

NAVAL POSTGRADUATE SCHOOL

NAVAL INNOVATION CENTER
OPERATING CONCEPT



WHERE SCIENCE MEETS THE ART OF WARFARE

Why a Naval Innovation Center?

“We are indeed in an innovation race — and it is one we must win. Innovation must permeate every aspect of our Department’s approach to the delivery of the technologies and capabilities at a speed and scale necessary for our Navy and Marine Corps to confront the challenges of today and the future.”

— Secretary of the Navy Carlos Del Toro

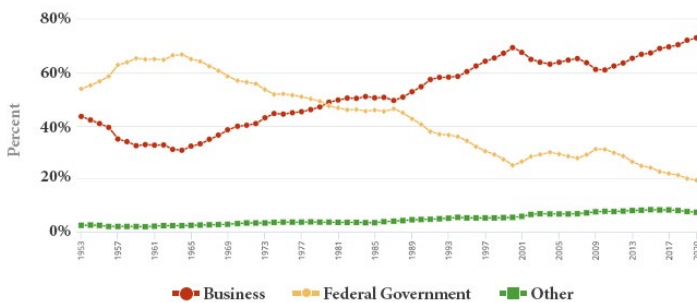
The Challenge



China’s civil-military fusion lowers barriers to rapidly mature their S&T innovations in space, cyber, electronic, information, and communications capabilities fuels their military growth as the world’s largest conventional force. Focusing their human talent, China is projected to be a global technology leader by 2040.

Innovation in America

U.S. total R&D expenditures, by source of funds: 1953-2020



Today, innovation in America is driven by industry. The business sector’s dominant role in the nation’s R&D funding began in the early 1980s, when its support started to exceed 50% of all U.S. R&D funding. We must keep pace and lower barriers to collaboration and defense innovation.



Rapid adaptation of emerging technologies into warfighting capability depends on human-machine integration.

We are living in exponential times—the Big Data Age. 74 x 10²¹ bytes created in 2021. Over 42 billion internet devices. Novel technologies scale in days. New technical information doubles every 2 years. Ubiquitous solutions today did not exist 10 years ago.



Quantum computing at scale places cryptographically secure networks at risk. Accelerating artificial intelligence capability will exceed human cognitive and learning capacity.



NPS students and faculty develop minimum viable solutions. Students practice *applied design* and *agile* methods with industry partners to develop rough prototype and experiment with novel solutions to bring speed to warfighting capability DevOps cycles.

When the future is uncertain, the most agile will adapt and prevail.



NPS is synonymous with *Innovation*



Leveraging the intellectual, operational, and entrepreneurial talent at NPS, the institution becomes a technology accelerator, incubator, and testbed for applications, concepts, and capabilities. Promising ideas are analyzed, war-gamed, reteamd, and matured through capstone projects in a classified environment. The NPS Strategic Framework combines *Education, Research and Innovation* with a strong Institution and partners to become a hub for rapid prototyping, experimentation and development.

Central to this idea is the Naval Innovation Center at NPS (NIC@NPS). A place purposefully created to connect experiential learning, collaboration, and naval innovation, the NIC@NPS will be the home of applied research and innovation aligned to core educational program areas that accelerate technology and talent development at greater speed and scale.

EDUCATION

Extend reach and increase the focus of defense-unique and naval-relevant education

RESEARCH

Increase the impact of applied research that is fully informed and directly contributes to warfighting solutions

INNOVATION

Lead naval innovation via a collaborative ecosystem connecting warrior-scholars with academia and industry

INSTITUTION

Enabled by a learning organization with a shared mission-focused culture developing defense leaders in modern and technologically relevant facilities.

Integrated teams will advance research and discovery supporting battlespace environments, naval engineering, combat systems, space technologies and operations, modeling and simulation, decision science and decision-making. Cyber and information technologies will close clear gaps in quantum science, operational energy, human-systems integration, integrated autonomous systems, high power computing, artificial intelligence, cyber and network operations, GEMS (gaming, exercising, modeling, and simulation), operational architecture, advanced materials, remote sensing, decision science, and climate and sustainability labs in support of warfighting.

These new capabilities will enhance learning beyond academic principles and strengthen education, research, and innovation outcomes.





