NAVSEA
WARFARE CENTERS
CRANE

SPECIAL MISSIONS

RAPID RESPONSE
PROVEN SOLUTIONS

Harnessing the Power of Technology for the Warfighter

Rapid Development and Integration of Remote Weapon Systems to Meet Operational Requirements – Abstract 8851

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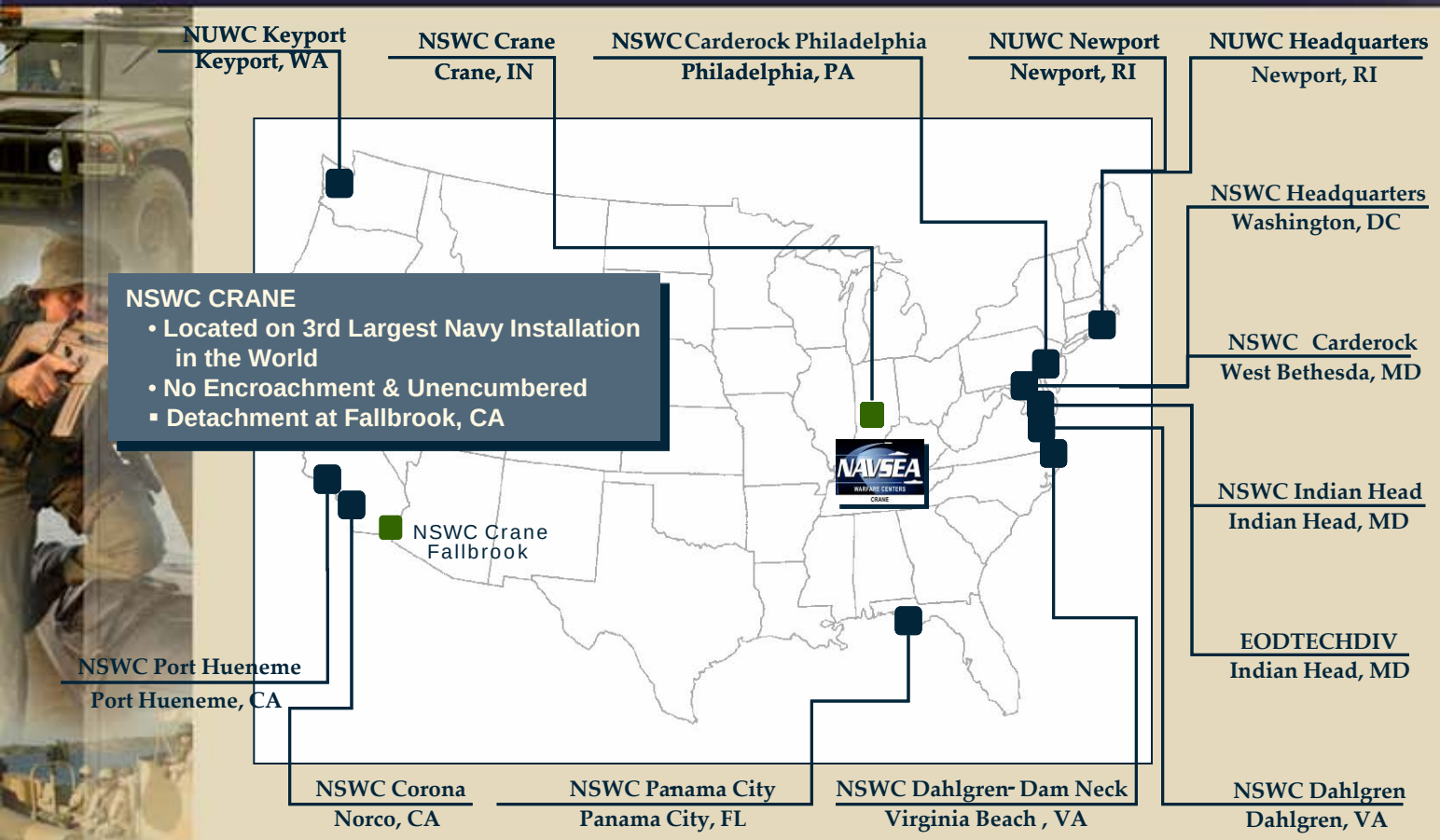
NSWC Crane Division



NSWC CRANE
- Located on 3rd Largest Navy Installation in the World
- No Encroachment & Unencumbered
- Detachment at Fallbrook, CA

