

Extending the Team Software Process for Systems Engineering

Tim Chick (a.k.a. Jeff Schwalb)

Naval Air Systems Command

James McHale

Software Engineering Institute

Topics

Need

NAVAIR/SEI Collaboration

Approach

Team

Research Challenges

Conduct of Pilot Project

What's Next?

Need

TSP is being used with great results on software teams.

See *CMU/SEI-2005-SR-012*, *CMU/SEI-2003-TR-014*, and *CMU/SEI-2000-TR-015*.

There is growing interest in applying TSP to other domains.

NAVAIR/SEI Collaboration

NAVAIR already has a great track record with TSP:

- ROI demonstrated on software projects
- other teams (SE) requested training and launch support

SEI is also receiving additional requests to apply TSP to non-software settings.

Solving software problems becomes increasingly difficult without addressing systems engineering and acquisition issues.

AV-8B TSP/CMMI Experience

AV-8B is a NAVAIR System Support Activity (SSA).

They integrate new features into the Marine Harrier aircraft.

They used TSP to reduce the time to go from CMMI Level 1 to CMMI Level 4.



SEI Average

6 Years

AV-8B

2.5 Years

TSP Results at NAVAIR

Program	Size of Program	Defect Density (Defects/KSLOC)	Cost Savings from Reduced Defects
AV JMPS	443 KSLOC	0.59	\$2,177,169
P-3C	383 KSLOC	0.6	\$1,478,243

Approach

Conduct a series of pilot projects to determine if extending TSP practices to Systems Engineering and Acquisition Management results in measurable improvement



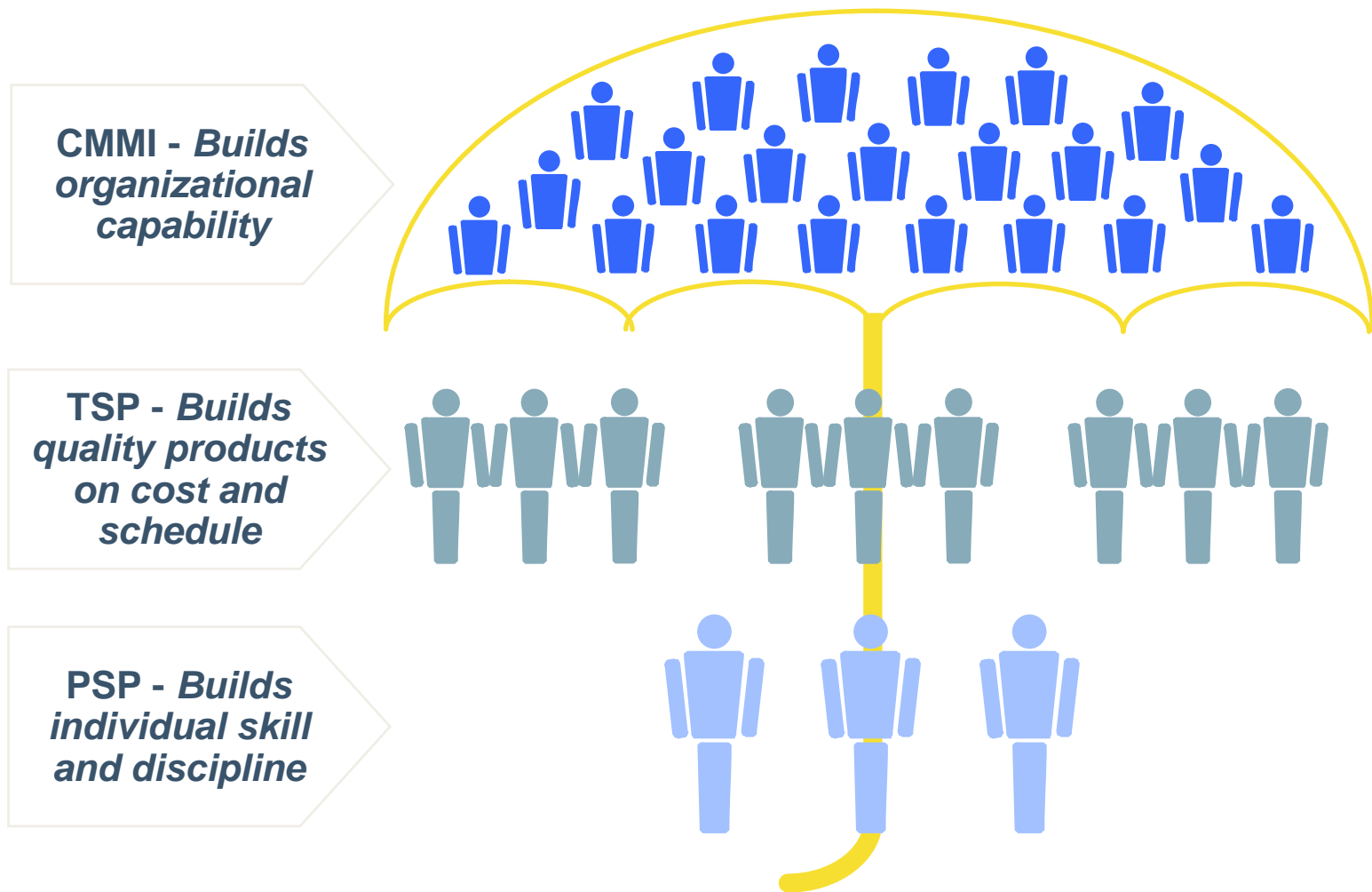
Use the results of this work to establish a common process for both systems and software engineering across the NAVAIR Mission Area Teams (MATs).

