

A collage of military imagery: a soldier in full combat gear on the left, a large naval ship at sea in the center, a fighter jet in flight above, and a missile launch with a large plume of fire on the right. A blue and yellow curved graphic element is at the bottom.

# HARNESSING THE POWER OF TECHNOLOGY for the **WARFIGHTER**

## **NSWC Crane Command Overview**

**October 2017**

***CAPT Mark Oesterreich, USN  
Commanding Officer  
NSWC Crane***

***Dr. Brett Seidle, SES  
Technical Director  
NSWC Crane***

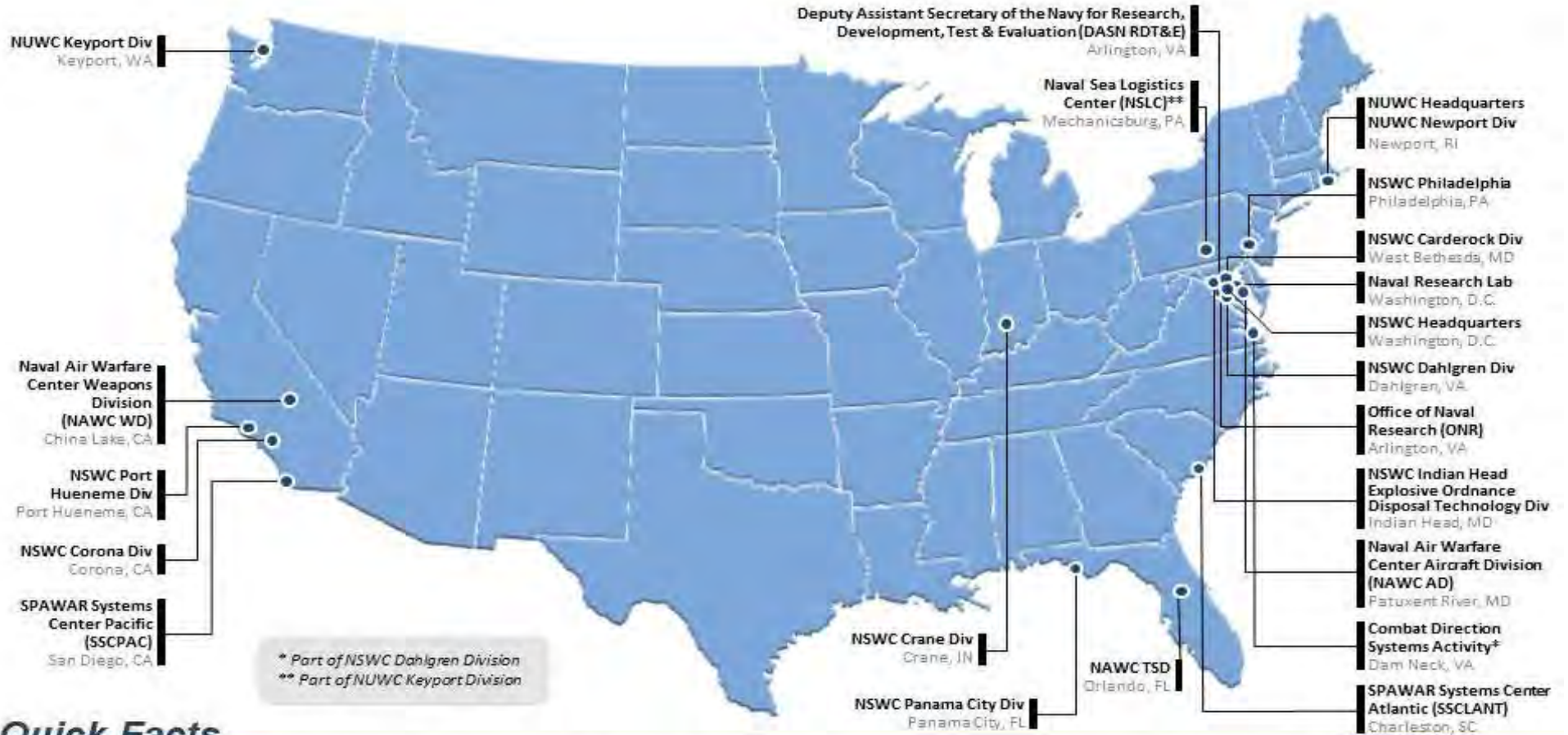
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# Naval Research & Development Establishment



