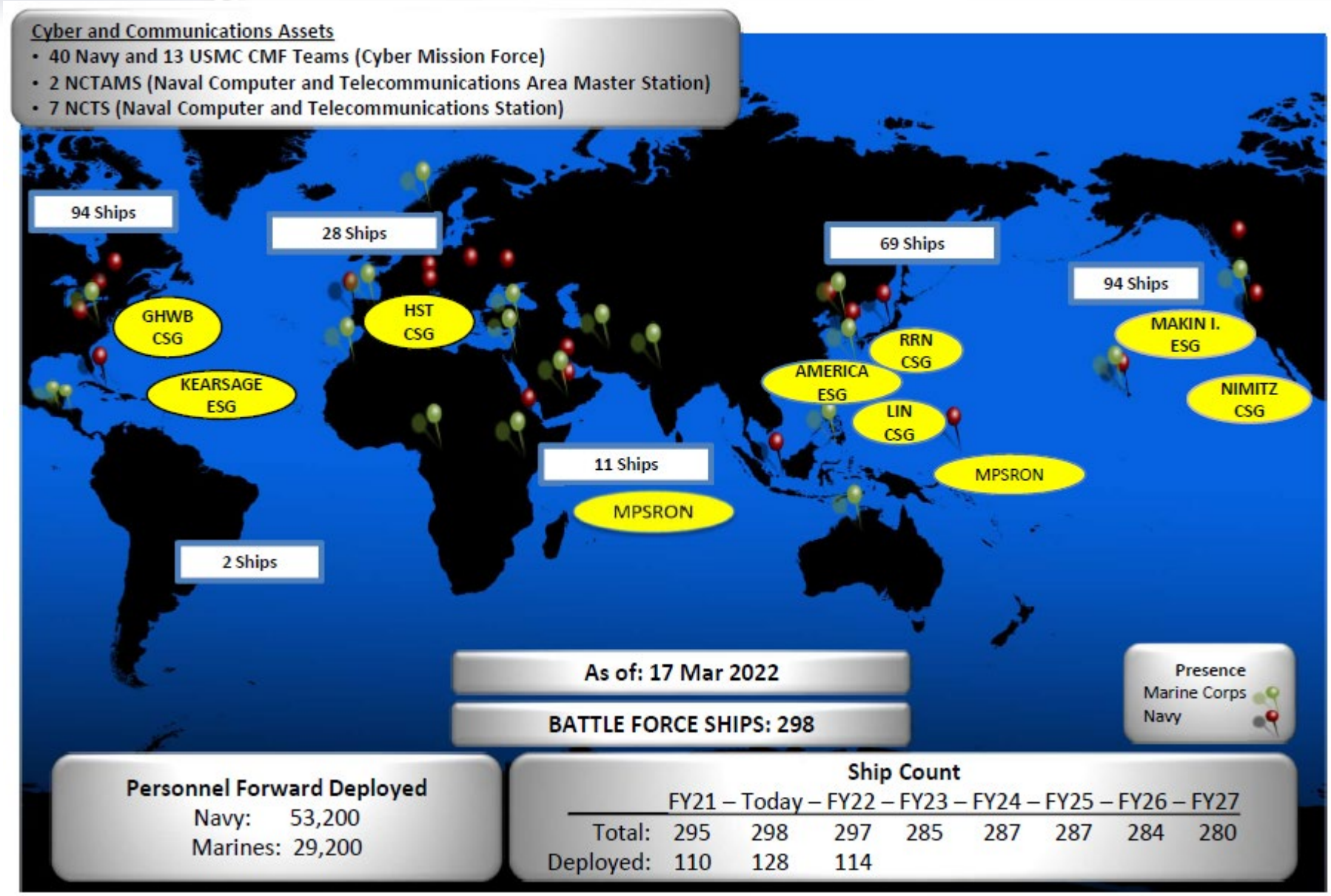
ACCELERATING TO THE NAVY & MARINE CORPS AFTER NEXT

MARINE BOARD SPRING MEETING

6 April 2022

Dr. Thomas Fu. SES
Mission Capable, Persistent and
Survivable Naval Platforms Department

