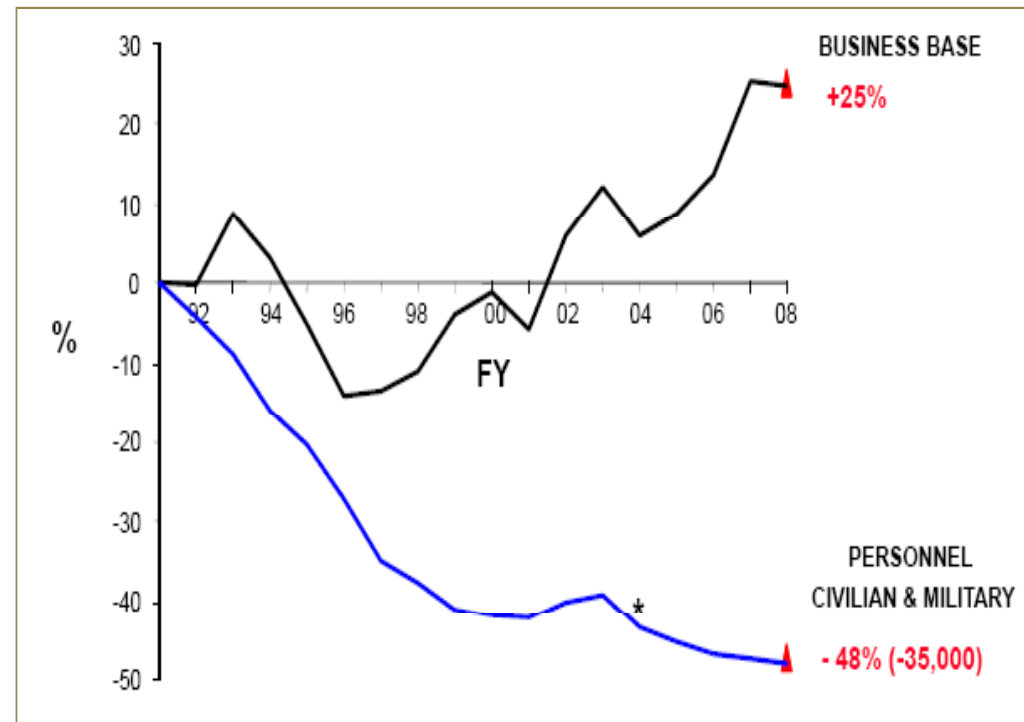
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Consultant for this study *

Warfare Centers: The Only Constant is Change

- Naval Technical Community experienced many changes before 1992
 - Labs + field stations
 - SYSCOM, SPAWAR, ONR management
- BRAC (rounds 2–4)
 - Four Warfare Centers reporting to SYSCOMS
 - ~50% reduction in staff
 - Overhead reduction
- WC portfolio expansion
 - Jointness
 - 9/11, Homeland Security, IEDs, etc.
 - Preserve core technical competencies
 - Overhead amortization





