SPECIAL MISSIONS

NAVSEA
WARFARE CENTERS
CRANE

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 12109

25-May 2011

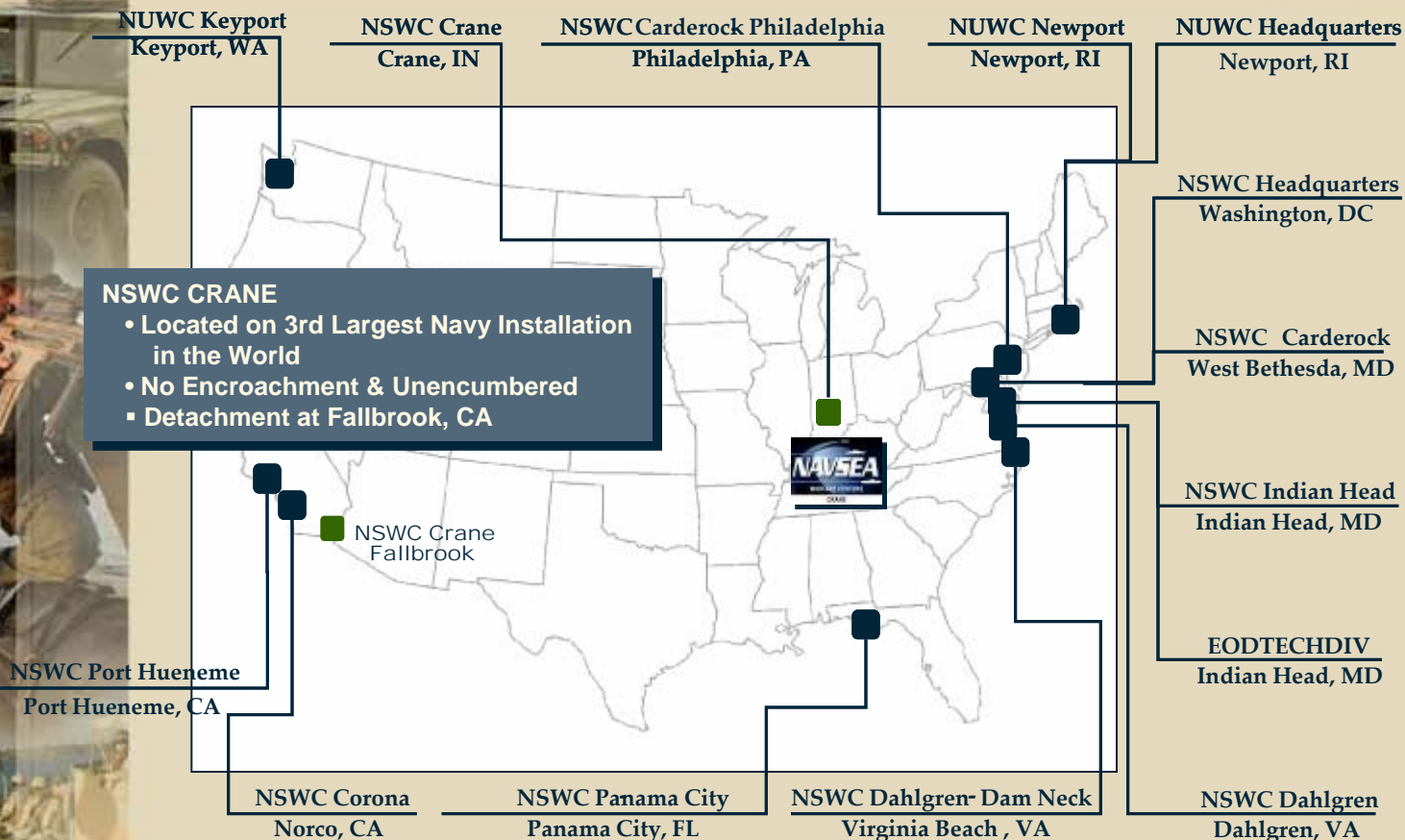**Joseph Burkart**
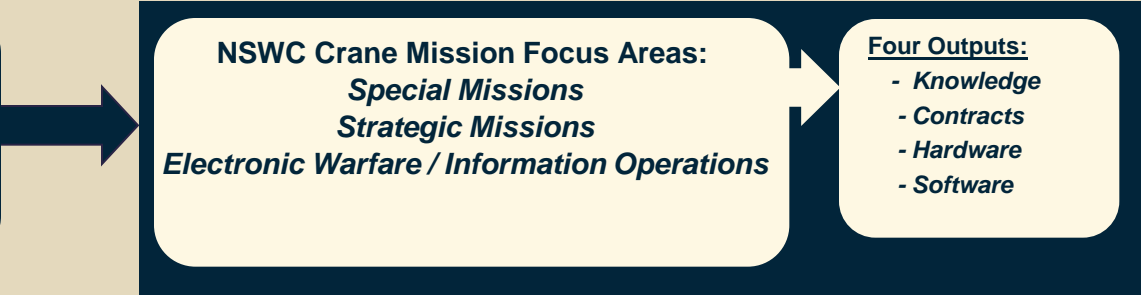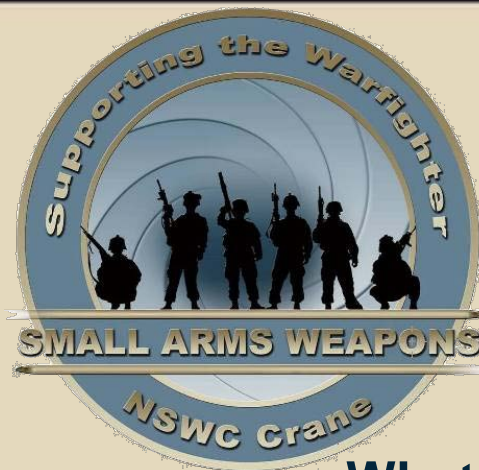**Crane Division, Naval Surface Warfare Center (NSWC Crane)**
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• Located on 3rd Largest Navy Installation in the World
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Stewards of 14 NAVSEA Technical Capabilities