What is TPI?

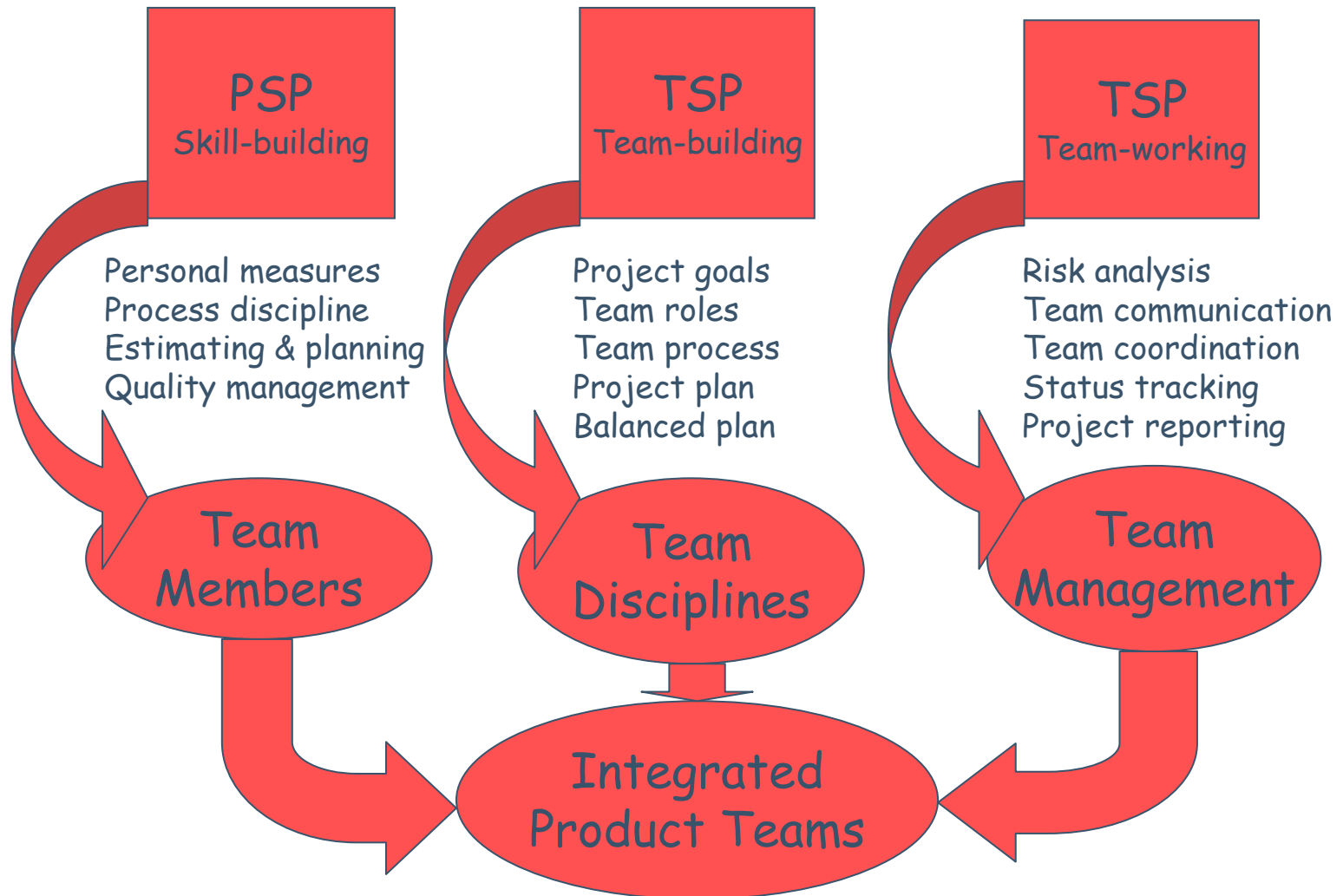
Team Process Integrated

- a multi-year experiment
- adapt and extend the training, methods, and tools associated with TSP
- targets selected systems engineering and acquisition teams within NAVAIR (i.e. already using TSP successfully for software development)