## Quick Facts

- ❑ Diverse and highly educated workforce with 25,000 scientists, engineers, and technicians (with more than 2,000 Ph.D.s)
- ❑ 20 commands across the NAVAIR/NAVSEA Warfare Centers, SPAWAR Systems Centers, ONR and NRL
- ❑ Conducts RDT&E for the DoN to discover, develop, transition and field technologically superior naval warfighting capabilities.
- ❑ Unique Naval RDT&E facilities including laboratories, test facilities and test ranges
- ❑ Serves as principal R&D agents for Navy and Marine Corps Program Executive Offices
- ❑ Organizationally aligned to Naval Systems Commands and ONR
  - Naval Sea Systems Command (NSWCs, NUWCs)
  - Naval Air Systems Command (NAWCs)
  - Space and Naval Warfare Systems Command (SSCs)

**Aggressive Research, Development, Test & Evaluation for reliable real world solutions.**



# Contributing to the Surface Navy After Next

**Kinetic and Non-Kinetic Effects**

- Electric and hypersonic weapons
- Hypersonic weapons
- Scalable multi-domain weapon effects
- Advanced energetics & propellants

**Sensors**

- Multi-source multi-domain, multi-modal sensing and fusion
- Multifunction apertures for active and passive sensing
- Novel sensing and processing

**Platform & Payload Integration**

- Arctic operations
- Advanced signature reduction
- Modular ship/payload design
- Novel CB protection

**Expeditionary**

- Adaptive force packages
- Fires as networked commodity
- All source real time decisions
- Ship-to-shore movement/connector

**Power and Propulsion**

- Advance power creation, distribution and control
- Cyber hardened machinery controls

**Surface Warfare Combat Systems**

- Fully integrated multi-domain fires
- Distributed multi-platform command and control enabled by AI
- Strategic to tactical integrated battlespace awareness

**Distributed Lethality**

Increase the offensive lethality of all warships  
Distribute offensive capability geographically  
Give ships the right mix of resources to persist in a fight

*Surface Force Strategy – Return to Sea Control  
Commander Naval Surface Forces January 2017*

**Mine Warfare**

- Advanced undersea scalable effectors with clandestine delivery
- Autonomy for in-stride MCM
- Rapid broad area neutralization
- Undersea battlespace pellucidity

**Ranges, Training Performance Assessment**

- Deployable training
- Robust LVC integrated to LBTS
- Range enterprise integration
- Real-time enterprise and joint performance assessments

**Autonomous Vehicles**

- Long range/long duration minimal monitored missions
- Multi-vehicle collaboration
- AI enabled weaponized UxS
- Interchangeable payloads and modular payload deployment

**Electronic Warfare**

- Passive precision targeting
- Network enabled distributed and coordinated EW
- Cognitive and adaptive systems
- Advance off-board EW

**Mission Engineering & Warfare Analysis**

- Mission architectures and analysis
- War gaming technical capabilities
- Theater warfare analysis

**Forward Support and Agile Logistics**

- On-demand mobile advanced maintenance
- Innovative distance support and prognostic health management
- Self healing systems



# Technical Leadership

3238

NSWC Crane Employees

67 %

Scientists,  
Engineers &  
Technicians

## QUICK FACTS

\$1.3B

Business Base

3

Focus Areas

Electronic Warfare  
Strategic Missions  
Expeditionary Warfare

1

Mission

2

DoD Executive  
Agent  
Assignments

5

Technical  
Warrant  
Holders

87 PhD

584 Masters

1401 Bachelors





# Mission Focus Areas

## Our Mission . . .

Provide acquisition engineering, in-service engineering and technical support for SENSORS, ELECTRONICS, ELECTRONIC WARFARE and SPECIAL WARFARE WEAPONS. Apply component and system level product and industrial engineering to surface sensors, strategic systems, special warfare devices and electronic warfare/information operations systems. Execute other responsibilities as assigned by the Commander, Naval Surface Warfare Center.