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

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

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Small Arms Air Platform Integration

- **Who are we?**
  - We are a team of engineers, logisticians, and technicians with vast crew served weapons and electronics 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.
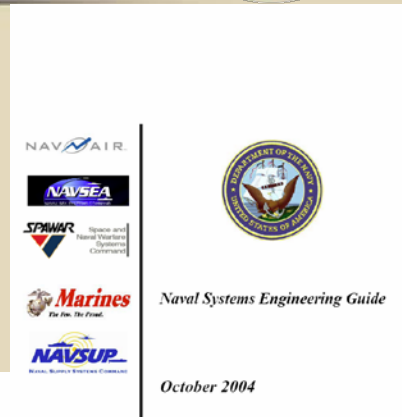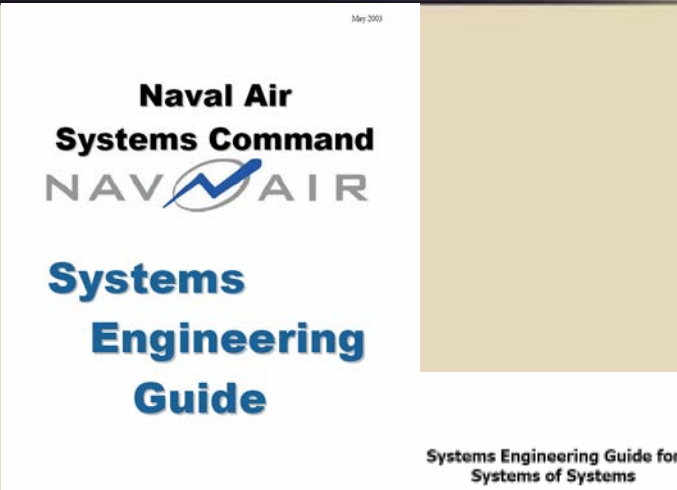
Crew-Served vs. Remote Weapons