NSWC Crane Key Attributes

- Critical concentration of 2,000 scientists, engineers and technicians
- $1.64B of work executed in FY 08
- 2720 workyears of effort
- 52 Patents Issued, 52 filed, 37 disclosed - "the metric of innovation"
- Business-based enterprise operating under the Navy Working Capital Fund

Stewards of

14 NAVSEA Technical Capabilities

NSWC Crane Mission Focus Areas:
Special Missions
Strategic Missions
Electronic Warfare / Information Operations

Four Outputs:
- *Knowledge*
- *Contracts*
- *Hardware*
- *Software*

NSWC Crane Division

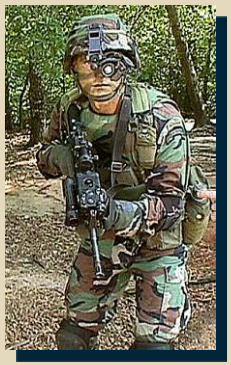
Our Mission . . .

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 / Information Operations

Special Missions



Providing innovative technical solutions for the rapidly changing combat environment

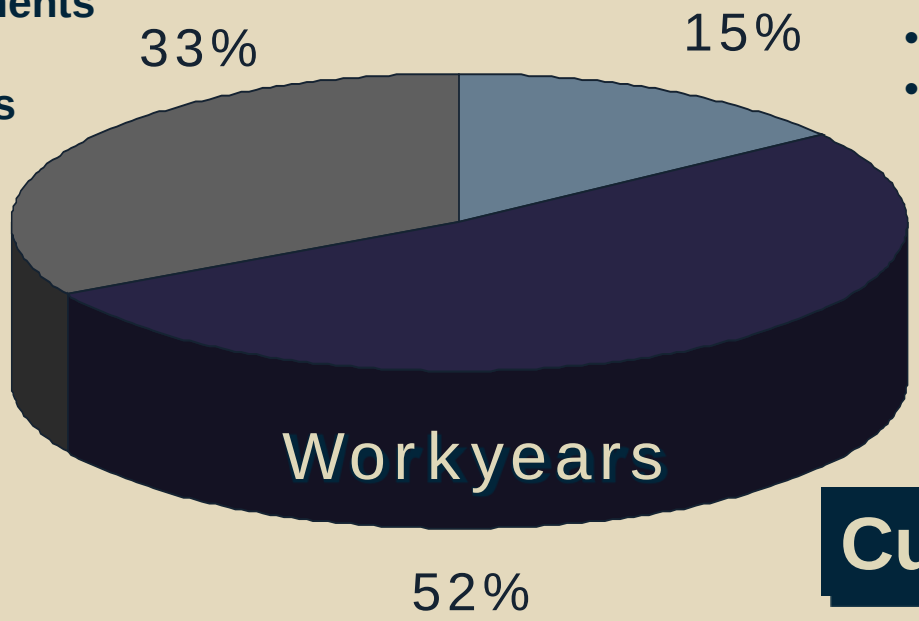
Total Life Cycle Leadership

Next Warfighter

Development
- System Engineering
- Hardware Acquisition
- Hardware Enhancements
- Rapid Design
- Acquisition Logistics
- Test & Evaluation

Warfighter After Next

Innovation
- System Engineering
- Basic Research
- Inserting Technology
- Modeling & Simulation
- Test & Evaluation



Current Warfighter

Sustainment
- In-Service Engineering
- Obsolescence Recovery
- Software Support
- Life-Cycle Logistics

Technical Expertise for the Future Navy

Small Arms Air Platform Integration

- **Who are we?**
  - We are a team of engineers, logisticians, and technicians with vast crew served weapons integration experience.
  - We have the capability to support the full life cycle of the systems we deploy.
  - We support multiple platform offices and team with industry partners.
  - We take great pride in providing high quality support to our customers in a timely manner.

- **What do we do?**
  - Design and integrate weapon systems for various aircraft.
  - Fabricate prototype parts for fit checks and testing.
  - Support flight certification process through the NAVAIR Performance Monitors.
  - Provide Finite Element Analysis (FEA) modeling for fatigue and crash loads.
  - Procure production hardware through GOV contracts.
  - Receive, inspect, kit, and deploy high quality systems.
  - Provide interim supply support.