CMMI, TSP & PSP Relationship

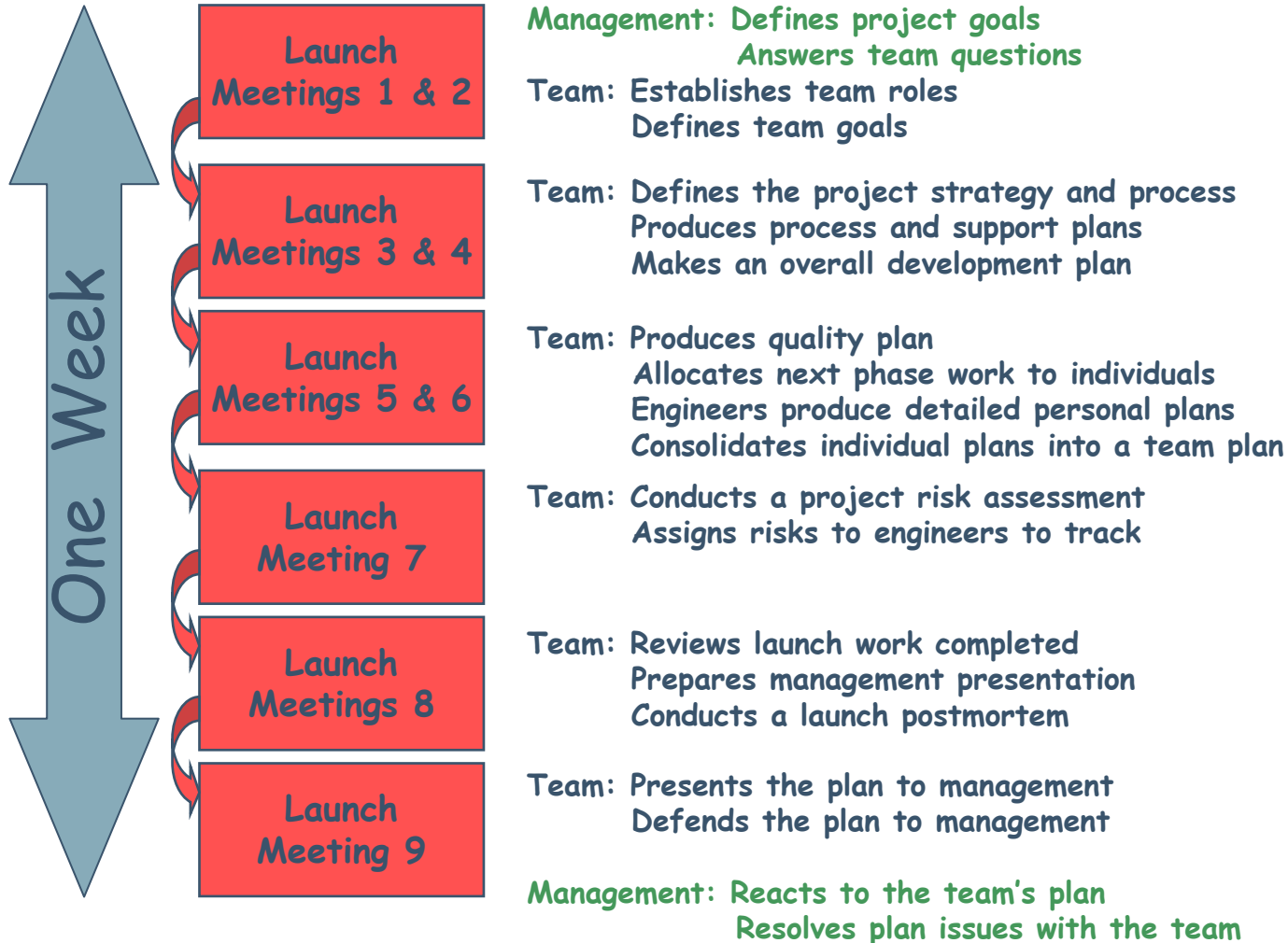


TSP Builds Effective Project Teams

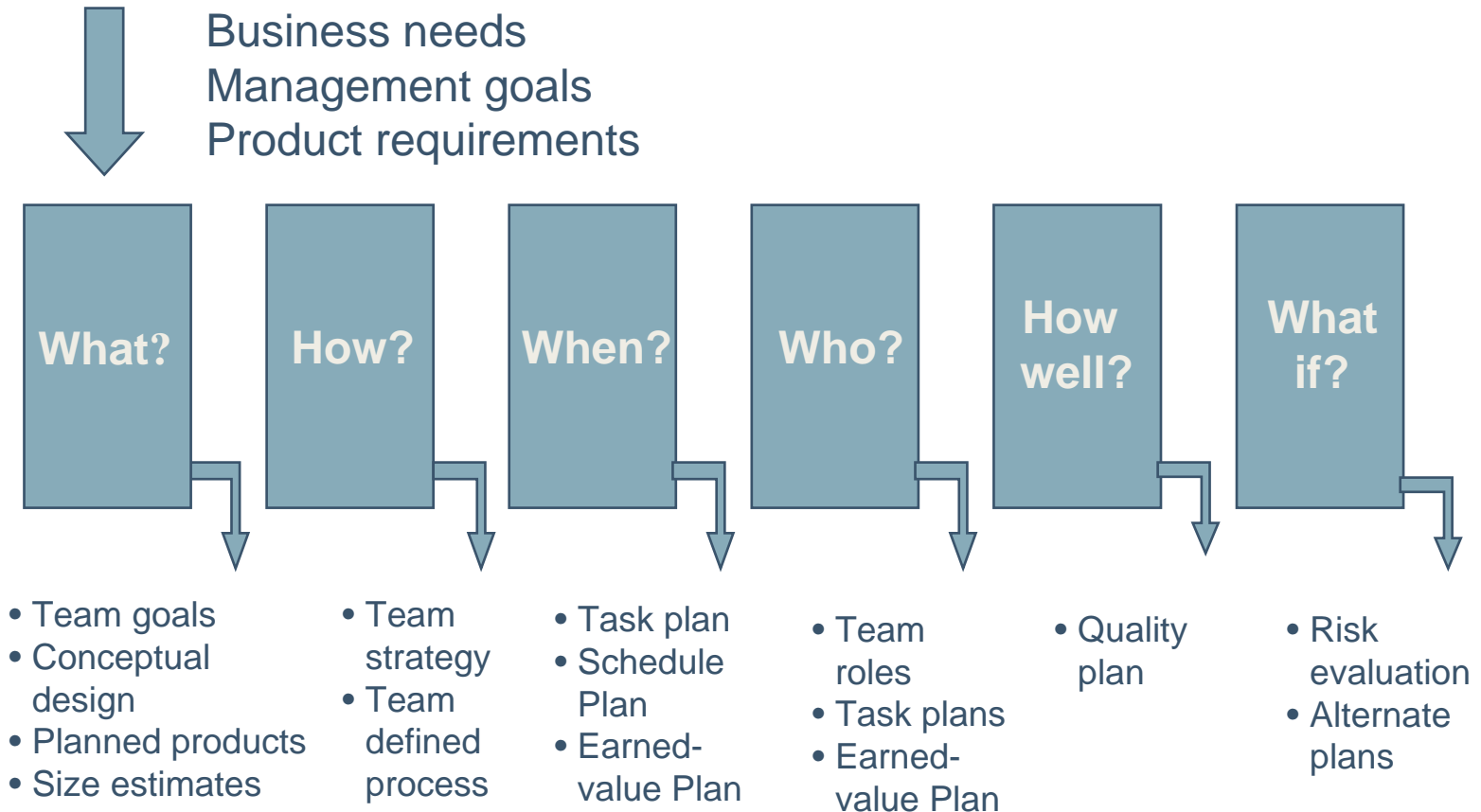




The TSP Launch Process



The TSP Launch Products



NAVAIR/SEI Team

NAVAIR

- Tim Chick
- Dennis Linck
- Linda Roush
- Jeff Schwalb
- Paula Strawser

SEI

- Anita Carleton
- Noopur Davis
- Watts Humphrey
- Jim Over

NAVAIR Systems Engineering Pilots

- AV-8B Harrier Aircraft
- E2-C Hawkeye



Research Challenges

As we kicked-off this effort, we realized that there were five areas of TSP that specifically had to be addressed for SE:

- Processes
- Measurement
- Role Definition
- Training
- Tool Support

Research Challenges - Processes

Develop prototype processes/scripts for SE

Develop prototype processes/scripts for ACQ based on:

- the DoD 5000 series regulations
- CMMI Acquisition Module

Used “traditional” TSP launch process

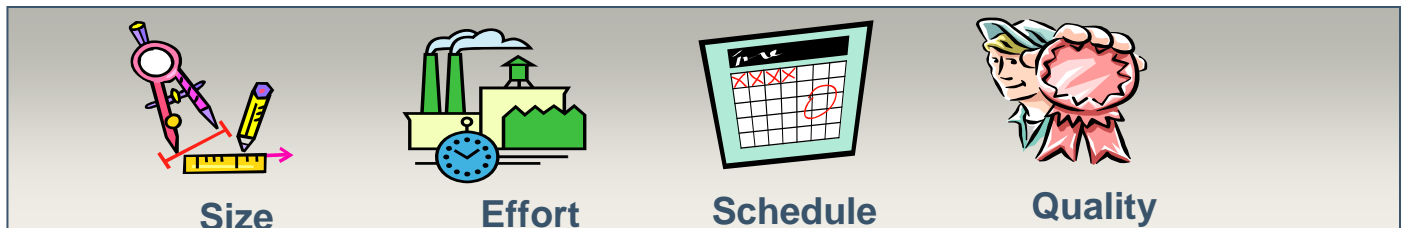
Research Challenges – Measurement - 1

Schedule and effort measures are essentially unchanged.

Lines of Code/Function Points would not serve as relevant size measures for SE/ACQ.