NPS Comparative Advantage

WARFIGHTER DEVELOPMENT

Critical and strategic thinkers able to problem-solve, adapt, innovate, and lead



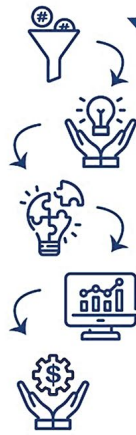
WARFIGHTING DEVELOPMENT

Classified and applied research and innovative solutions

EDUCATION SUPPORTING NAVAL REQUIREMENTS

- Naval Engineering
- Combat Systems
- Cyber and Information Systems
- Data Science and Decisions
- Global Security & Strategic Competition
- Defense Systems Management
- Space Technology and Operations
- Maritime Battlespace Environments
- Modeling, Simulation, & Visualization

Minimum viable solutions



Rapid prototyping and field experimentation



APPLIED RESEARCH IN SUPPORT OF NAVAL PRIORITIES

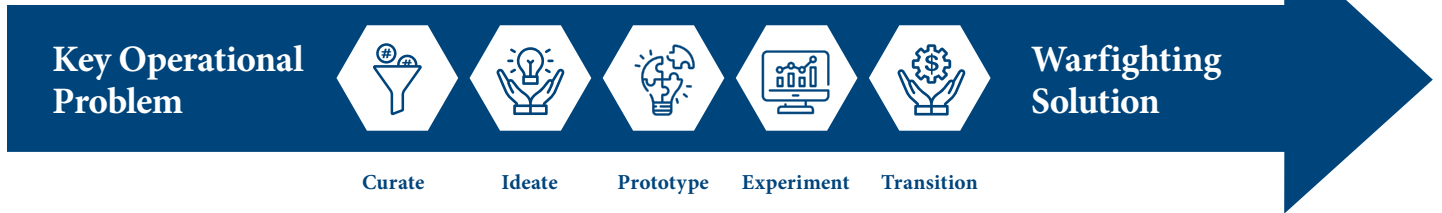
- C-C5ISR
- Long Range Fires
- Terminal Defense
- Contested Logistics
- Maritime Domain Awareness
- Artificial Intelligence
- Intelligent Autonomous Systems
- Naval Operational Architecture
- Modeling & Simulation GEMS/LVC
- Energy and Climate Security

Innovation Driven, NPS Develops Warfighters and Warfighting Solutions



NPS Innovation Operating Concept

- ▶ Warfare Innovation Continuum
- ▶ Naval Innovation Exchange
- ▶ Joint Interagency Field Experimentation
- ▶ Interdisciplinary Transition Team



WARFARE INNOVATION CONTINUUM

A campaign of analysis focused on an overarching warfighting challenge. Design teams develop minimum viable solutions.

NAVAL INNOVATION EXCHANGE TEAMS

Starting student-faculty-industry teams refine minimum viable solutions, explore mature technologies and warfighting application to accelerate adoption Naval customers.

FIELD EXPERIMENTATION (JIFX)

Identifies, influences, and accelerates early-stage technology development to enable rapid adaptation and adoption.

INTERDISCIPLINARY TRANSITION TEAM

Integrates technical, acquisition, and operations to accelerate capability transition to Program Executive Offices.

Navy Relevant Education and Research in Critical Technologies

Materials Science	Space Systems
Climate & Energy	Decision Science
Integrated Autonomous Systems	Combat Systems & Weapons

Established coherence around innovation activities within existing NPS education and applied research in support of warfighter development and solutions.

The NPS Innovation Operating Concept enables cross-disciplinary teams, **NR&DE and industry involvement** throughout process leveraging in-resident student experience, faculty expertise enhancing learning, while developing fully informed **prototype solutions**.