**Strategic  
Missions**

**Electronic  
Warfare**

**Expeditionary  
Warfare**

*Providing the American Warfighter with solutions to their toughest technical challenges in order to better equip them with a DECISIVE advantage over our Nation's adversaries.*

# Strategic Missions

## *Deter, Defend, Defeat*

### Areas of Expertise:

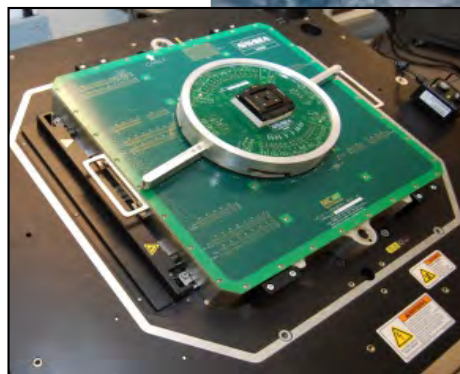
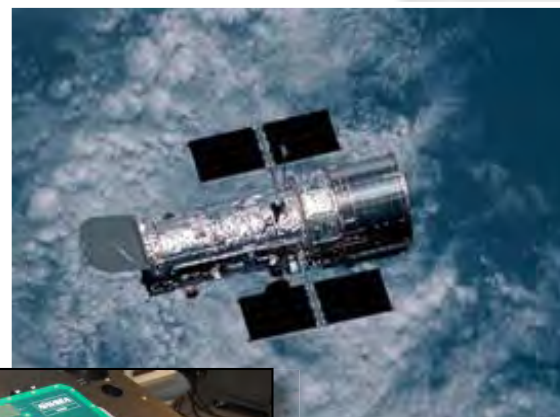
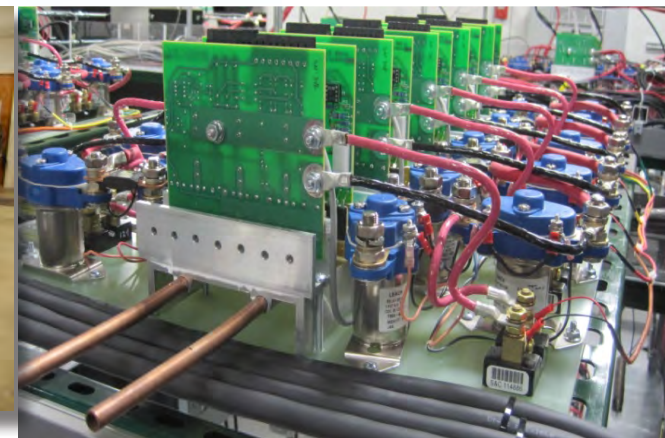
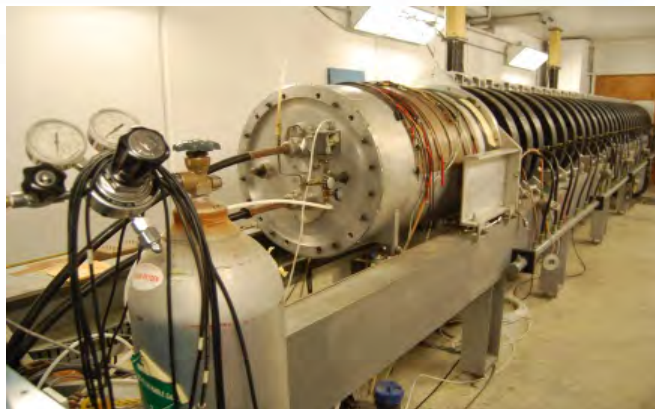
- Trusted Electronics
- Radiation Sciences
- Failure/Material Analysis
- Flight Engineering
- Design & Systems Engineering
- Component Engineering
- Anti-Tamper Technologies
- Automated Test Equipment
- Printed Circuit Board Design

### Hardware Product Areas:

- Launcher Systems
- Missile Handling and Transportation Systems
- Fire Control and Navigation Systems
- Deployed Test and Measurement Equipment
- Polymer Sciences and Underwater Sensors
- ASIC Design and Verification

### Key Technical Areas Core to Future:

- Model Based Systems Engineering
- Radiation Hardened Electronics
- Counterfeit Electronics
- Microelectronics
- Automated Test Equipment Design
- Trusted Hardware