Navy Working Capital Funding

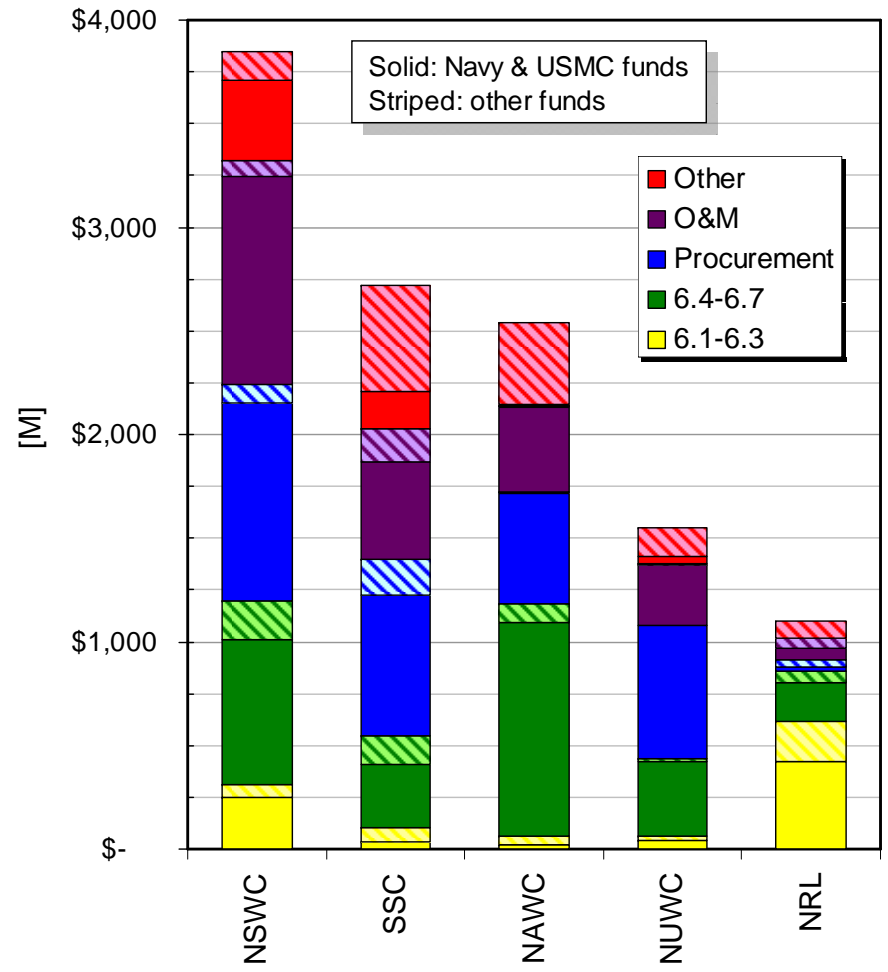
Advantages

- A good business model for survival of WCs
- Ensures customer relevance and responsiveness to emerging operational issues
- Enables joint tasking

Issues

- Does not incentivize development and sustainment of deep technical competence
- Relatively short-term focus fosters neglect of planning for the future

Reimbursable Expenditures by Funding Type, GFY09





Programmatic Context for NRAC Study

- Mandate to increase size of acquisition workforce (in-sourcing and new hires)
- SECNAV goal of “acquisition excellence”
- Likely decreasing DoN RDT&E budget
- SECDEF goal of “reducing overhead and improving business operations”...”to provide the equivalent of roughly 2 to 3 percent real growth”
- Unsustainability of current Federal budget

Programmatic Context Contains Mixed Messages



Technological Context for NRAC Study

- US military supremacy has been tightly linked to US technological dominance
- That dominance enabled in part by relative vigor and size of the US economy
- The US economy a decreasing proportion of the global economy
- US S&T is a decreasing proportion of global S&T
- These realities will shape the Navy & Marine Corps

Technology Context is Coherent, Consistent and Inexorable



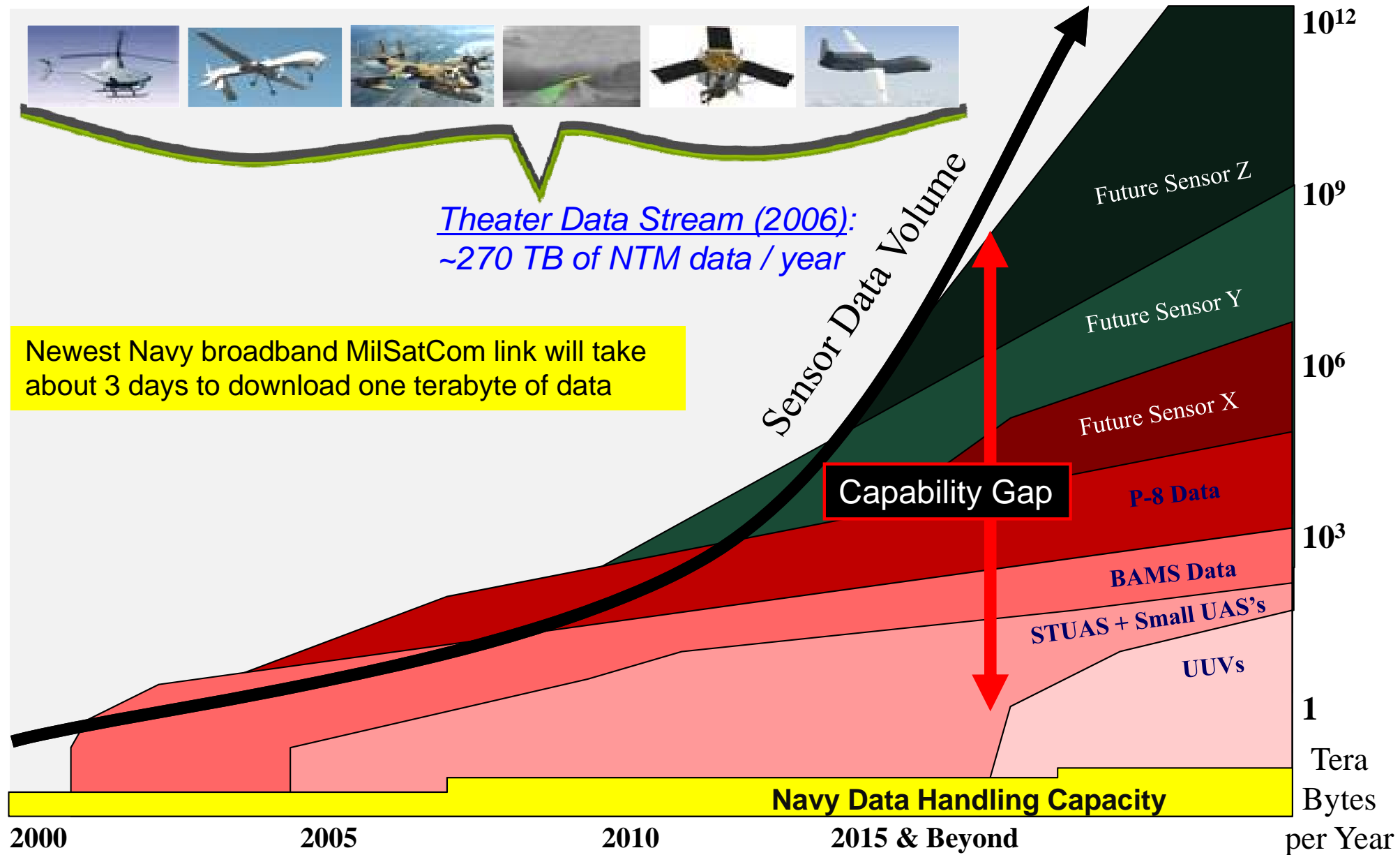
Desired Attributes of DoN Technology Portfolio Management