- **Multiple Department of Defense Agencies have conducted Remote vs. Crew-Served weapon effectiveness analyses.**

- **Various studies and evaluations have concluded that Remote Weapon Systems can provide increased force protection.**

- **Why are Remote Weapon Systems not integrated into a greater number of platforms?**

- How can we rapidly integrate weapon systems at a reduced cost that will provide enhanced capability for the fleet?
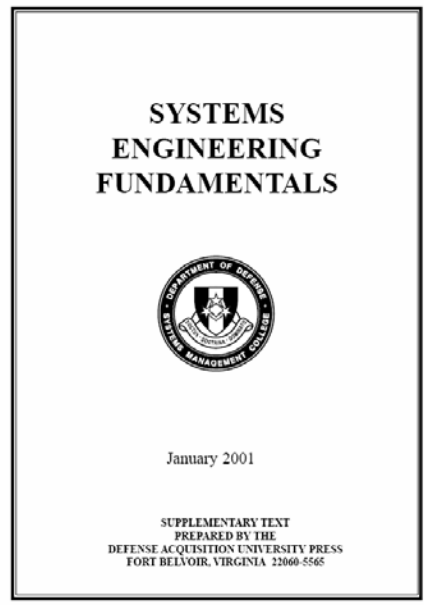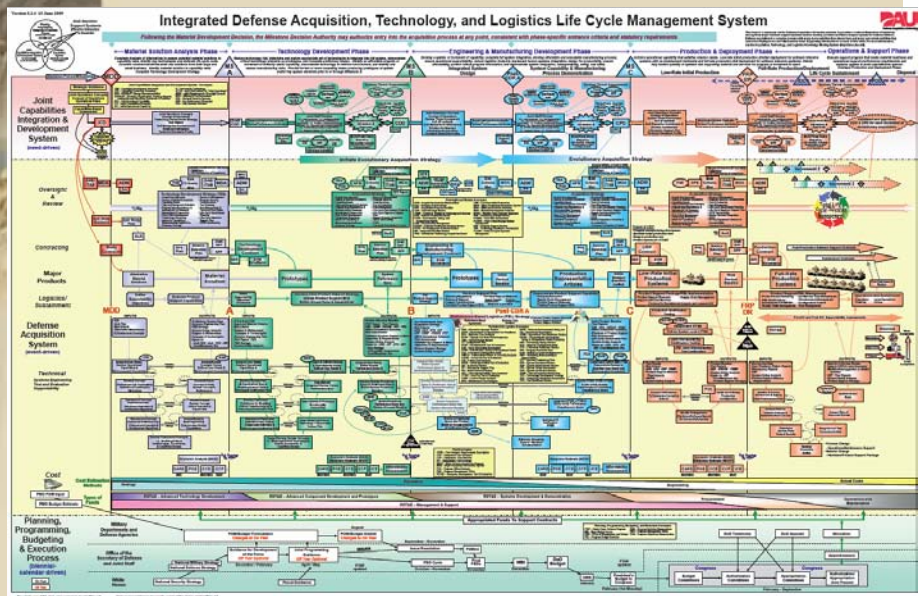- How are we using Systems Engineering to solve this?

Process & Artifacts

Execution

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

Naval Air Systems Command
NAVAIR

Systems Engineering Guide

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

Integrated Defense Acquisition, Technology, and Logistics Life Cycle Management System

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

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- The use of 'Tailor' instead of 'Cut' was key to our systems engineering process
  - Tailor: to fit to a particular circumstance
  - Cut: reduction; break off
- 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?
- Readdressed how we 'Tailor' the Guides and Instructions to ensure we're meeting the intent of the document
- Putting 'Pen to Paper' forces tough decisions to be made early and greatly aid in the planning process and gets everyone on the same page