Operational Context



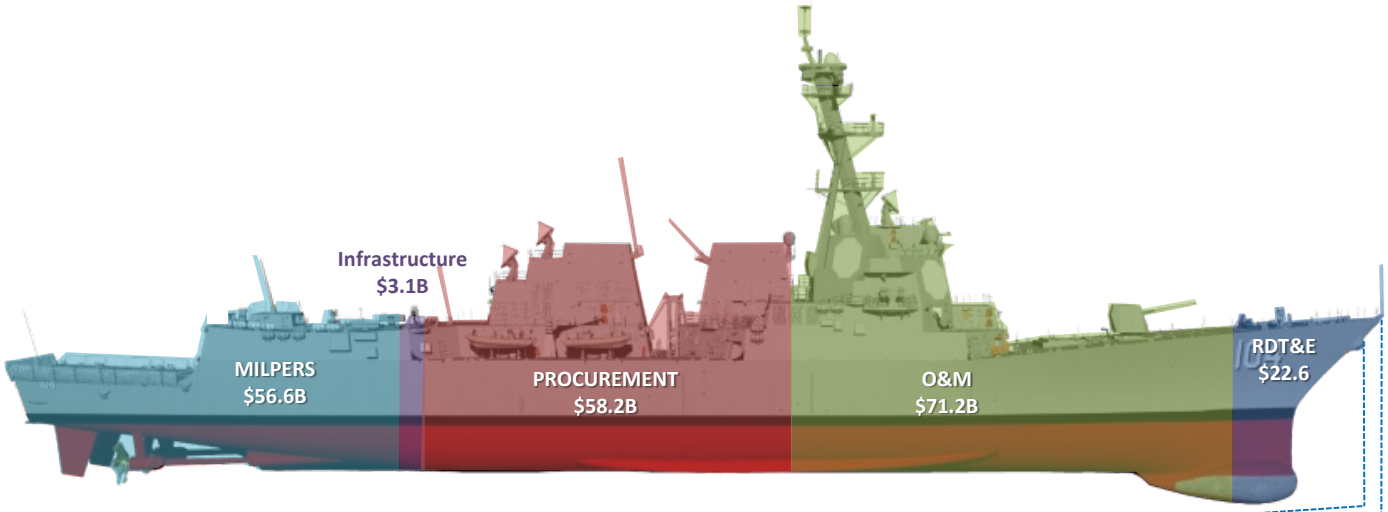
Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2022

Potential Naval Platform Ranges

	Naval Platform Ranges	
Platforms	Low	**High**
Aircraft Carriers	9	**11**
LHA/LHD	8	**9**
Large Amphibious Warfare Ships (less LHA/LHD)	16	**19**
Small Amphibious Warfare Ships[1]	24	**35**
Large Surface Combatant	63	**65**
Small Surface Combatant	40	**45**
Attack Submarines / Large Payload Submarine	66	**72**
Ballistic Missile Submarines	12	**12**
Combat Logistics Force[2]	56	**75**
Support Vessels	27	**29**
Total Battle Force Ships	321	**372**
Uncrewed Surface Vessels	59	**89**
Uncrewed Undersea Vessels	18	**51**
Total Uncrewed	77	**140**
Total Battle Force Ships + Uncrewed	**398**	**512**

Naval Research Enterprise Budget

FY22 DoN Budget Request $211.7B



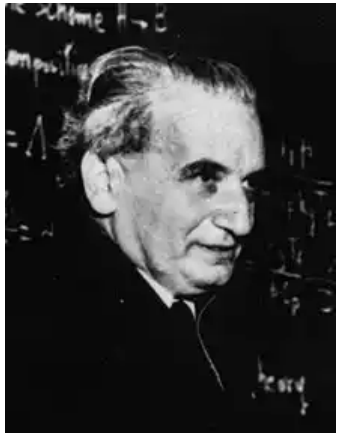
Naval Research Enterprise => $2.64B

11.5% of FY22 $22.6B RDT&E,N Budget

NRE Portion of BA 04, BA 06, BA 07
$284.1M

NRE Portfolio Management

*"…**plan, foster, and encourage** scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security…." (P.L.588 establishing ONR in 1946)*