- Operationally motivated S&T investments
- Self-refreshing
- High quality
- Robust against disruptive innovation
- Informed by global technology landscape
- Vision consistent with resource & infrastructure requirements
- Agile adoption & differentiation of global innovation

Agile Adoption Will Become Increasingly Important



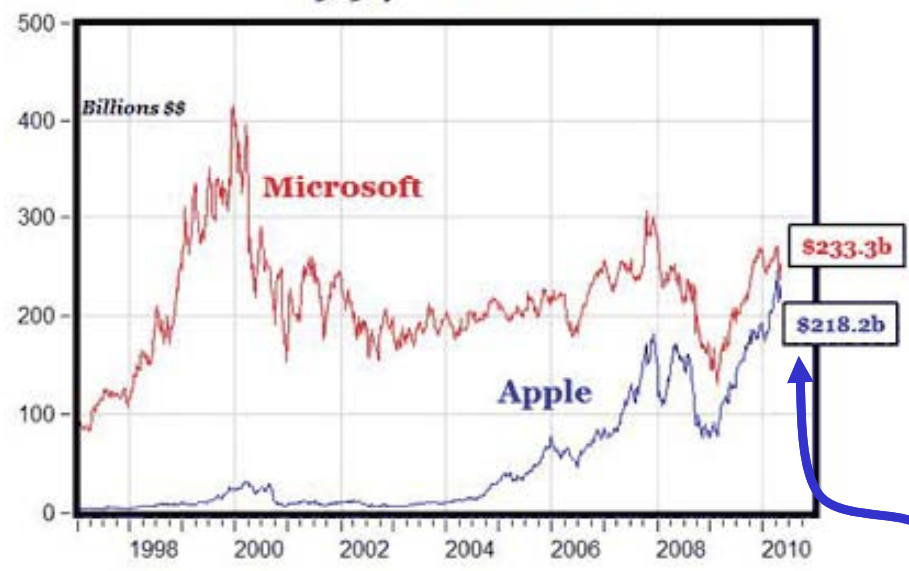
Mismatch Between Vision and Attendant Infrastructure





Power of Agile Adoption

Market Capitalization: Microsoft vs. Apple 1997 to 2010



- Add Apple's "secret sauce"
- Apple invests @ ~3.5% sales



Achieved through "smart" investment!