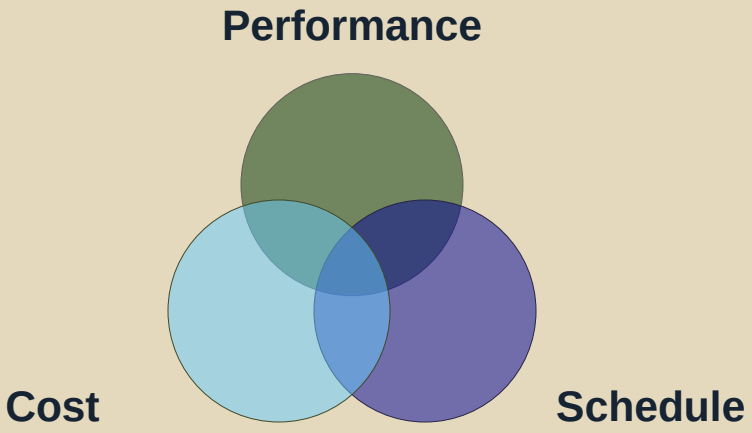
Various Air Platforms Supported

Approved for Public Release; Distribution is unlimited.

Crew-Served vs. Remote Weapons

- **Multiple Department of Defense Agencies have conducted Remote vs. Crew-Served weapon effectiveness analyses.**
- **These tests have concluded that Remote Weapon Systems can provide increased force protection.**
- **Why are Remote Weapon Systems not integrated into a greater number of platforms?**

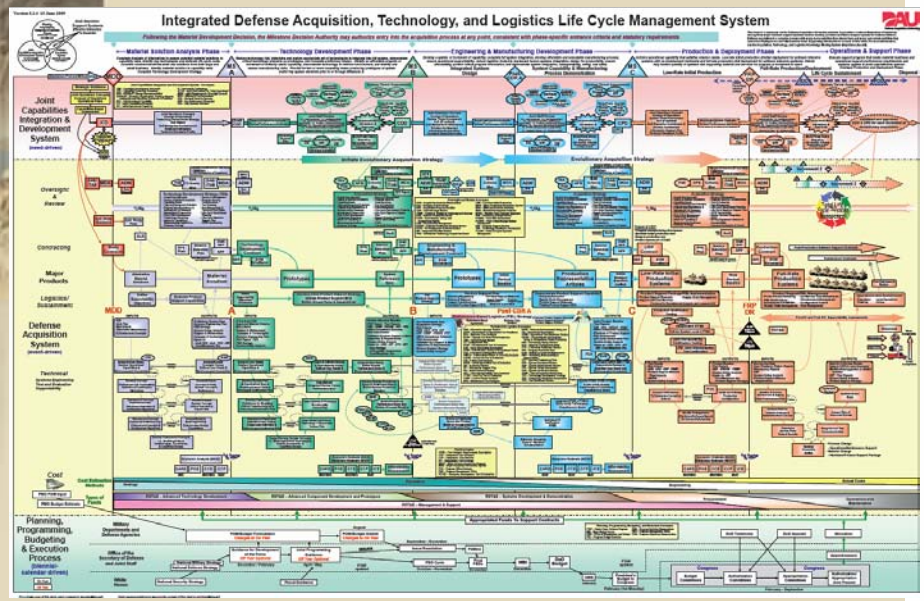
Systems Engineering



- **How can we rapidly field Remote Weapon Systems on multiple platforms at a reduced cost that will provide enhanced capability for the fleet?**
- **How are we using Systems Engineering to solve this question?**

Systems Engineering Process

- **We use applicable Systems Engineering Guides to derive a tailored Systems Engineering Plan**



May 2003

Naval Air Systems Command

NAVAIR

Systems Engineering Guide

NAVAIR
NAVSEA
SPAWAR
Marines
NAVSUP

Naval Systems Engineering Guide

October 2004

Systems Engineering Guide for Systems of Systems

Version 1.0
August 2008

SYSTEMS ENGINEERING FUNDAMENTALS

January 2001

SUPPLEMENTARY TEXT
PREPARED BY THE
DEFENSE ACQUISITION UNIVERSITY PRESS
FORT BELVOIR, VIRGINIA 22060-5565

Systems Engineering Plan Preparation Guide

"Technical Planning for Mission Success"

Version 2.01
April 2008

Department of Defense

Office of the Deputy Under Secretary of Defense for Acquisition and Technology

Systems and Software Engineering
Enterprise Development

Approved for Public Release; Distribution is unlimited.