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# Expeditionary Warfare

## Rapid Response, Proven Solutions

### Areas of Expertise:

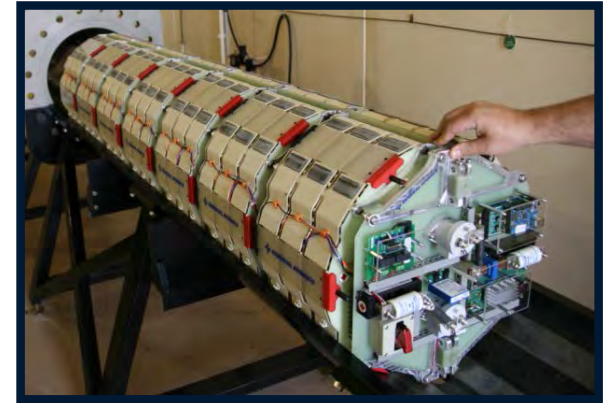
- Small Arms Weapon Systems Engineering
- Specialized Munitions Systems Engineering
- Electro-Optic Technology Systems Engineering
- Surveillance, Reconnaissance & Intelligence Collection Systems Engineering
- Expeditionary Systems Integration & Engineering
- Power Systems and Interconnect Technology Engineering
- System Test and Evaluation

### Hardware Product Areas:

- Hand Emplaced Munitions
- Small Arms (less than 20 mm)
- Expeditionary Ground and Air C4
- Expeditionary ISR Systems Ground and Air
- Multi-Sensor/Multi Domain EO/IR Systems
- Multi Chemistry Battery and power management Systems

### Key Technical Areas Core to Future:

- Robotics & Weapons Control
- Software Interfaces
- Sensors & Sensor Fusion
- Artificial Intelligence & Machine Learning
- Human Systems Integration
- Systems of Systems T & E



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## Control The Spectrum, Control The Fight

### Areas of Expertise:

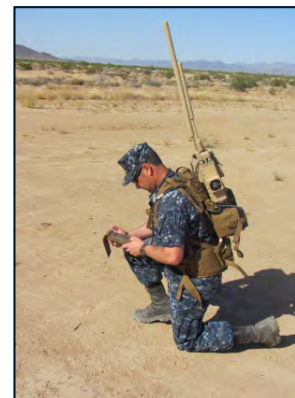
- Full life cycle engineering
- System Test and Integration
- Threat exploitation
- Technology Transition
- Hardware in the Loop, Modeling & Simulation

### Hardware Product Areas:

- Surface Electronic Warfare
- Counter Radio Electronic Controlled Improvised Explosive Device Warfare (CREW) Systems
- Airborne Electronic Attack
- Infra-Red (IR) Countermeasure Design  
Flares/Chaff/Lasers
- Phased Array and Solid State Technologies

### Key Technical Areas Core to Future:

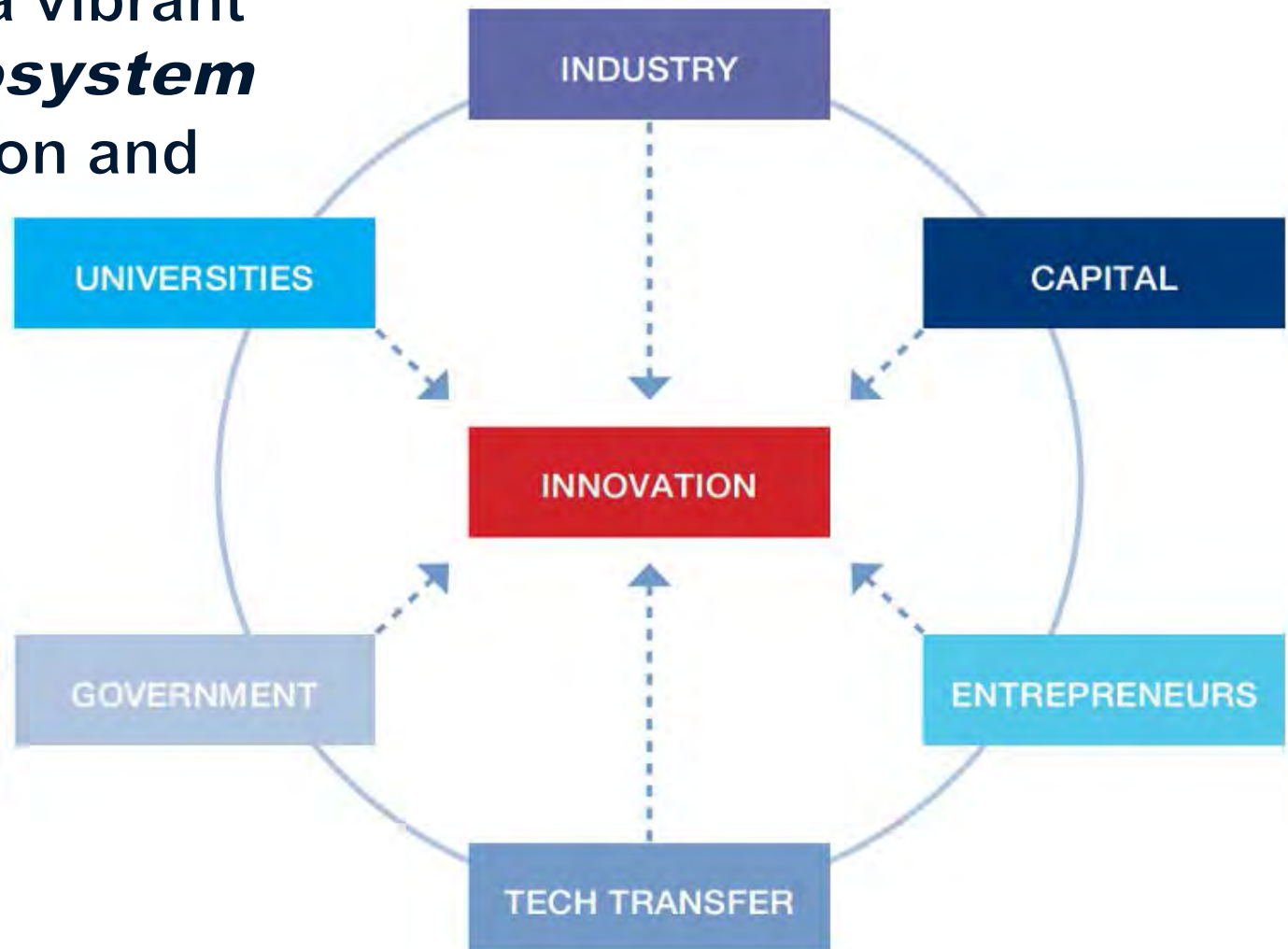
- Electromagnetic Spectrum Control Expertise
- Cyber via the Spectrum
- Model Based Systems Engineering
- Live/Virtual/Constructive Experimentation
- Distributed, Cognitive, and Adaptive Technologies