Study Approach

	NAVSEA	NAVAIR	SPAWAR	MARCORSYSCOM	NRL	UARC's	Integration
Panel Chair	Young	Bowes	Fernandez	Fratangelo	Bellingham	Harris	Sommerer
Vice Chair	Blatstein	Schiefer	Cantrell	Johnson-Winegar	Ramirez	Tozzi	Bowler
Panel	Brown	Castellaw	Langston	Andrews	Andrews	Firebaugh	Alving
Members	Firebaugh	Mykityshyn	Tozzi	Weber	Bowler	Schiefer	Subpanel Chairs
	Harris	Schmitt			Bruno		Selected Panelists
	Schiefer	Whelan			Carnes		
	Schmitt	Winston			Korris		
	Tozzi				Tennenhouse		

>600 Staff-days fact-finding
>60 Site visits to:
SYSCOMs & Warfare Centers
NRL
UARC's
PEOs & PMs
Industry
Naval Leadership



Bottom Line, Up Front (1)

- **Naval R&D Establishment (NRDE) comprises a cadre of dedicated public servants, including many experts in technical competencies needed now and in the future by the DoN**
 - **SYSCOMS, supported by the NRDE, are providing essential in-service engineering to the Fleet**
 - **NRDE offers significant leverage for the Department's pursuit of Acquisition Excellence ("Smart Buyer")**
- but***
- **DoN facing evermore technologically intensive and complex future**
 - **Many critical skill areas are only one or two deep with experienced technologists**
 - **New areas where the Navy has not been a leader**
 - **Navy will need to be a leader to enable vision of Naval Leadership**



Future Technology Leadership Areas

- **Integrated C4ISR for combined manned/unmanned (mixed) systems**
- **Infrastructure required to support Information Dominance**
- **Electronic Warfare**
- **Counter Anti-access & Area Denial (A2/AD) and High End Asymmetric Threat (HE/AT)**

The uniqueness of the maritime physical and operational environment and the impending integration of unmanned vehicles into the battlespace require technical leadership in these areas



Bottom Line, Up Front (2)

- **DoN faces this future with a seriously weakened technical workforce**
 - DoN must rebuild technical leadership in the uniformed Navy and emphasize quality in revitalizing the civilian R&D workforce
- **There is a lack of coordination across the NRDE**
 - E.g., DoN must assign Technical Authority that cuts across SYSCOMs and platforms
- **DoN must have a robust S&T program that allows it to effectively extract and differentiate technology from the global marketplace**
- **Navy-After-Next stewardship has been haphazard. DoN needs a champion with continuity of vision**



Bottom Line, Up Front (3)

- **ASN(RDA) is responsible for managing all Naval R&D investments and for supervising the Chief of Naval Research (SECNAVINST 5430.7Q)**
- **ASN(RDA) needs a full-time civilian (3 star-equivalent) delegate, *with long-term continuity of vision,***
 - **to provide stewardship for all BA1-3(4?) funds across the DoN to align investments that sustain critical Naval technology areas and that support future and ongoing acquisition programs**
 - **to provide essential stewardship for the NRDE**