Von Kármán at the Caltech Jet Propulsion Laboratory in 1950

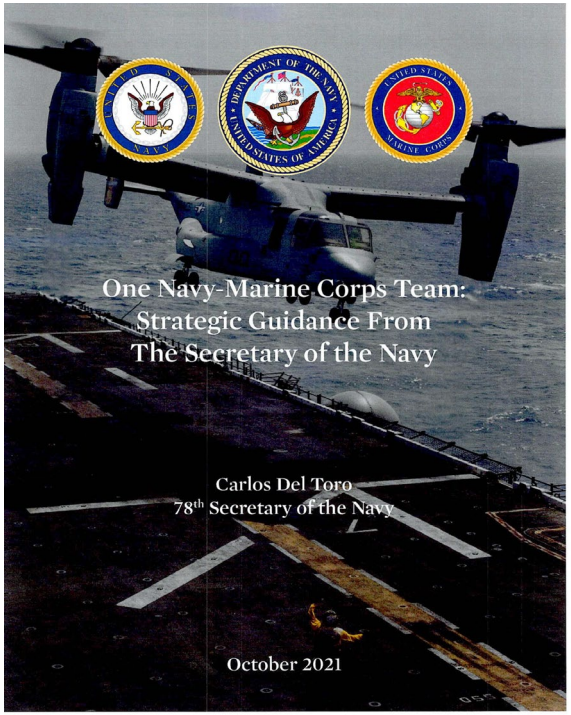
"Scientists study the world as it is, engineers create the world that never has been."

Theodore von Kármán*

This is essentially ONR's mission. We study the world in which we live, because we must operate, function, and win in that world. But we also create the Navy that has never been. ***This is exactly how we reimagine Naval Power.***

* an engineer who received the first National Medal of Science in 1962

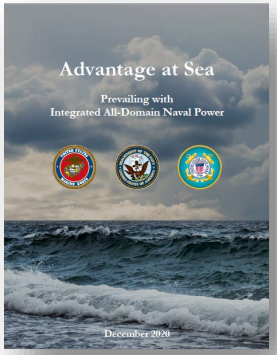
SECNAV Strategic Guidance



"Since my confirmation as the 78th Secretary of the Navy, I have characterized the most pressing challenges facing the Department of the Navy as the ***"Four Cs": China, Culture, Climate Change, and COVID***. The People's Republic of ***China represents the pacing challenge*** against which we must plan our warfighting strategies and investments. Cultural challenges that we must tackle include confronting sexual assault and harassment, ***promoting diversity, equity, and inclusion,*** preventing suicide, and demanding integrity and accountability across our naval leadership. ***Climate change poses a rapidly intensifying spectrum of risks*** to our operating environment, our allies and partners, and our planet. And ***COVID has posed an unprecedented test of the resilience*** of our people, their families, and our health system. We must tackle these Four Cs with a sustained sense of urgency and a strong bias for action."

