

NAVAL RESEARCH AND DEVELOPMENT



A FRAMEWORK FOR ACCELERATING TO THE
NAVY & MARINE CORPS AFTER NEXT

*“The Navy must get to work
now to both build ships, and to think
forward - innovate - as we go.
To remain competitive we must start today
and we must improve faster”*

“The Future Navy”
Admiral John M. Richardson
Chief of Naval Operations

*“Any monopoly we might
have on ‘breakthrough’ systems
will likely be short-lived.”*

“U.S. Marine Corps Operating Concept”
General Robert B. Neller
Commandant of the Marine Corps

A CHARTER FOR CHANGE

Maritime superiority for America's Navy and Marine Corps is enabled by technological superiority. However, our once-dominant technological edge is at risk of being overtaken due to the accumulated friction of complexity and bureaucracy in our system of research, development and acquisition. Lasting strategic advantage comes from institutional capacity to develop and field new capabilities faster than our adversaries.

The Secretary of the Navy, Chief of Naval Operations and Commandant of the Marine Corps have challenged the research and development (R&D) community to find ways to accelerate technology development and delivery to our naval forces. There is broad consensus that the current pace of technology development and adoption is unsatisfactory, and that without significant reform, we will lose the competition for maritime superiority.

To win, we must be first to field decisive capabilities.

As a first step, this new **Framework** will serve to better synchronize the continuum of naval Research, Development, Test and Evaluation (RDT&E). Three components of this Framework—*Align, Allocate and Accelerate*—will guide the conversation and efforts: we must *align* early research, development and demonstration to priority technology requirements; *allocate* investments for higher payoff in lethality, integration and interoperability; and *accelerate* capability adoption to match the pace of technology innovation.

Why a Framework? By its nature, R&D is not a deterministic system—it is exploratory for the purpose of new knowledge and invention; therefore, a “plan” or “strategy” falls short as a guiding mechanism to connect Department of the Navy (DON) research activities. We need a new, faster way to align, allocate and accelerate scientific discoveries to naval programs of record and deployment as new capabilities. This Framework is offered as a charter for change and a call to action. As a charter, it outlines key issues for leaders to address and a consistent vision for innovators to achieve. As a call to action, it challenges all hands in the naval R&D community to rise above traditional boundaries, collaborate on shared priorities and focus our work together on a singular customer—the naval warfighter.

Subsequent steps to effectively implement this vision must endeavor to inclusively draw upon the knowledge and diversity of thought resident within the R&D community. Additionally, overcoming existing institutional barriers and breaking free from bureaucratic drag requires equal commitment to speed organizational innovation—our national security is at stake. With this Framework, our implementation will challenge old assumptions and reimagine possibilities.

When successful, naval RDT&E investment will be managed collectively as a coherent portfolio. We will fully invest in research areas unique to naval warfare, while exploiting new scientific discoveries and technological opportunities at large. We will take more risks earlier in technology development and transition more capabilities to programs of record. In short, we will be more agile and effective at delivering decisive warfighting advantage to our Navy and Marine Corps.



CORPORATE BOARD DIRECTIVE

We are in a competition for maritime superiority; one we must win. Our Sailors and Marines depend upon technological advantage to protect the homeland, build maritime security, project power and win decisively.

Our Navy and Marine Corps' strategic advantage, therefore, depends upon accelerating the cycle of technology development and fielding of new capabilities—faster and better than our adversaries. However, the rapid advance of technology globally has outstripped our traditional institutions' ability to keep pace. Status quo is unacceptable.

Consistent with the Navy's "Design for Maintaining Maritime Superiority" and the "Marine Corps Service Strategy 2016," a more integrated approach to research and development (R&D) is needed. This new Framework aligns R&D priorities, allocates resources and accelerates execution to speed the adoption of new capabilities for the DON.

THE CHALLENGE

Our technological advantage is diminishing as our pace of technology development and adoption is slowed by outdated behaviors and incentives. These institutional factors create drag and encourage risk aversion at the cost of innovation and agility. Lacking common priorities for decision-making across the RDT&E continuum, the allocation of vital resources is sub-optimized. Consequently, fragmented decision-making diffuses strategic direction and erodes the will to kill underperforming technologies. "First to field" decisive capabilities, is our goal.

WAY FORWARD

The defining attribute of future naval forces is SPEED—not only in operations, but in DON decision-making and business execution. We must be responsive to the accelerating pace of technology development and create pathways that will result in the timely fielding of new naval capabilities. It requires bold leadership and immediate action to attack this problem with the same intensity we bring to the battlespace.