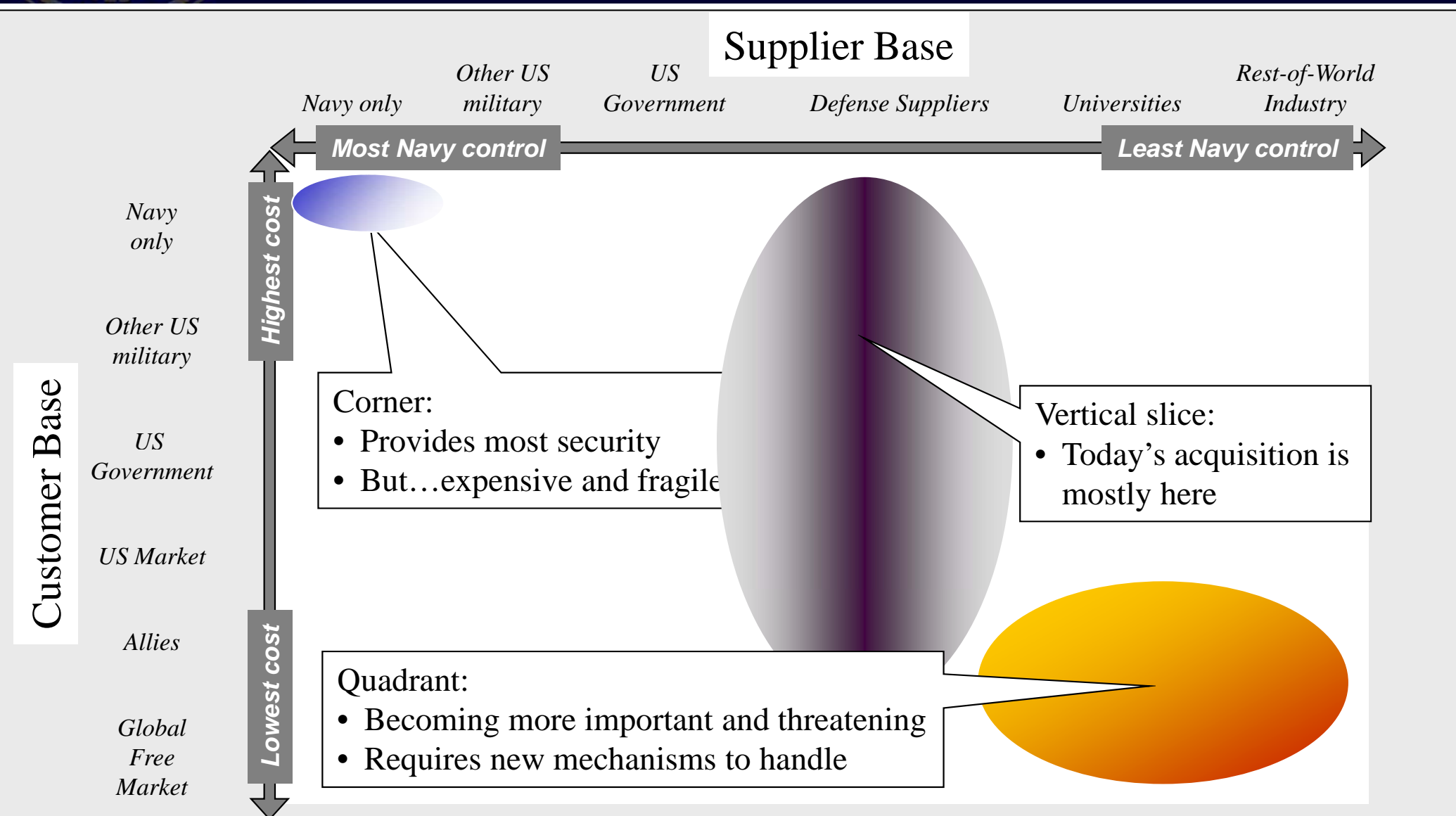


Assessment of NRDE Technical Capabilities

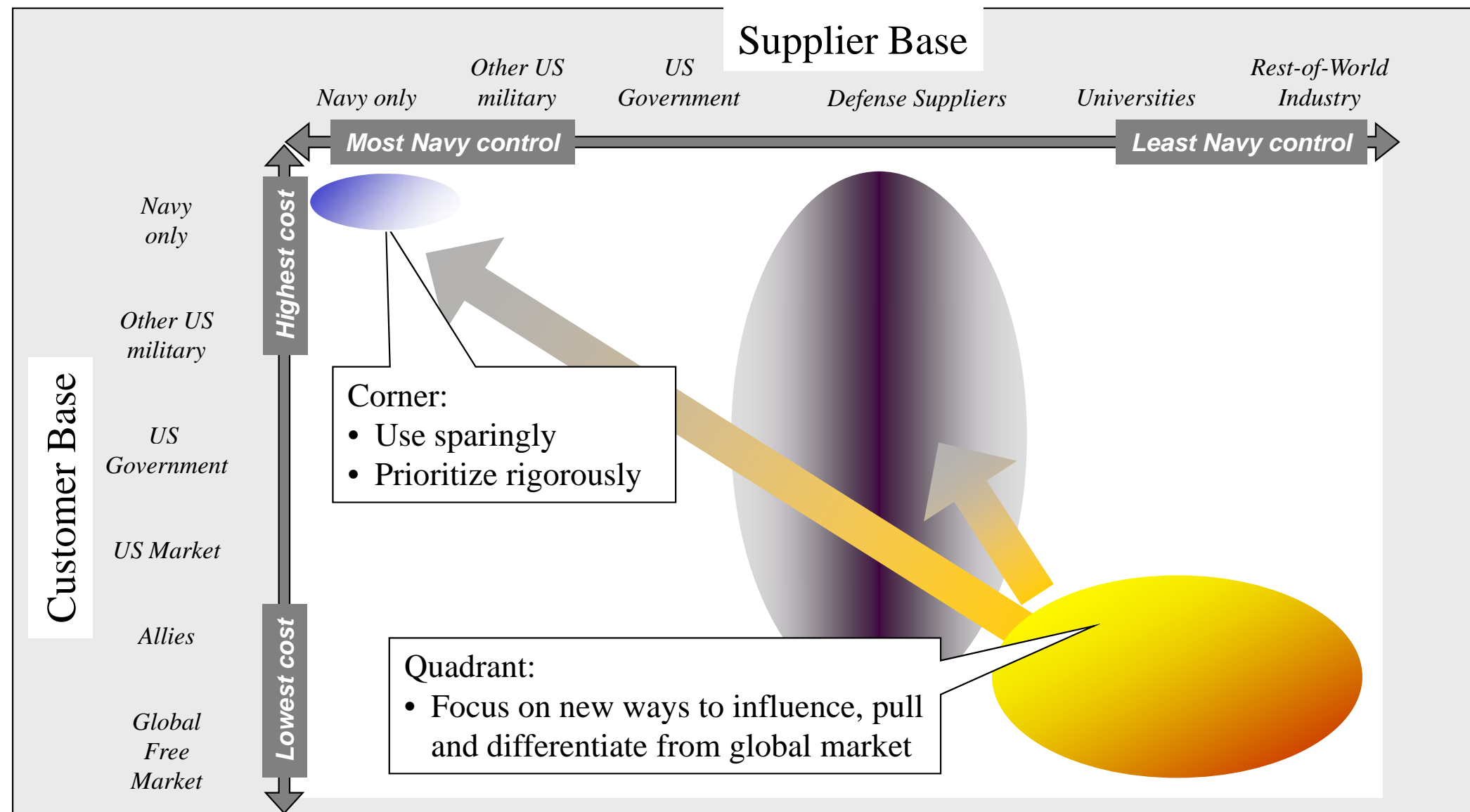
- **NRAC WC Sub-panels have received technical capability self assessments from the Warfare Centers and informal feedback from a number of Navy SYSCOMs/PEOs/PMs and Defense Industry Representatives**
- **NRAC did not have the time nor the resources to do an independent, in-depth, comprehensive assessment of the Naval R&D Establishment**
 - **A true assessment of the quality of the technical capabilities in the Naval R&D Establishment would require an extensive internal and external evaluation of each technical capability (e.g. there are >133 TCs just in NAVSEA Warfare Centers)**
 - **NRAC did not assess technical capabilities residing within the SYSCOMs' headquarters program offices and PEOs**
- **Periodic assessment is nevertheless critical to understanding, building, and improving the Department's technical capabilities**



Framework for Assessment Customers and Suppliers



Framework for Assessment Implications





Emerging Agile Adoption Areas

- **Mixed decision making systems (manned and agent-based).** NRDE must acquire the technical competency to shape, adopt, and adapt this capability for the Naval applications
- **Commercially-available Enterprise Information Systems.** NRDE must develop technical capability to participate in standards and tools development, especially for Naval unique needs
- **Managing software development.** NRDE must develop and implement a comprehensive strategy for revitalizing in-house software engineering competency
- **Power generation and energy storage.** NRDE must be aware of global advances in power generation/control as well as energy efficiency so they can be adapted for Naval-unique uses
