Training Your Systems Engineering Workforce

Michael T. Kutch, Jr.

Chief Engineer Code 70 E
Intelligence & Information Warfare Systems Department
Director Engineering Operations Code 09 K
SSC Charleston

NDIA Systems Engineering Conference, October 27, 2005
Presentation Outline

- Introduction to SPAWAR Systems Center Charleston
- General Training
- Systems Engineering Training
- Development and Certification Opportunities
- Summary
Introduction to SPAWAR Systems Center Charleston (SSC-Charleston)

- Where we fit
- What we do
- What we are known for
- Who we are
- Vision
Where We Fit

SPAWAR
Space and Naval Warfare
Systems Command

Secretary of Defense

President

Secretary of the Navy

Other DoD

non-DoD

CNO
Fleet Support

ASN (RDA)
Acquisition

SPAWAR
San Diego, CA

NAVSEA
Washington, DC

NAVAIR
Patuxent River, MD

NAVSUP
Washington, DC

NAVFAC
Washington, DC

NETWARCOM
MARCOR

ADDU for C4I

NAVSEA
NAVAIR

SYSCEN
San Diego, CA

SYSCEN
New Orleans, LA

SYSCEN
Norfolk, VA

SYSCEN
Charleston, SC

SFA
Chantilly, VA

Network Centric
Enterprise

Approved for release to the public - 30 Sept 2005
What We Do

C4ISR

Command
Control
Communications
Computers
Intelligence
Surveillance & Reconnaissance

- Modeling & Simulation
- Command & Control
- Navigation
- Physical & Computer Security
- Video Teleconferencing
- Information Assurance
- Sensors
- Communications
- Cryptologic & Intelligence
- Image Processing
- Meteorology
- Air Traffic Control
What We’re Known For

- Developer of FORCEnet joint collaborative assessment tools that promote netCentric interoperability and reduce system redundancy.
- Principal SPAWAR provider for Joint and Homeland Security C4I solutions in a responsive manner.
- Navy’s most efficient provider of critical engineering and acquisition expertise for Navy/Joint commands and other federal agencies.
- Rapid integrator and deployer of interoperable technologies to the Navy, Federal Government, and Joint Warfighter.
- Developer and employer of life-cycle logistic support solutions in a web-enabled portal environment.
Who We Are

A Large Systems & Software Engineering Organization

- The effective and efficient solutions to the global war on terror developed by SPAWAR result from good systems and software engineering.
- Systems engineering is our core competency.
- Total workforce of ~ 2300 employees.
• Vision
  – Develop and maintain a World Class Systems Engineering Organization

• Approach
  – Achieve Command-wide operational consistency
  – Based on ISO 15288 – systems engineering
  – Based on ISO 12207 – software engineering
  – Measure using best practices of CMMI®

• Benefits
  – Facilitates sharing of tools, documentation, templates, and other artifacts needed by project engineers
  – Project Engineers will implement projects quicker; with improved monitoring, effectiveness, quality and efficiency

“Engineering is the key to our survival. Look to the future.”

James Ward, Executive Director, SSC Charleston
General Training

- Competency Focus Areas
- Mandatory Training
- Employee Development Plans
• Corporate Strategy
  – Navy, SPAWAR, and SSC-Charleston
• FORCEnet – NAVY integration initiative
  – SPAWAR Alignment
• CMMI and Process Improvement
• Lean Six Sigma
• DAWIA – Defense Acquisition Workforce Improvement Act
• Leadership Development - supervisors
• Human Systems Integration
• National Security Personnel System (NSPS)
Mandatory Training

All Employees

Ex: Meet the Fleet; Anti-Terrorism, Info Assurance

CNO, HQ, SSC-C Commander’s Guidance

SPAWAR Alignment; FORCEnet 101

Process Improvement WBT

Six Sigma Intro

Supervisors

Ex: Mgmt Control; EEO; Payroll; etc

Balanced Scorecard

FORCEnet 201

Ex: Federal Executive Institute; Harvard Bus. School

Mandatory Training may be computer based or instructor delivered
Intro to Process Improvement

Originally given as an 8-hour class, converted to Web Based Training in 2004
• **Career Intern New Professional – 2 year plan**
  – Required combination of DAU coursework, rotational experience, Project Management, Scientists to Sea, Technical Report

• **Supervisors**
  – Mandatory plus series of recommended

• **Project Managers / System Engineers**
  – Recommended list of available courses and workshops

• **Moving to a demand-driven training budget**

• **Goals set for training x% of population in CMMI® and Lean Six Sigma**
Systems Engineering Training

- Plan
- Systems Engineering Fundamentals
- SE 101 WBT
- Introduction to Software Engineering
- DoDAF
SSC-C SE Revitalization Plan

Elements of SSC-C SE Revitalization

- **Policy / Guidance**
  - DoD SE Guidance & SE Instruction 54xx.1
  - SSC-C SE Process Manual
  - SSC-C SW Process Manual
  - ePlan Builder

- **Training / Education**
  - Intro to PI WBT
  - SE 101 WBT
  - SE Fundamentals
  - SW Fundamentals
  - Certification Program

- **Assessment & Support**
  - CMMI® Level 2
  - CMMI® Level 3
  - Integrated Product Teams
  - SITC - Tools
  - Lean Six Sigma