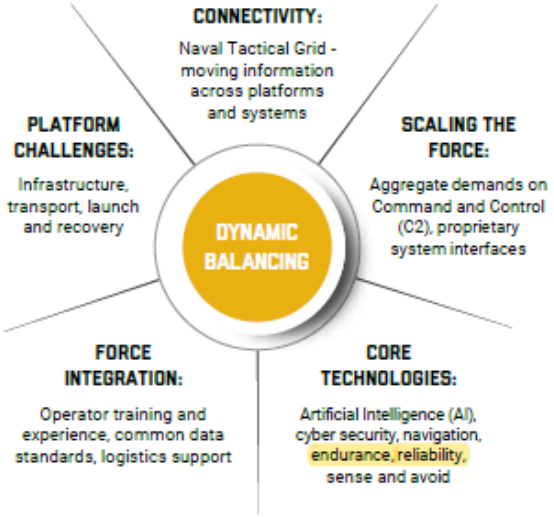
As President Biden stated in his March 2021 Interim National Security Guidance, "our world is at an inflection point." In the President's words, ***"The United States must renew its enduring advantages so that we can meet today's challenges from a position of strength."*** The Navy-Marine Corps Team is one of America's unmatched enduring advantages, and will be a vital part of realizing the President's vision.

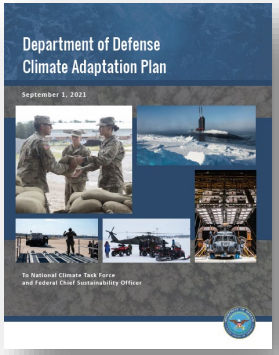
Strategic Guidance



"New and converging technologies will have profound impacts on the security environment. Artificial intelligence, autonomy, additive manufacturing, quantum computing, and new communications and energy technologies could each, individually, generate enormous disruptive change."

Executive Order 14008:
Tackling the Climate Crisis at Home and Abroad





"Ensure the DOD can operate under changing climate conditions, preserving operational capability and enhancing the natural and man-made systems essential to the Department's success"

S&T Issues/Concerns

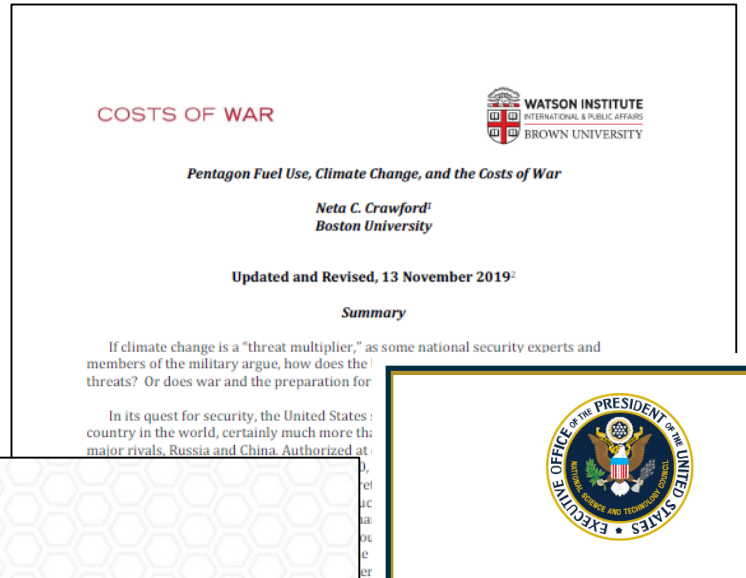

National Defense

DEFENSE DEPARTMENT

Vital Signs 2020: Defense Sector Straining to Attract STEM Talent

1/22/2020

By Yasmin Tadjdeh


COSTS OF WAR

WATSON INSTITUTE INTERNATIONAL & PUBLIC AFFAIRS BROWN UNIVERSITY

Pentagon Fuel Use, Climate Change, and the Costs of War

Neta C. Crawford[1]
Boston University

Updated and Revised, 13 November 2019[2]

Summary

If climate change is a "threat multiplier," as some national security experts and members of the military argue, how does the
threats? Or does war and the preparation for

In its quest for security, the United States
country in the world, certainly much more th
major rivals, Russia and China. Authorized at