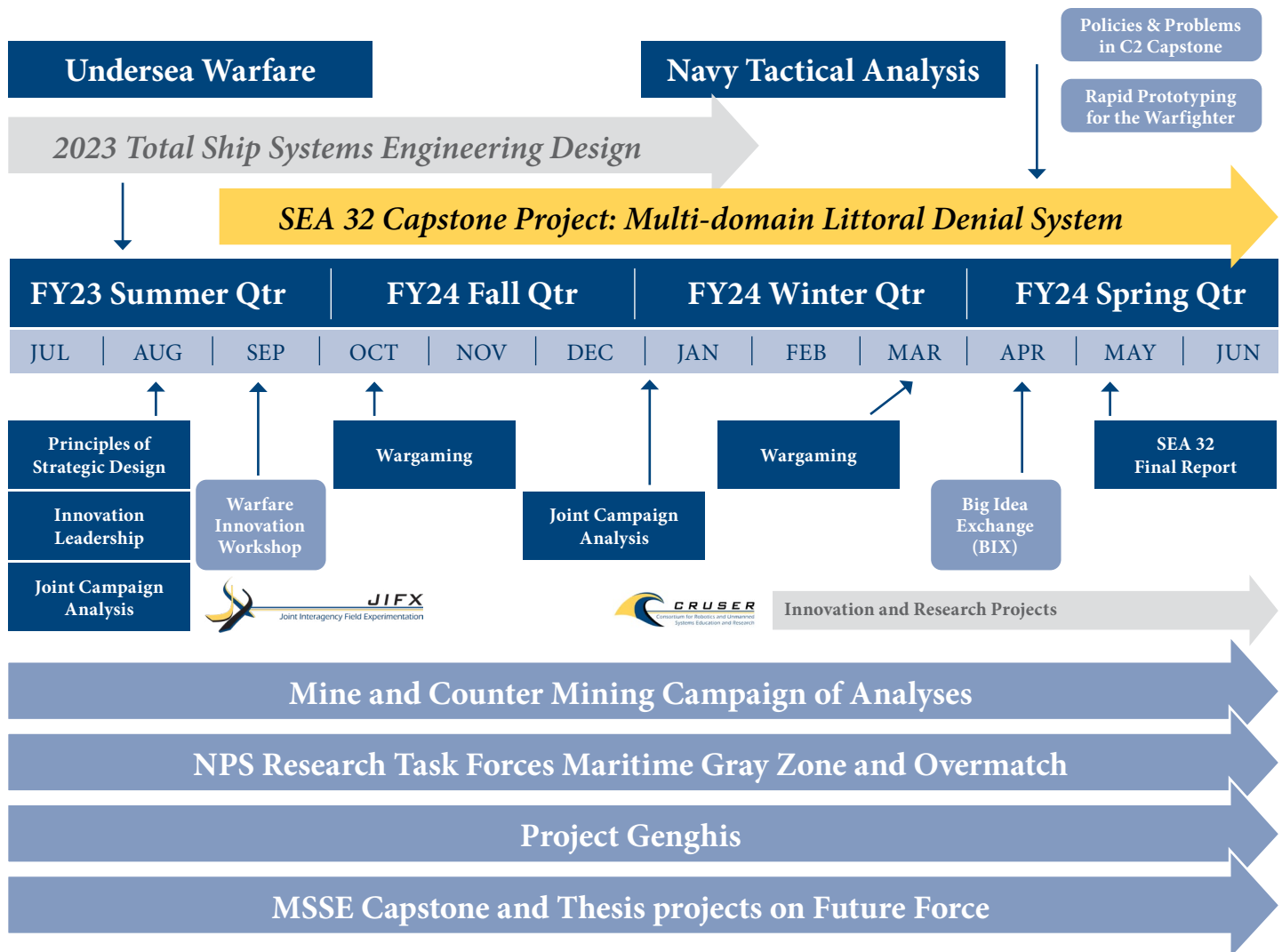
Warfare Innovation Continuum



The Warfare Innovation Continuum (WIC) is an annual year-long campaign of learning centered on a single overarching naval warfighting theme. Each September NPS' Naval Warfare Studies Institute (NWSI) holds a week-long WIC workshop where the topic is presented and interdisciplinary concept generation teams, consisting of NPS faculty, warrior-scholars, naval sponsors, industry participants, and Sailors and Marines of the Fleet and Fleet Marine Forces, propose ideas for how we might meet associated concept and capability challenges. Minimum viable concepts are explored over the remaining three quarters through workshops, academic courses, capstone projects, wargames, research efforts, ship designs, thesis work, white papers, prototyping, and experimentation. FY23/24 is aligned to the Navy's Analytic Master Plan (AMP) and will inform future AMP Campaigns of Learning.