Underway
Completed/Ongoing
Need for SE Training

• Industry-wide issues (NDIA Study – Jan, 2003)
  – Requirements definition, development, and management not applied consistently
  – Lack of systems engineering discipline and effective SE implementation

• SSC-Charleston issues prior to 2004
  – Limited number of skilled, experienced, trained subject matter experts
  – Processes not institutionalized
  – New professionals have not been taught a structured systems engineering process
  – Lack of alignment with process improvement and CMMI® initiative
• 3-day on-site, classroom course  
  – Based on SMU SE Masters course  
  – Customized to incorporate SSC-C SE process  
  – 180 SSC-C engineers trained in FY05  
  – Classes planned every 2 months  

• 1-day SE for Managers course added  
  – To align management with SE Process

“*The course was very educational. It helped me relate my current project to the overall system it was a part of, and how it fits in with the big picture.*”

“The course was well presented and accurately covered the Systems Engineering Design Process Fundamentals. Continued/additional training on this subject is critically needed for this command to continue to develop as a professional engineering organization.”

Student Feedback
• Introduction to Systems Engineering WBT
  – 10-module web based training
  – Closely aligned to SSC-C SE Process, SE Fundamentals Course, ISO/IEC 15288 and IEEE standards
  – Includes hotlinks to referenced documentation
    • Process manuals, policies, standards
• Similar format to the Systems Engineering Fundamentals
  – 3 days, primarily lecture
  – Aligned with the SSC-C Software Development Process Manual

• Course Outline
  – Intro to Software Engineering
  – Roles
  – Software Engineering Practices
  – Software Development Process
  – Software Maintenance
  – Managing Software Projects
  – Tailoring
• **Developing Executable Architectures Using the DoDAF and SE**
  – 3 day on-site course for Systems Architects and Systems Engineers

• **Intro to Architecture Primer**
  – Currently in design
  – To educate and promote value of system architecture to non-architects
Development and Certification Opportunities

- SE Certification Hierarchy
- SE Masters and Certification Programs
- Certification in Other Disciplines
SE Certification Hierarchy

**LEVEL 1**
- SE Certificate based on SE core courses
- One year SE field experience
- BS in Engineering or Science

**LEVEL 2**
- Five core courses plus five electives
- 2-4 years SE field experience

**LEVEL 3**
- MS (or PHD) in SE
- INCOSE SE Certification exam

10% of the work force

30% of the work force

60% of the work force
Master Degree/Certification in SE

• Available to SSC-C engineers through
  – Southern Methodist University
  – University of Alabama-Huntsville
  – Other approved programs

• Certified Systems Engineering Professional (CSEP)
  – Through INCOSE

• Defense Acquisition University (DAU)
  – Systems Planning, Research, Development and Engineering—Systems Engineering
  – Certification Levels 1, 2, and 3
• **Software Certification**
  – Developing tiered hierarchy for SSC-C software professionals similar to SE hierarchy
  – IEEE Certified Software Development Professional (Level 3)

• **Architecture Development Certification**
  – FEAC Institute
    • Federal Enterprise Architecture Framework Certification
    • DoD Architecture Framework (DoDAF) Certification
  – Software Engineering Institute (SEI)
    • Software Architecture curriculum
Summary

- Training Accomplishments
- Lessons Learned
Process Improvement Training

• **Intro to Process Improvement**
  – Over 800 people trained
  – Provided via WBT
  – Now Mandatory for all employees

• **CMMI®**
  – SEI Intro to CMMI®
  – SSC-C Level 2 Processes
  – 875 people trained

• **Project Management/Project Monitoring & Control**
  – 625 people trained

• **Process-specific Workshops (CM, QA, REQ, M&A)**
  – 375 people trained

*This accounts for some employees attending more than one course*
Lessons Learned

• **Senior Management support is critical to success**

• **Training Strategy**
  – Everyone needs to be engaged – “train the masses”
  – Create a foundation/baseline of understanding
  – Integrate/align additional courses to build on the baseline
  – Specific training for process owners/subject matter experts

• **Utilize Teams (IPTs) as champions of specific processes**
  – Multi-department representation
  – Each team addressing training and certification needs for their process

• **Resource Centrally**
  – Utilize your organization’s training group
  – Coordinate employee development planning with training implementation
  – Provide funding centrally for mandatory training and key initiatives
Aggressive SE Program

Industry Standards
  – Systems Engineering (SE)
  – Software Engineering (SW)

Best Practices
  – CMMI®
  – ISO 9001
  – Lean Six Sigma

Successes
  – Command Achieved CMMI® Maturity Level 2 in April 2005
  – 1st SPAWAR Systems Center to Achieve CMMI® Maturity Level 2

Training – 1,300 people*

Systems Engineering Fundamentals - 180

Intro to SSC-C PI
  – CMMI® Level 2 Processes
  – CMMI® Level 3 Processes
  – SE/SW Engineering Workshops
  – Web-Based Training (WBT) for Process Improvement

*includes industry partners

Summary

Plans
  – World Class Systems Engineering
  – Support Command Balanced Scorecard
  – April 2007 CMMI® Maturity Level 3

Approved for release to the public - 30 Sept 2005
Contact Information:

Michael T. Kutch, Jr  
SPAWAR Systems Center Charleston  
michael.kutch@navy.mil  
(843) 218-5706