- **Biology-based innovation.** NRDE needs sufficient expertise to monitor and exploit new and emerging areas of technology that are based on biological systems



Recommendations & Supporting Findings

- **Technical Competency**
 - **Stewardship**
 - **Navy-After-Next**
 - **Best Business Practices**
 - **SYSCOM-specific findings**
-
- **Summary of Actions**
 - **Take-Aways**



Recommendations

Technical Competency

- **Sustain and enhance current NRDE technical competencies to support operational and acquisition needs**
 - **Provide additional meaningful “hands on” work**
 - **Commit to NDAA 2009 Section 219 funding to the limit authorized by law to provide discretionary funding to be applied via disciplined process**
 - **Provide greater incentives for both military and civilians to achieve technical expertise**
 - **Allocate a greater number of technical SES and ST billets to the warfare centers**
 - **Increase number of military billets in the NRDE**
 - **Conduct periodic, independent assessment of the NRDE technical capabilities led at the ASN (RDA) level**



Recommendations

Technical Competency

- **Widen the aperture of the Technical Community**
 - **Establish NRL as a place for development and experimentation of the methods to scout, shape and exploit global technology**
 - **Enhance tools and techniques to expand global technology awareness**
 - **Emphasize workforce mobility, agile adoption**
 - **Develop a pilot program to exchange personnel among industry, academia and the NRDE**
 - **Influence external research agendas & standards to narrow gaps, prepare WCs to close gaps and engage Navy**