Notional Warfare Innovation Continuum Campaign of Learning

FY24 WIC: Integrated Naval Campaigning





Naval Innovation Exchange



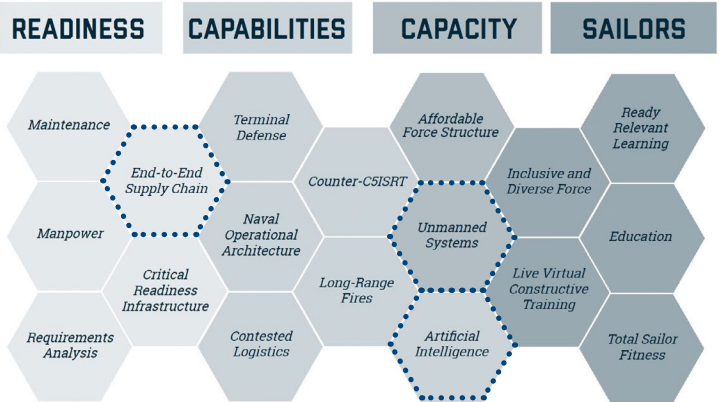
The Naval Innovation Exchange (NIX) creates, connects, and supports student-faculty-industry teams that accelerate adoption of innovations for Naval customers. The NIX is a networked organization that coordinates many teams of NPS faculty and students partnering with the primary stakeholders from Naval commands from around the world to drive specific technologies into adoption from ideation and prototyping through thorough test and evaluation aligned to NAVPLAN priorities and objectives.

Initial NIX Pilots

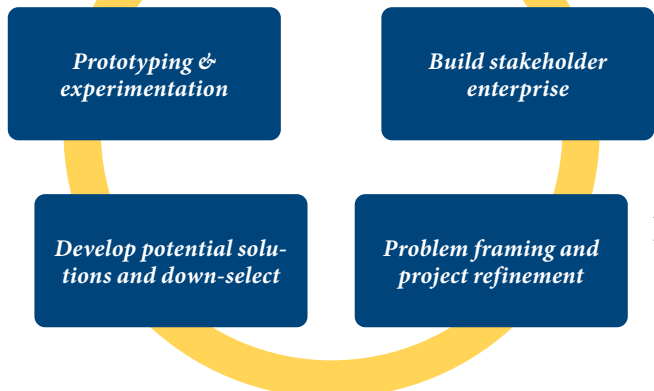
AI / AM / IAS



NAVIGATION PLAN PRIORITIES AND OBJECTIVES



Iterative Interdisciplinary Research Cycle



- Accelerate
- Incubate
- Transition

- FY24 NIX Teams:**
- ▶ Artificial Intelligence
 - ▶ Intelligent Autonomous Systems
 - ▶ Additive Manufacturing



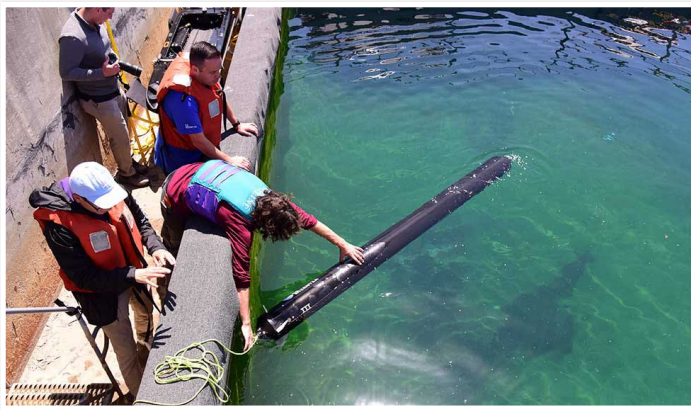
Joint Interagency Field Experimentation (JIFX)



Innovation occurs at the seams of expertise and experience. JIFX puts NPS students in the middle of developing the next generation of military systems. From outer space to underground and through air, sea, and cyber space, JIFX provides an operationally relevant experimentation environment to accelerate concepts to capability.

How does it work?

Quarterly JIFX events are a week-long and feature a relevant defense theme. An open Request for Information (RFI) invites students, faculty any organization, DOD, academia or industry, that is developing a capability that may have a military application to apply and propose an experiment. Proposals are screened and the most relevant and highest payoff are accepted including classified.



5G-enabled, JIFX offers land, air and sea-based test facilities, JIFX educates the Naval and joint warfighters on the "art of the possible" across a wide range of emerging technologies.