To win, this Framework:

- Aligns naval research, development and acquisition to shared priorities
- Allocates resources to speed priority-aligned results to the warfighter
- Accelerates capability delivery by streamlining business execution and empowering people

Building on our strong foundation of research, talented people and partners in government, academia and industry, these actions develop evolutionary and revolutionary capabilities while reducing cost and increasing speed.

Accordingly, the Chief of Naval Research is charged with leading further development and execution of this Framework with Program Executive Officers, Systems Commanders, Resource Sponsors and other key stakeholders.

(The RDT&E Corporate Board comprises the Under Secretary of the Navy, Vice Chief of Naval Operations, Assistant Commandant of the Marine Corps and the Assistant Secretary of the Navy for Research, Development and Acquisition)

**Our course is set:
Accelerate to the
Navy and Marine
Corps after next!**

RATIONALE FOR A R&D FRAMEWORK

Four enduring naval functions are critical to maintaining maritime superiority: deterrence, power projection, sea control and maritime security. Increasing volume, speed and complexity of threats demands a naval force fully interoperable, integrated and more lethal. This begins with basic research and proceeds along a fully synchronized RDT&E continuum with agility to pursue new breakthroughs at the rapid pace of discovery and technology development.

Unfortunately, advantage is yielded daily to adversaries through the accumulated drag of budgetary, organizational and acquisition practices. This drag limits our ability to absorb fast-maturing technologies and implement new capabilities. While formed from good intentions, it has become the antithesis of agility, responsiveness and decisiveness.

Lasting maritime superiority for America's Navy and Marine Corps requires continuously outpacing adversaries' cycles of technology development and adoption. This Framework aims to expand DON's total capacity for capability adoption by targeting both technology development and delivery activities. Technical leadership is gained to the extent institutional friction is minimized. Current bureaucratic drag factors and key issues plague progress and jeopardize future maritime superiority; they must be addressed.

KEY ISSUES

- Structure and cadence of budgeting activities drive near-term, fragmented decision-making and foster a protectionist mindset at the expense of strategic program effectiveness
- Lack of R&D priorities to guide and align investment/kill decisions sub-optimizes outcomes, slowing the maturation and delivery of needed capabilities
- Prototyping, experimentation and demonstration are misallocated in acquisition vice earlier in development incurring programmatic risk in cost, schedule delays and performance shortfalls
- Organizational bureaucracy and administrative churn associated with the complexity of acquisition rules stifle agility and innovation, and promote splintered governance over an integrated portfolio perspective

TAKEAWAYS:

Maritime superiority requires outpacing adversaries. The RDT&E status quo is inadequate to keep pace with technology innovation. This Framework identifies key issues and barriers jeopardizing our future advantage.



GAINING COMPETITIVE ADVANTAGE

Maritime superiority is enabled by technological superiority. As the competition for superiority escalates, competition to field new technology-based warfighting capabilities intensifies at a corresponding rate. Now more than ever, the competition from research to technologies to capabilities is dynamic, disruptive and intense. The nature of this competition is driven by four fundamental trends that, if mastered, also present opportunities for competitive advantage:

Emerging Power of Data

Data is trending towards universal collection on a continuous basis. Amassing, sharing and understanding vast data offers great potential.

Advances in data collection, storage and analytics, computing devices, networking, and autonomous processing and decision-making are disruptive, but also offer advantages.

Opportunity

Engage with academia and industry experts on the cusp of this frontier to unlock the sea of data for enhanced insight, rapid decision making and new mission capabilities.

Global Access to Technology

The commoditization and proliferation of technology offers unfettered access by competitors around the world. Barriers of cost and complexity that historically limited access to advanced technologies are decreasing. Anyone (friend or foe) is a potential user and/or innovator of high-tech capabilities.

Opportunity

Leverage our network and enhance research partnerships across industry and academia to rapidly absorb new technology for competitive advantage.

Expanding Technical Foundation

The technical foundation of R&D—the underlying science—is growing exponentially. Every new discovery invites follow-on innovation within that discipline. More importantly, the opportunities for cross-discipline innovation and breakthroughs also increase.

Opportunity

Exploit the multi-disciplinary dimension of discovery to create greater potential for disruptive innovation.

Faster Development & Adoption of Products

The pace of commercial technology adoption is accelerating. The time for new products to be developed and adopted is decreasing and new capabilities are reaching users (friend and foe) at an increasing rate.

Opportunity

Grow core research in National Naval Responsibilities¹ while gaining organizational competencies to fast-follow and leverage other investments by industry, academia and DoD.