August 2021

China is Fast Outpacing U.S. STEM PhD Growth

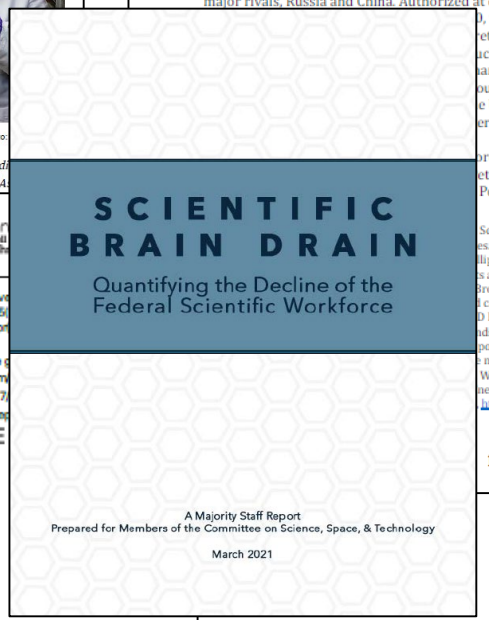
CSET Data Brief

CSET
CENTER for SECURITY and EMERGING TECHNOLOGY


Explaining the Persistence of Gender Inequality: The Work–family Narrative as a Social Defense against the 24/7 Work Culture*

Irene Padavic,[1] Robin J. Ely,[2] and Erin M. Reid[3]

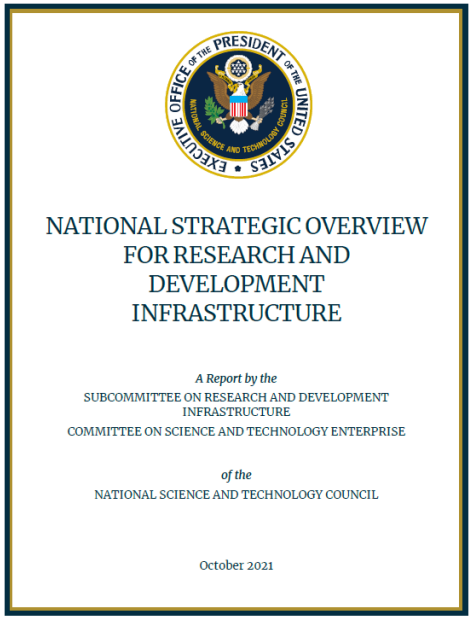
SAGE


SCIENTIFIC BRAIN DRAIN

Quantifying the Decline of the Federal Scientific Workforce

A Majority Staff Report
Prepared for Members of the Committee on Science, Space, & Technology