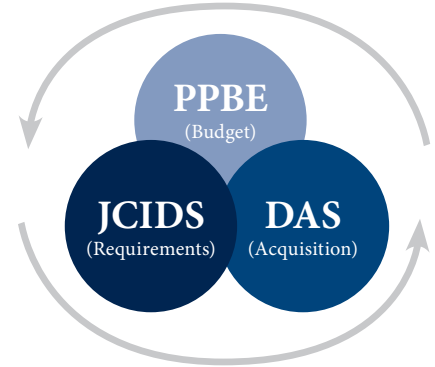
JIFX

Joint Interagency Field Experimentation

Interdisciplinary Transition Teams (ITT)

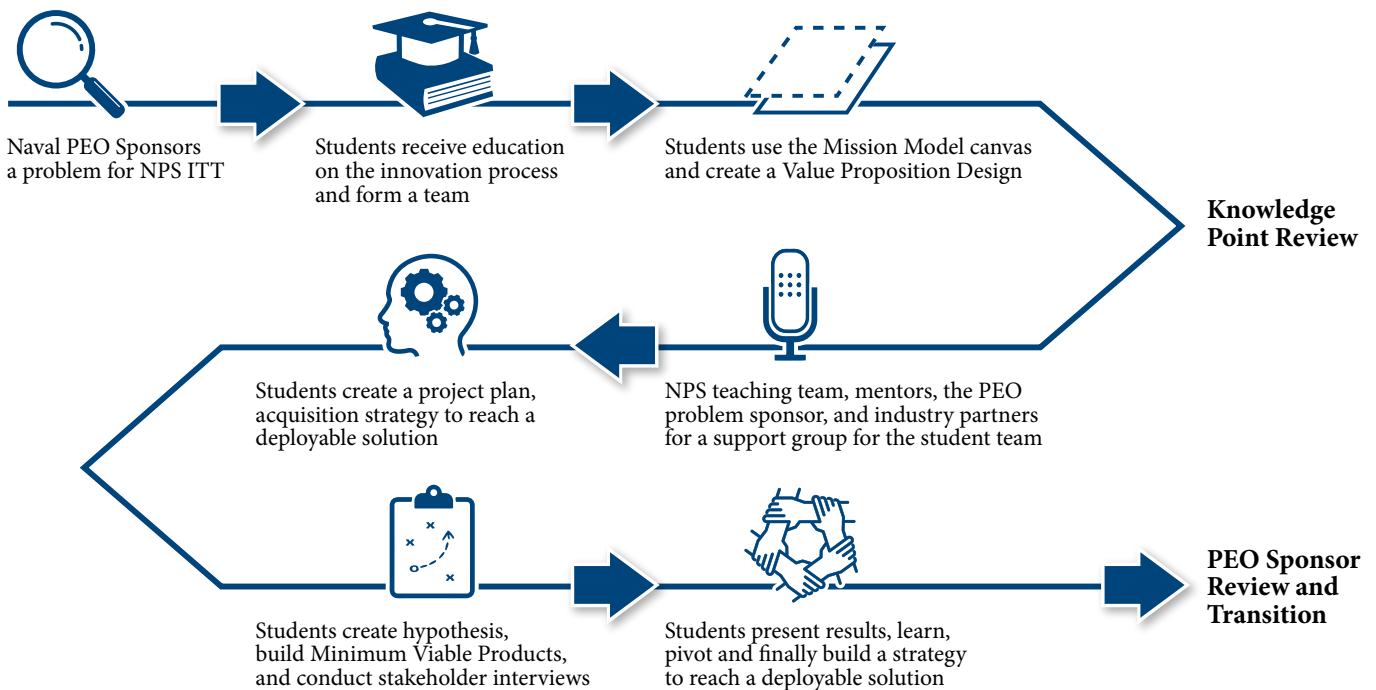


The ITT provides framework and alignment to the Defense Decision Support System (see graphic) which is necessary for technology to be adopted and transitioned to the warfighter.