These trends foretell the future for technological superiority. They already stress our organizational systems and processes, which served us well in a less complex competitive environment, but today, diminish our effectiveness. We must adapt to win. Competitive advantage belongs to the naval force that best captures the power of data, leverages the global technology base, disruptively innovates across technical disciplines, and develops/adopts new capabilities at the speed of innovation.

TAKEAWAYS:

The competition is to be first-to-field decisive capabilities. This Framework charts a pathway to increasing competitive advantage. It leverages fundamental trends that give rise to threats, to also create new opportunities.

HOW TO WIN | ALIGN – ALLOCATE – ACCELERATE

The criteria for victory is clear: rapid fielding of new capabilities that are adaptive, autonomous, defensible, scalable, efficient, fast and especially, lethal. The Fleet and Force face growing complexity of threats, which we will not defeat by simply out-spending. Success necessitates speed of innovation, agility and adaptability. The way forward is equally clear: we must urgently Align, Allocate and Accelerate naval R&D to deliver technology-enabled capabilities faster.

ALIGN – R&D to Shared Priorities

To gain the efficiency and effectiveness needed to win, there must be DON-wide alignment in commitment and execution. The future force attributes necessary for the **Navy and Marine Corps After Next** are reflected in the following **Framework Priorities**. These Priorities are the aligning mechanism that guides investment across the warfighting domains and yields cross-domain synergies. Alignment is critical across the entire naval R&D community, including the Department of Defense, industry, academia and non-profit partners.

PRIORITIES	OBJECTIVES
Augmented Warfighter	<ul style="list-style-type: none">• Enhance decision-making speed and quality• Improve human-machine interfaces and teaming• Mitigate tactical-level risk to our people and command, control and communications degradation
Integrated & Distributed Forces	<ul style="list-style-type: none">• Enhance dynamic, synchronized actions across forces• Support collaboration spanning geography, domains, platforms and joint partners; leverage satellite and Precision Navigation and Timing advancements• Increase flexibility and reach of the naval force through incorporation of autonomous and disaggregated systems
Operational Endurance	<ul style="list-style-type: none">• Enable maneuverability, efficiency and resiliency for sustained operations by warfighters, systems and platforms (regardless of the threat or operating environment)• Improve platform-level energy storage/efficiency for propulsion and weapons systems• Develop wide-area and force wide disinformation deception and decoys
Sensing & Sense-Making	<ul style="list-style-type: none">• Transform vast data into timely knowledge• Enable persistent awareness and understanding, and optimized operation (regardless of the threat or operating environment)• Integrate artificial intelligence into C4ISR networks scalable to theater wide
Scalable Lethality	<ul style="list-style-type: none">• Enable offensive and defensive actions that are multi-domain, integrated, cost-effective, and kinetic and non-kinetic• Deliver directed energy and low cost, high probability of kill standoff strike

DESIRED OUTCOMES:

Framework Priorities translate future force attributes into actionable objectives. Priorities are the aligning mechanism that guides decisions from research to acquisition. Streamlined business of R&D accelerates prioritized execution.

HOW TO WIN continued

ALLOCATE – Resources to Speed Results

A balanced R&D investment portfolio is a hedge against future uncertainties. Consistent with alignment to the **Framework Priorities**, this investment portfolio must be managed with a DON perspective. While priorities guide choices, informed decisions guide allocation balance. Portfolio allocation decisions must consider the following factors:

TECHNOLOGY-UNIQUE TIMELINES

Science emerges and technology matures at varied speeds. R&D investment decisions must take into account each technology's timeline and create appropriate pathways for timely capability adoption. *Required: Greater agility in the business of R&D to respond to emerging opportunities.*

EVOLUTIONARY AND REVOLUTIONARY CAPABILITIES

Evolutionary capabilities incrementally improve existing capabilities; they are generally easier to incorporate into the current naval force. Revolutionary capabilities produce game-changing impacts; however, they push the boundaries of science, have an increased risk of failure and may be disruptive to incorporate into the naval force. *Required: Institutionalized methods to rapidly deliver new technologies that are in advance of requirements.*

RESOURCE EFFICIENCY

Balanced investment across R&D (from basic research to operational system development) is critical. Each phase complements and depends on the others. Broad-based basic research provides a foundational core that is as important as transitional engineering to getting a capability into the field. Access to the best talent, across industry, academia and government is critical. *Required: Flexible RDT&E investment, lean processes and a simplified regulatory environment to accelerate results and make DON a preferred partner for innovative businesses, universities and our nation's best talent.*