Supporting Findings

Technical Competency

- **The shortage of discretionary overhead funding for workforce development and innovation is a barrier to technical leadership**
- **Many critical technical competencies are only one or two deep**
- **Current prioritization of workforce competencies reflects PEO needs and near-term considerations**
- **Little evidence of building global technology awareness**
- **Technical Authority implementation is inconsistent across SYSCOMs**
- **Too few military are assigned to technical billets in warfare centers and systems commands and less operational exposure among civilian workforce**
- **Insufficient in-house hands-on work to build experience and maintain essential Navy technical competence**



Supporting Findings

Technical Competency

- **Perception is that program management offers greater promotion opportunity than technical achievement**
- **No effective process to exchange experienced technical personnel among industry, academia and NRDE**
- **Salaries not competitive at senior levels**
- **Recruiting environment is increasingly challenging**
 - **Gen-Y less attracted to “jobs for life”**
 - **Perception that quality and innovation of government work is declining**
 - **Increasing shortfall in U.S. citizen pool of technical talent**



Recommendations

Stewardship

- **Strengthen ASN (RDA) stewardship of the NRDE**
 - ASN(RDA) designate a *Director of Naval Research and Development Establishment (DNRDE)* responsible for aligning investments across the DON, under the direction of the ASN(RDA):
 - Represent the ASN (RDA) in supervising CNR investments of BA1–3(4?) across Navy & Marine Corps
 - Support the ASN(RDA) in prioritization issues across BA1–3(4?) investments among CNO, CMC, & CNR
 - Coordinate with OPNAV to ensure relevance of ONR investment to Navy-After-Next needs
 - Provide continuity in stewardship of NRDE
- **Establish a Science Advisor to the CNO**
 - Also serve as liaison to ASN (RDA)



Recommendations (2)

Stewardship

- **Strengthen ASN (RDA) stewardship of the NRDE (2)**
 - **Update/reinstate SECNAV Instructions for governance of NRDE (including NLCCG) and Technical Authority**
 - **Assign technical authority for systems that cut across SYSCOMs & platforms**
 - **Increase coordination of the R&D activities that support the Navy-After-Next**
 - **Establish a process to implement and integrate S&T strategy across the NRDE & SYSCOMs**
 - **Create a plan to increase the transition of NRL technology and capability into the Warfare Centers and industry**



Supporting Findings

Stewardship

- **S&T strategy and investment is not uniformly appreciated throughout OPNAV**
- **Enterprise-wide governance is inconsistent, requires updating, and lacks synergy**
 - **Stewardship of the Warfare Centers by the System Commands is not a high priority**
 - **Technical authority for systems that cut across platforms has not been defined or is fractionated**
 - **Inconsistent use of technical expertise in the acquisition process**
 - **Coordination of S&T resources and investments among the Warfare Centers is inadequate**
- **ONR & NRL do not share a common view of how they coordinate their S&T activity**



Naval Technology Horizons

- Today's Navy: existing platforms and systems
 - Stewardship role is well defined
 - Technology focus is engineering (ISE)
- Next Navy: POR developmental platforms and systems
 - Stewardship role is well defined
 - Technology role is important – needs “seat at table”

Stewardship:

- Leadership
- Accountability
- Navy-wide view
- Funding
- Facilities
- Execution oversight

Major focus today

- Navy-After-Next: pre-POR capabilities
 - Stewardship role has been undefined, putting execution at risk
 - CNO-00X and CNR roles have been unclear
 - Other elements are missing (CONOPS, experimentation/trials, doctrine...)
 - Technology role provides foundation for developing new capabilities

Limited attention



Recommendations

Navy-After-Next

- **Establish an office of primary responsibility for the management of the necessary competition of ideas attendant to the confluence of concepts with S&T for the Navy-After-Next**
 - **Empower that office to create and implement a process that incubates and assesses promising concepts across DoN. (Further refine the implementation of OPNAVINST 5401.9)**
 - **Assign to CNO-N00X**
 - **Ensure NRDE active participation in concept generation and Concept Development Teams**
 - **Identify and, where appropriate, champion concepts from other agencies (e.g. DARPA)**



Supporting Findings

Navy-After-Next

Stewardship of Navy-After-Next has been haphazard, especially with respect to the engagement of the S&T community