Tailor vs. Cut

- **The use of ‘Tailor’ instead of ‘Cut’ is key to our systems engineering process**
  - **Tailor: to fit to a particular circumstance**
  - **Cut: reduction; break off**
- **The Systems Engineering Process is often over simplified due to perceived ‘plug and play’ instead of integration**
- **Key Questions:**
  - **How can we apply guides and instructions written for an ACAT I program to a small rapid development effort?**
  - **What is the purpose of the process/document?**
  - **Does the purpose add value to the program?**
  - **How can we benefit from the purpose within cost and schedule?**

Installation vs. Integration

- **The next key concept is the difference between ‘Installation’ and ‘Integration’**
  - **Installation: putting a machine in position for operation**
  - **Integration: link to form a whole**
- **Complex Integrations are over simplified into simple installations.**
- **Square Peg in a Round Hole**

The Line of Integration

- **At what point do we draw the line for integration**
  - **COTS System onto Platform**
  - **COTS Subsystems into System onto Platform**
  - **COTS Components into Subsystems into Systems onto Platforms**
  - **The higher the better, within Performance, Schedule and Cost**
- **Use of Analysis of Alternatives and Trade Studies to identifying level of integration**
  - **Risk vs. Benefit Chart**
    - **This places the priority on the performance of the end item**
  - **Cost and Lead Time**
    - **Often COTS lead times are longer than entire project schedule**

Keeping a Fleet Perspective

- **It's all about "Supporting the Warfighter"**
- **NSWC Crane has a close working relationship with the end user.**
  - **This allows us to continually receive feedback and make adjustments.**
- **How does the task I'm performing support the warfighter?**

NSWC Crane as the System Integrator

- **RAPID RESPONSE**
  - **As a DoD Activity funding can be provided immediately avoiding contract lead times**
  - **This allows us to be fully engaged from the start of the program, working with the sponsor and end user to solidify requirements**
  - **No contract mods when requirements change**
  - **Flexibility to adjust to SE process changes**
    - **Drop non-value added tasks**
    - **Add emerging tasks to meet goals**

Tools

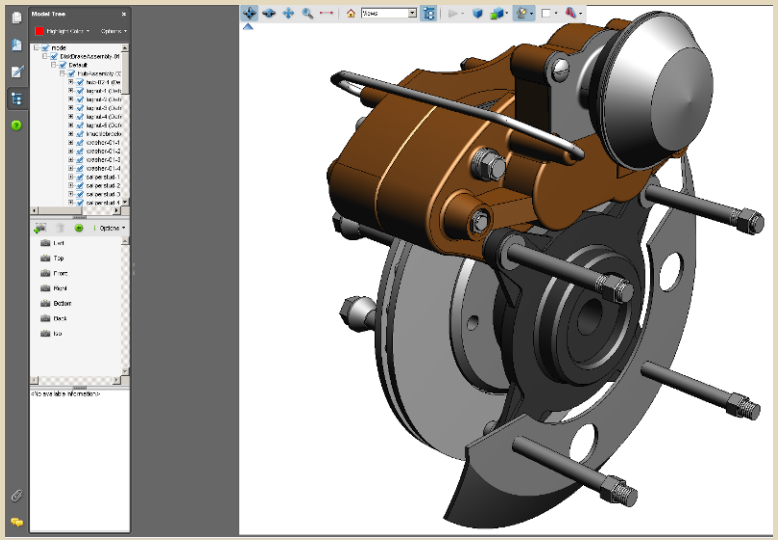
- **MS Project**
  - **Integrated Master Schedule**
  - **Setup by WBS allows for clearer tasking and reporting**
- **Guides**
  - **Start with guides and tailor, not process that reference guides**
  - **MIL-HDBK's / MIL-STD's**
  - **DoD/Navy/Industry Guides**
  - **DoD/Navy Instructions**
  - **GAO Reports**

Hardware-In-the-Loop Development

- **Establishing a DoD Hardware-In-the-Loop Working Group**
  - **Navy Warfare Centers, AFRL, TARDEC**
- **Model-Base Software development allows for rapid software development**
- **Software can be broken up into ‘Subsystems’, simulated, tested with actual hardware, and then integrated into full system.**

3D PDF

- **The use of 3D pdf's has allowed us to have integrated design reviews.**
- **The design can work right up to the meeting**
- **Meeting location not dependant on CAD capable computer**
- **Helps with non co-located quick look design reviews**



Summary

- **Increase in Remote Weapon System would provide enhanced capability to the warfighter**
- **‘Tailored’ System Engineering Process provide the foundation for a complex effort**
- **Remote Weapon Systems must be integrated, not just installed**
- **The point of integration must be adjusted to meet desired performance**
- **Rapidly adapt SE processes to stay focused on how that task benefits the warfighter**
- **Use new tools to perform SE activities**

Thank you for your time and attention!

For more information on NSWC Crane, please visit www.crane.navy.mil

Images were downloaded via publically accessible websites