TECHNICAL LEAD vs. FOLLOW

Finite resources do not permit us to lead research in every technical discipline. We lead those areas critical to naval warfighting or where the naval force has a unique requirement or use. We fast-follow and/or leverage expertise in other areas common among service partners or commercial interests. *Required: Resource core National Naval Responsibilities¹ and technical disciplines unique to naval warfare to ensure world-class leadership.*

APPROPRIATE ALLOCATION OF RISK

To optimize investment in new warfighting capability we must resolve technical risk as fast and as early as possible. This is achieved by separating technology development from product development and conducting enhanced prototyping, experimentation and demonstration prior to acquisition commitment. *Required: Distinguish R&D from acquisition to accept greater risk in development, streamline business and speed execution.*

The future is uncertain and winning is essential. Addressing these factors enables DON to rapidly respond to a more dynamic threat environment and accelerate new capabilities to the warfighter.

DESIRED OUTCOMES:
Priority-driven investments optimize allocation and hedge against uncertainties.
The Framework allocates resources to resolve technical risk earlier in development.
Effectiveness requires the latitude to respond to factors affecting balanced allocation.

ACCELERATE – Technology-Enabled Capabilities

In warfighting, as in business, there are inherent advantages to being first; and there are significant costs to being second. Being first and best to field capability results from an integrated approach that coalesces R&D, business and people to accelerate how we select, develop and adopt capabilities. Three goals will guide implementation:

ALIGNMENT TO PRIORITIES

GOAL

Priority driven naval R&D activities are strongly aligned to deliver the desired attributes of the **Navy and Marine Corps After Next**, driving efficiency and transforming our technology focus from a system-centric to mission-centric mindset. Resulting investment allocation is priority balanced and integrated across warfighting domains. Together, capability outcomes are optimized.

AGILE & RESPONSIVE BUSINESS

GOAL

The speed of naval R&D business decisions and execution exceeds the pace of technology innovation, accelerating advantages to the warfighter. Agility and financial flexibility enables leadership to take quick advantage of technology breakthroughs. Governance and policies differentiated between development and acquisition mitigate risk and accelerate results.

EMPOWERMENT OF OUR PEOPLE

GOAL

At all levels leaders set the conditions necessary for an innovation climate that enables bright minds to thrive. Authority is pushed to the innovator level where people in every position have the latitude, motivation and mission focused sense of urgency to find better ways to do their important work. Customer-focused on the warfighter, they accelerate the pace of delivery.

The Framework aligns the RDT&E continuum to common priorities. It balances allocations across investment portfolios. When fully synchronized, the development, delivery and adoption of capabilities is accelerated.

DESIRED OUTCOMES:

Coordination from leadership to the laboratory accelerates results. Streamlined decision-making and simplified business execution speeds delivery. Pushing authority down to the innovator level unleashes the talent of our people.



CONCLUSION

Competition for Maritime Superiority is intensifying. This Framework is a bold vision that responds to the competition by leveraging opportunities in fundamental trends to gain advantage and positions our Navy and Marine Corps to lead the future. To win, we must work together to Align, Allocate and Accelerate the RDT&E continuum. Maritime superiority results only when we are “first to field” decisive capabilities.

CALLS TO ACTION

Fielding new capability at the pace of technology innovation is the central imperative. This requires leaders to: leverage Framework priorities to align and synchronize R&D activities; allocate resources to promising initiatives earlier in the investment cycle, resolving risks sooner and at less cost to accelerate delivery; speed required actions to reduce institutional drag and position DON as a preferred partner; improve conditions necessary for innovation and push authority down to the innovator level.

PAYOUTS INCLUDE

- Capability adoption at the pace of technology development
- Executive alignment and resourcing for evolutionary/revolutionary projects with the highest potential to increase lethality, integration and interoperability
- Rapid technology insertion into the Fleet/Force with early prototyping and experimentation as an integral part of the development process
- Greater payoff from our RDT&E investments by managing technology development separately from product development
- Technology-enabled capabilities being used by trained operators in the Fleet and Force in volumes that matter

RESULT:
The Framework will enable the Navy and Marine Corps After Next to deter conflict or win decisively and return safely.

Discoveries play a vital, though not singular, role in delivering new capability. Ultimately, it is the people—our team of military, civilians, scientists, engineers, business professionals, contractors and dedicated staff—and the broader R&D community across industry, academia and government that will provide the capability needs of future naval forces, together.



Endnote:

¹National Naval Responsibilities: Ocean Acoustics, Undersea Weapons, Naval Engineering, Undersea Medicine, Sea-Based Aviation

*“To win, we must be first to field
decisive capabilities.”*

ALIGN ALLOCATE ACCELERATE

TO THE NAVY & MARINE CORPS AFTER NEXT