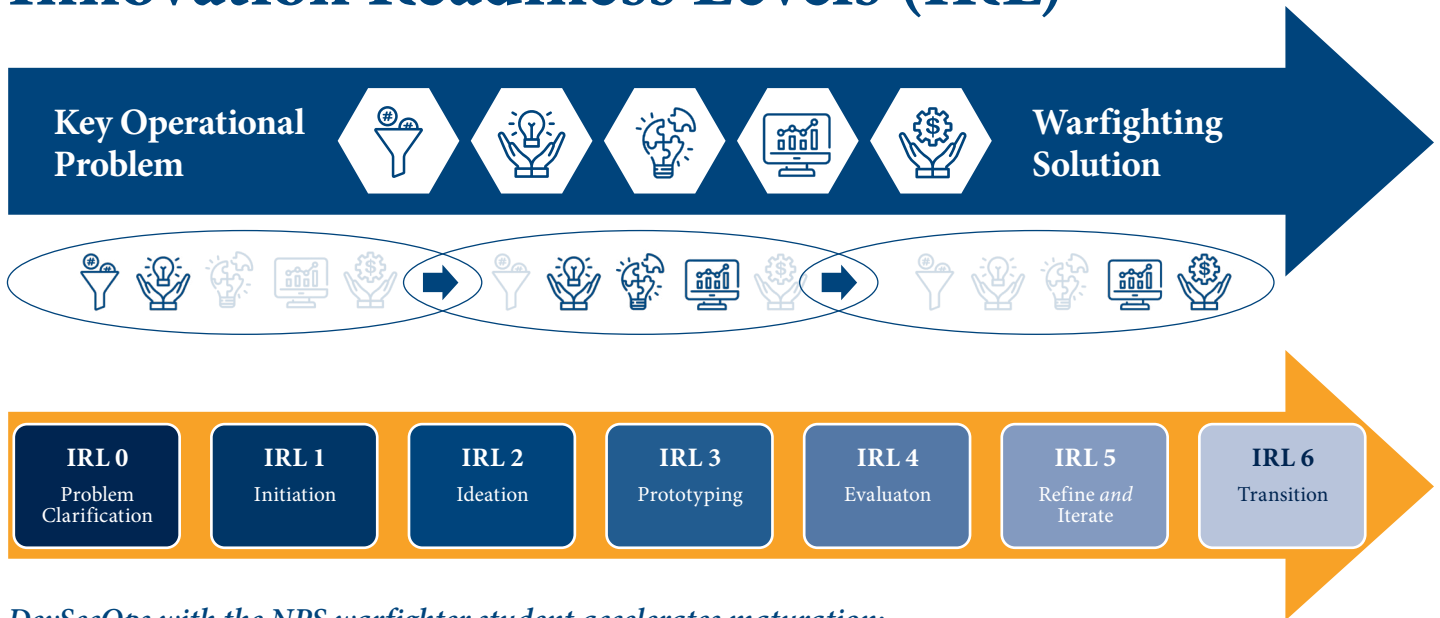


The requirements transition sponsor (PEO/PM) and their “users” are engaged throughout the process in which the ITT team is working toward the Value Proposition Design and the Minimum Viable Product (MVP). If innovative small business can help the ITT team to refine and deliver a Minimum Viable Product, they will proceed forward with the students for Milestone B (MSB). A presentation is made to the requirements transition sponsor by the ITT Team at event MSB.

The figure shows a roadmap from requirement insertion to MVP and transition. If the requirement sponsor is satisfied that the MVP can transition to a prototype, then the MVP proceeds forward for future development within the requirement sponsor organization. At this point the requirement sponsor can bring the small innovative sponsor forward with a non-FAR based contract for rapid prototyping.