March 2021


EXECUTIVE OFFICE OF THE PRESIDENT OF THE UNITED STATES

NATIONAL STRATEGIC OVERVIEW FOR RESEARCH AND DEVELOPMENT INFRASTRUCTURE

A Report by the
SUBCOMMITTEE ON RESEARCH AND DEVELOPMENT INFRASTRUCTURE
COMMITTEE ON SCIENCE AND TECHNOLOGY ENTERPRISE

of the
NATIONAL SCIENCE AND TECHNOLOGY COUNCIL

October 2021

Developing a Diverse STEM Workforce

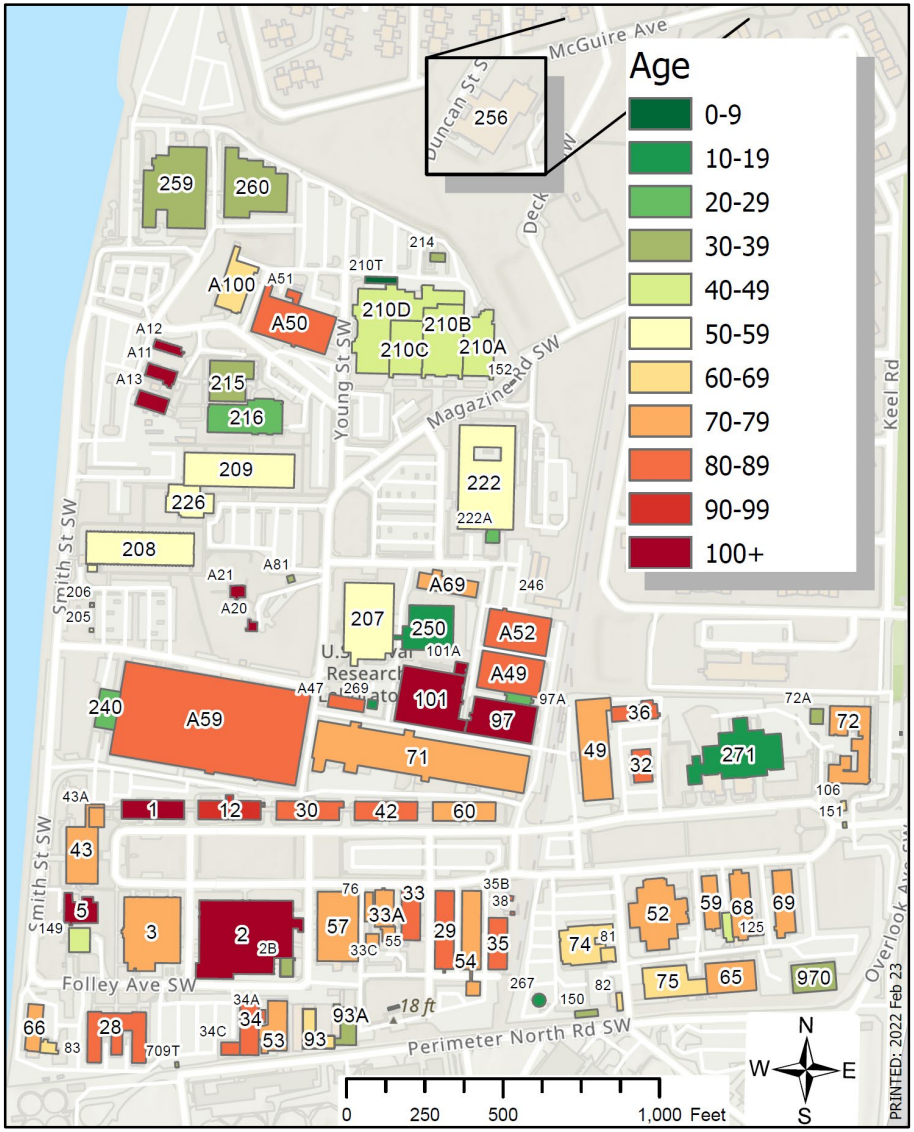
Blue Integrated Partnerships (BIP)

One single entity cannot solve the inequality gap and lack of diversity in STEM fields, alone - we must forge key strategic partnerships at multiple levels. We propose a system of systems approach to change the culture at each local institution within the ecosystem but that can also be replicated.

VISION: ***TO ATTRACT, MENTOR & SUPPORT THE UNTAPPED INCLUSIVE TALENT OF THE 21ST CENTURY WORKFORCE, READY TO SOLVE THE BIG CHALLENGES OF TOMORROW AND BUILD A TRANSFORMATIONAL ECOSYSTEM OF NATIONAL SECURITY.***

U.S. NAVAL RESEARCH LABORATORY

Facilities Issues & Challenges
Overview



Issues/Challenges:

(1) Aging infrastructure: As of 2022, the average age of NRL DC buildings is **67 years.**

(2) Current Facility Recapitalization Rate is **152 years.**
- Department of Defense (DoD) goal is 67 years.

(3) Competitiveness of military construction (MILCON).
- Only 4 MILCONs have been authorized for the NRL over the past 2 decades.

(4) Budget restrictions, decision models, and other external controls have limited lab/facility conditions & recovery or improvement.

(5) Technology demands straining the capabilities and capacities of current buildings.