Key Documents

- **System Architecture**
  - Aids in communication
- **Systems Engineering Plan**
  - Identifies Roles and Responsibilities
- **Work Breakdown Structure**
  - Helps to Scope the Project
  - Contains a dictionary of elements
  - Allow for assignment of tasks
- **System Subsystem Specification**
  - Allocated Requirements to WBS Elements
  - Assigned to Functional Leads
- **Interface Control Document**
  - Defined External and Internal Functional, Physical, Human Interfaces
  - Established Interface Nomenclature
  - Assigned to Functional Leads
- **System Subsystem Design Description**
  - Established System Architecture
  - Documented System Wide Design Decisions
  - Consolidated Trade Studies and Analyses to one Location

Team Structure
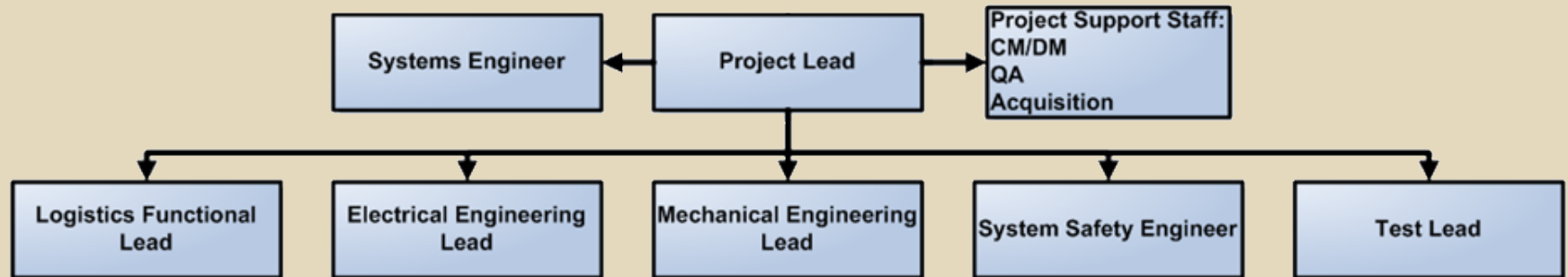
- **Established a Team that could execute the work**
- **Involved Non-Design Functional Areas from the start of the project**

The Line of Integration

- **At what point do we draw the line for integration**
  - COTS System onto Platform?
  - COTS Subsystems into a 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
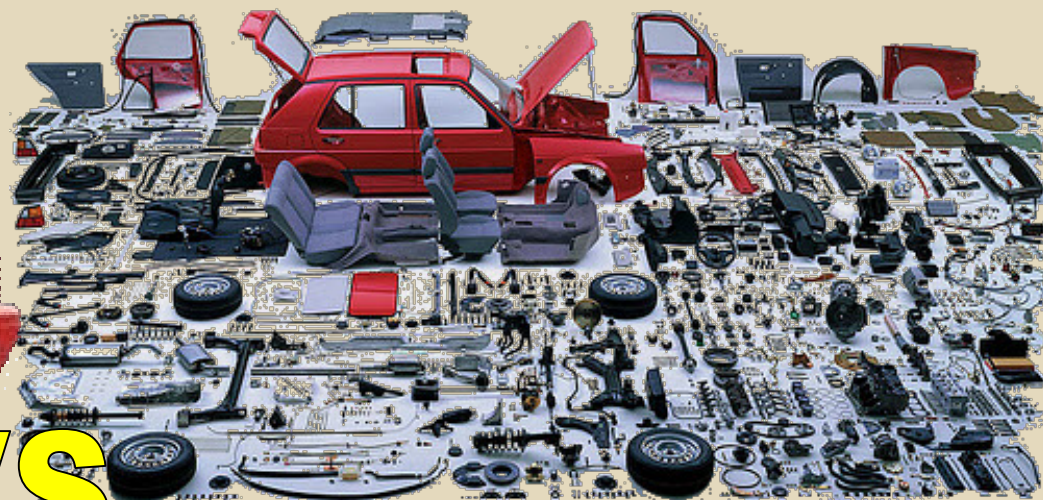
VS.