- **OPNAVINST 5401.9 is a good starting point for concept development, but does not fully address S&T engagement needs of Navy-After-Next**
- **Effective stewardship is essential, given global technology context and that Navy-After-Next is point at which U.S. Naval dominance may be challenged**
- **Current FNC process severely curtails BA 6.3 spending on Navy-After-Next concepts for which there is no Program of Record**
- **Deep NRDE engagement in both concept generation and in concept development for Navy-After-Next is lacking**
- **There is no organized process to provide a “landing zone” for innovative S&T-based concepts pioneered by DARPA and/or other agencies**
- **Long-term guidance on future technical leadership and competency areas is not being provided to the Warfare Centers**



Recommendations

Best Business Practices

- **Accelerate physical infrastructure modernization or recapitalization**
- **Consolidate Human Resources, MILCON, and maintenance responsibilities for NRL and warfare centers under a single Regional Commander for MILCON & maintenance, and a single Regional HR Office for HR**
 - **Both must be attuned to needs of technical organizations**
- **Streamline the hiring process for technical personnel and restore local hiring authority**



Supporting Findings

Best Business Practices

- **General physical infrastructure and working conditions do not meet the needs of the quality science/technology work**
- **Some regionalized facilities and HR management offices are not responsive to the special needs of warfare centers and NRL**
 - **Recruiting and hiring qualified people takes too long**
 - **DoN Installation “Regionalization” Support to NRDE is inconsistent**



Recommendations

Technical Leadership and Agile Adoption

- **The DoN must sustain, enhance current NRDE technical competence required to support operational and acquisition needs**
- **R&D is needed in future areas where the DoN will need to exercise technical leadership and where it will be a successful agile adopter**
 - **Internal technical capability to define and help solve Navy-unique problems**
 - **“hands on” expertise to allow Navy representation in shaping and harvesting external innovation**
 - **ONR/NRL/Warfare Centers/UARCs are all involved**



Example SYSCOM-Specific Findings

NAVSEA WCs	<ul style="list-style-type: none"> • WC indirect funds viewed as bill payer, resulting in reduced investment in WC advanced technical equipment and innovation • Capability, competency and skills in offensive mine warfare and energetics are decaying due to lack of sustaining developing work
NAVAIR WCs	<ul style="list-style-type: none"> • All warfare center personnel are organizationally integrated into the systems command • High turnover of technical personnel assigned to programs
SPAWAR WCs	<ul style="list-style-type: none"> • Although SPAWAR has specific TA responsibilities, Navy-wide C4ISR TA is not well-defined, disciplined or consistently practiced • Customer opinions regarding warfare center technical competencies highly variable
NRL	<ul style="list-style-type: none"> • Base funding is primary investment in Naval in-house fundamental research and is critical to sustaining technical competency • Base funding is not fully coordinated with CNR's external research investments
UARCs	<ul style="list-style-type: none"> • Ingrained culture of independence. Ability to hire technical staff at commercially competitive salaries and benefits ensures quality technical workforce. Ability to capitalize (and amortize) at own discretion results in adequate facilities • Navy funding declining as a percentage of total UARC funding

Technical Support & Overlap in the NRDE

- Issue of "overlap" is exaggerated
- Evaluation of technical support requires in-depth understanding
- Real risk, critical technical capabilities lacking, stewardship could be lost



Summary of Actions

CNO

- **Establish a process to coordinate concepts and technology for Navy-After-Next**
- **Establish a Science Advisor to the CNO**

ASN (MRA)

- **Consolidate HR responsibilities**

ASN (EIE)

- **Consolidate MILCON and maintenance responsibilities**



Summary of Actions

ASN (RDA)

- Designate *Director of Naval Research & Development Establishment*
- Ensure SYSCOMs are investing in Navy technology leadership areas
- Ensure future needs are reflected in BA1-BA3 investments
- Commit to maximum NDAA 2009 Section 219 funding
- Update/reinstate SECNAV Instructions
- Conduct biennial assessment of the NRDE technical capabilities
- Allocate a greater number of technical SES and ST billets to WCs
- Accelerate physical infrastructure modernization or recapitalization

CNR

- Enhance tools and techniques to expand global technology awareness



Take-Aways

- **The DoN has a seriously weakened technical workforce**
- **In the future, increased emphasis will be on adapting global technologies to Naval application**
- **Closer coordination between the operational and technical communities is essential for the Navy-After-Next**
- **More effective coordination required among OPNAV, ASN (RDA), CNR, SYSCOMs, WCs, NRL and UARCs**
- **Need a champion with experience and continuity of vision to shape the technological future of the DoN**