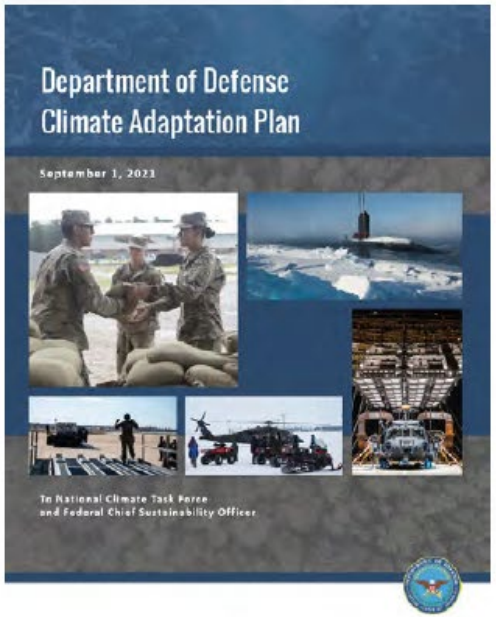
Proposed MILCONs and Whole Building Renovations:

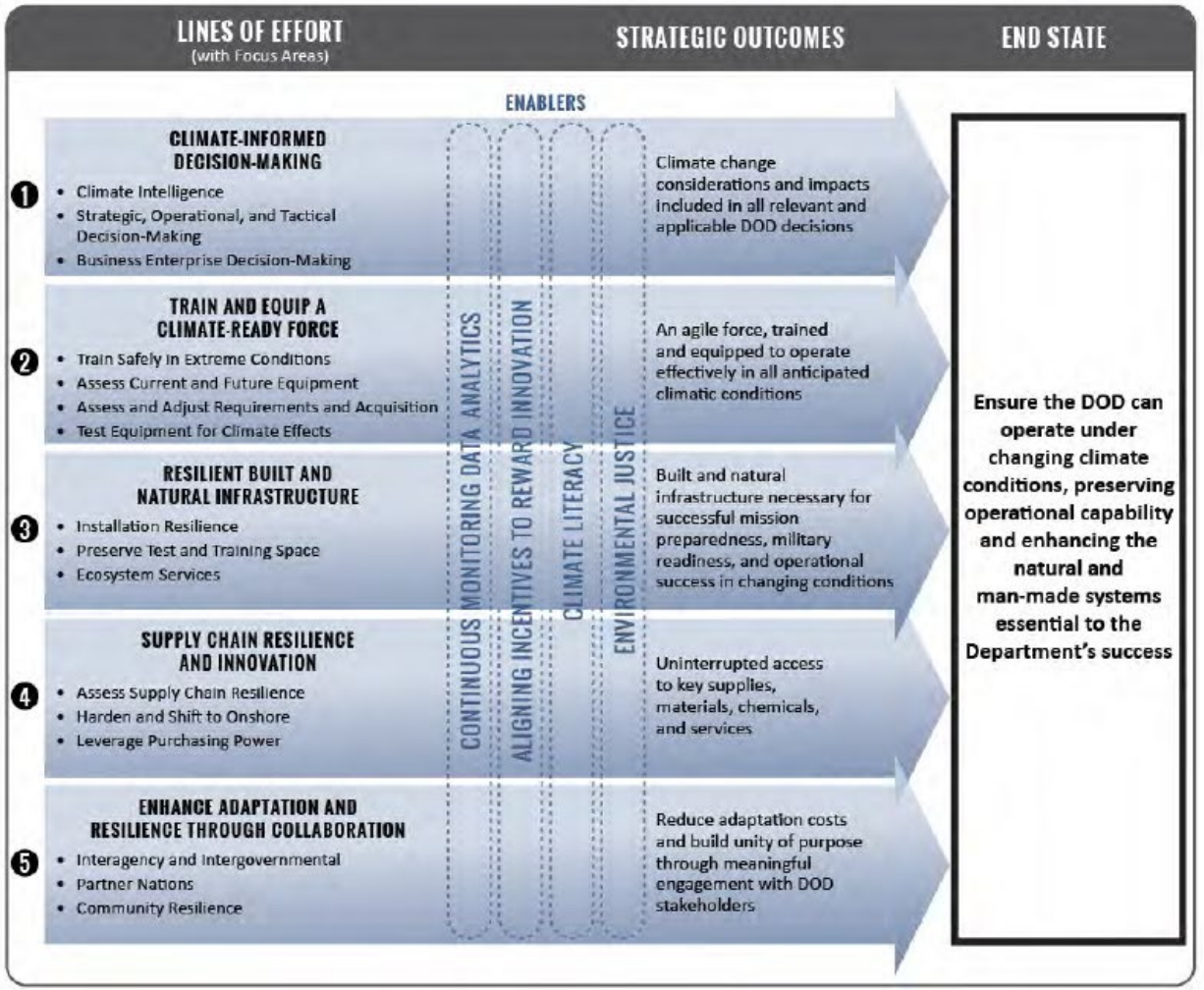
P215 Electromagnetic Counter-Measures Research Lab:
NRL #1 MILCON Priority, CNR validated in 2009
PA $509.6M, 246,876 SF