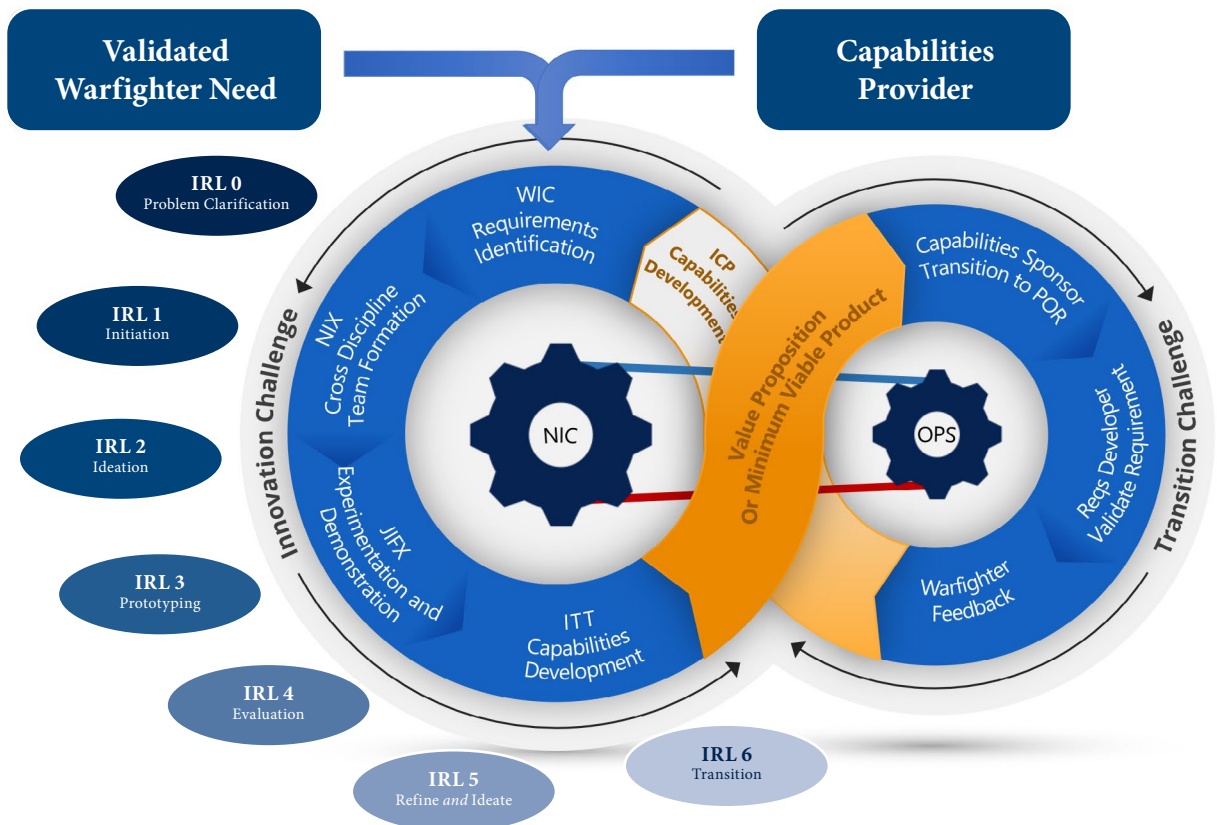


Innovation Readiness Levels (IRL)



DevSecOps with the NPS warfighter student accelerates maturation:

- ▶ Acceleration of operationally informed solutions
- ▶ Rapid prototyping and experimentation with industry partners
- ▶ Collaboration with defense-expert faculty and the NR&DE innovation ecosystem
- ▶ Learning by doing: experimentation lowers barriers and reduces acquisition program risk



Vision: Accelerating Ideas to Impact

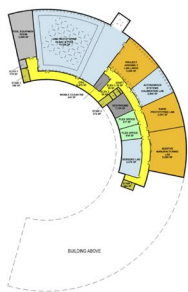
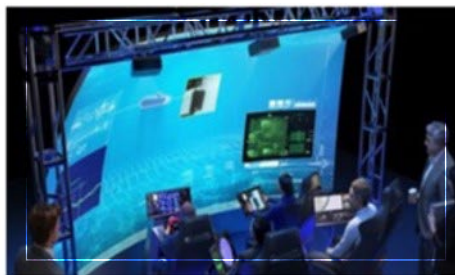
The Naval Innovation Center (NIC) is a function and future facility. The NIC will leverage NPS attributes and location near Silicon Valley to accelerate technology concepts and capabilities at greater speed and scale.

- ▶ Purposefully designed, multi-disciplinary laboratories and collaboration spaces.
- ▶ Creates spaces designed for high performing interdisciplinary teams to curate, ideate, prototype, experiment, and transition cutting edge processes and technologies.
- ▶ Allows students to collaborate with industry and academia to apply basic research concepts to Naval and DOD problems.

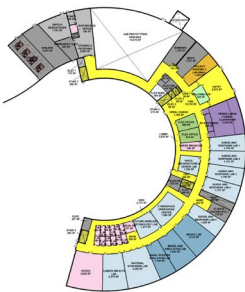


conceptual rendering

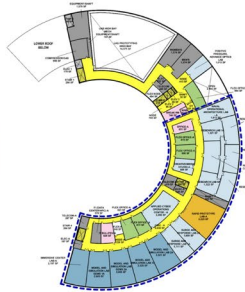
Provides labs and spaces at various levels of classification and capabilities:



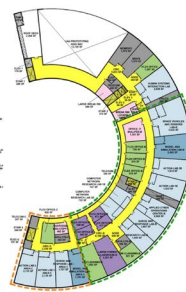
Basement



First Floor



Second Floor



Third Floor

- ▶ Artificial Intelligence
- ▶ Modeling and simulation
- ▶ Prototyping
- ▶ Applied cyber operations
- ▶ Wireless technologies (NextG)
- ▶ Energy and Climate Security
- ▶ Operational energetics
- ▶ Naval Operational Architecture
- ▶ Autonomous systems
- ▶ Space systems and sensors

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