- **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
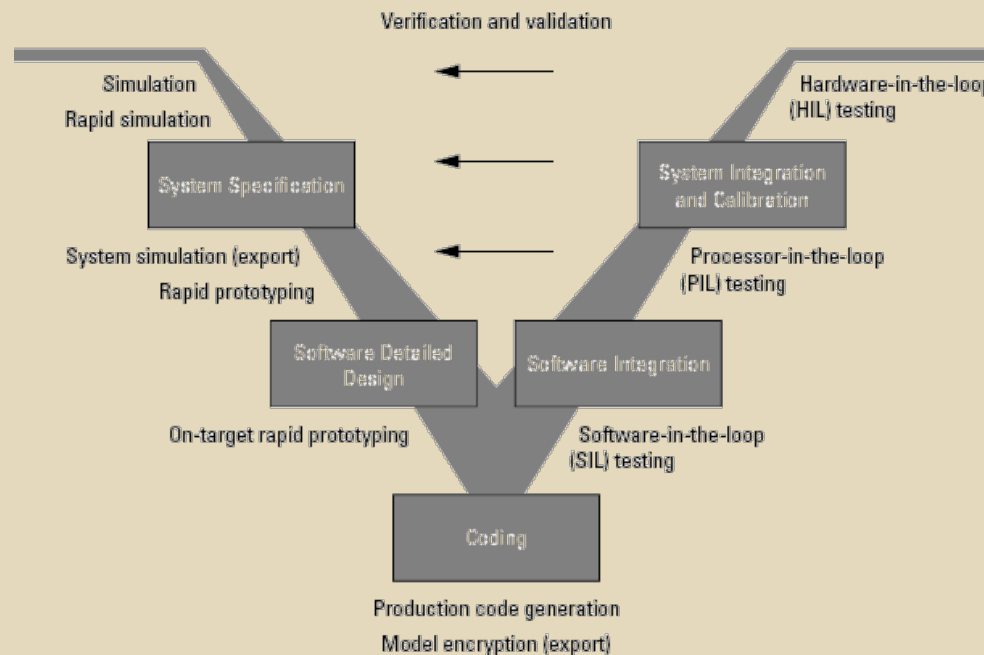
- **Model-Base Software development allows for rapid software development**
- **Software can be broken up into 'Subsystems', simulated, tested with actual hardware, and then integrated into full system.**

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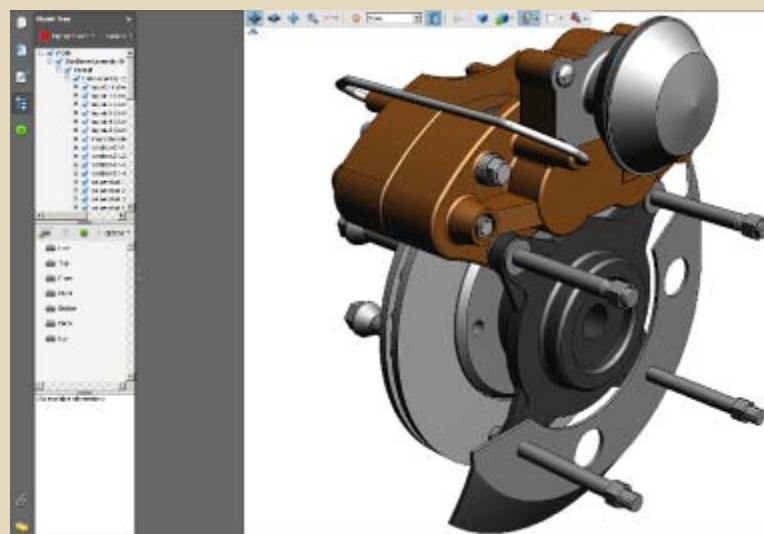
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- **RAPID RESPONSE**
  - **As a DoD Activity funding can be provided immediately avoiding contract lead times**
  - **This allows us to be fully engaged from the start of the program, working with the sponsor and end user to solidify requirements**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

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?

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

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