P250 Biomolecular Science & Synthetic Biology Lab:
NRL #2 MILCON Priority, CNR validated in 2009
PA $81.9M, 88,456 SF

PW6291 Renovate Building 208 for Chemistry Labs
Unfunded NRL SRM Project
Cost Estimate $126.1M, 149,831 SF

DoD Climate Adaption Plan



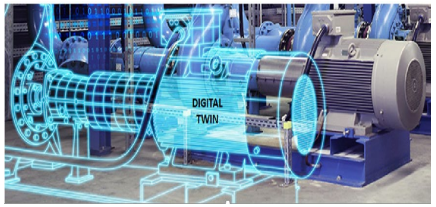


Current ONR programs address all 5 LOEs

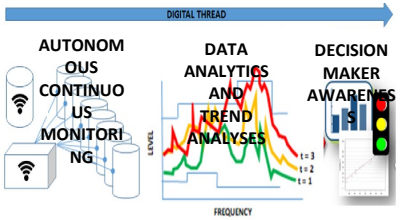
Digital Twin Science and Technology

ONGOING INITIATIVES

1. Developing technology to turn Navy's large data sets into useable knowledge to enable and expand the warfighting advantage.
2. Continuous analytical fusion of data, physics-based models, and machine learning (ML) to prescribe multiple, future representations of the platform and its environment.
3. Develop methods for autonomous command and control of a naval platform's power distribution system.



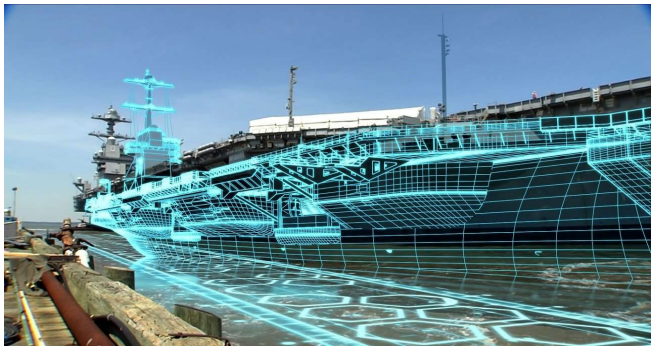
Data and Model Based Component and Subsystem Measurement and Analysis



Real-Time Data Compared to Historical and Model Data To Provide Actionable Information for Decision Makers

WHY THIS IS IMPORTANT

1. Having a tool to help identify the critical issues in a timely fashion to increase mission readiness and operational availability.
2. Apply AI/ML techniques to recognize deviations from expected operational conditions to prevent failures.
3. Improving the ability to provide protection against large power fluctuations and increase platform survivability.



Subsystem Information is Aggregated to Provide Increased Platform-Level Awareness

TRANSITION OPPORTUNITIES

1. Digital twin technology supports various power and energy programs, both manned and unmanned
2. Identify and mature digital twin technologies and capabilities that they can be operationalized for use on existing and future platforms