# Innovation Ecosystem

Accelerate and enable the development of a vibrant *Innovation Ecosystem* across the region and state.





# Innovation Ecosystem Metrics

163

Active T2 Agreements

Agreement  
Breakdown:

44 CRADAs  
67 EPAs  
14 PIAs  
17 PLAs  
21 WFPPs

- ✓ Delivering innovation through strategic partnerships
- ✓ Providing game changing solutions
- ✓ Goal: Effective, scalable and sharable T2 model

## FY17 QUICK STATS

95

IP Disclosed

Intellectual  
Property Portfolio

326

Patents  
Issued

Agreements  
Initiated  
FY17

33

126

Patents Filed

547

NSWC Crane  
Technology Transfer  
(T2) Program

Last updated: July 25<sup>th</sup>, 2017

Leveraging T2/IP for enhanced lab mission effectiveness through technology innovation and collaboration is ensuring we're using ALL our assets







# University Partnerships

- PhD Fellowships
- SMART PhD Scholarships
- Naval Research Enterprise Internship Program
- Naval Engineering Education Consortium Grants
- Microgrants for Research
- Temporary Faculty Hires
- Post-doctoral Researcher On-Site Fellowships
- Cooperative Research and Development Agreements
- Educational Partnership Agreements



INDIANA UNIVERSITY



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# Summary

- **NSWC Crane is:**
  - **The Navy’s primary organic field activity for full lifecycle leadership in Strategic Deterrence**
  - **A National Leader in Electronic Warfare providing full lifecycle support of multi-domain, multi-spectral EW systems.**
  - **The Center of Excellence for Special Operations Weapons, Sensor Integration, and Weaponry for the Expeditionary Warfighter**
  
- **NSWC Crane provides our Naval, DoD and National Customers affordable, innovative solutions necessary to defend our country and deter aggression**



**NAVSEA**  
WARFARE CENTERS  
CRANE

We at NSWC Crane exist to provide the American Warfighter with solutions to their toughest technical challenges in order to better equip them with a **DECISIVE** advantage over our Nation's adversaries.

Create a culture of innovation that values leadership and employee engagement.



**Ethos**

Integrate capabilities and processes to enable efficient and effective execution of our mission.



**Execution**

Innovate game changing and agile solutions.



**Excellence**

**Vision Statement**

Combating our nation's greatest threats, NSWC Crane is the indispensable mission expert, leveraging our deep technical heritage to deliver solutions through innovation and strategic partnerships.

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