Formulate size measures for SE and ACQ.

Examples:

- DOORS objects
- Requirements
- Verifies



Research Challenges – Measurement - 2

Quality measures in SE

- Define what “quality” means in SE
- Where in the process do you collect data?
- What are the derived quality measures (e.g., defects/DOORS object?)
- Establish an initial quality baseline during Build 1



Research Challenges – Measurement - 3

What are the quality goals? Examples:

- Goal: Accuracy in the work
Measure: # of problem reports against requirements and test documents
- Goal: Conformance to standards
Measure: # of defects in peer reviews; # of defects in requirements and test documents, etc...

Research Challenges – Role Definition

Apply four primary roles—planning, process, quality, support

Assess applicability of remaining roles and define additional roles needed for SE and ACQ.

- Added Requirements Manager
- Design and Implementation roles were combined into one role
- Test Manager role expanded to Flight Test Manager and Lab Test Manager

Research Challenges – Training - 1

Currently, our training is geared to software teams.

Our challenges:

- building conviction and discipline in teams that don't write software programs
- providing just the right amount of training to get a team started
- supplementing with additional training modules as needed

Research Challenges – Training - 2

Develop “JIT” training to support SE teams

Develop Leadership Seminar and Team Member Training to focus on:

- providing the fundamentals of TSP
- launching a team
- maintaining a plan

Follow-up with additional, “JIT” training, e.g.,

- Inspections
- Measurement, data analysis, and reporting
- Checkpoints and Postmortem Analysis
- Tool



Research Challenges – Support Tool

Develop an extensible tool that allows for:

- Defining any process
- Collecting data unobtrusively
- Defining a measurement framework

Progress

SE Pilot Projects Selected (AV-8B and E-2C)

SE/ACQ Prototype Processes/Scripts
Developed

Training Developed

Prototype Support Tool Developed

AV-8B Team Trained and Launched

Some Early Data

Launch Sept. 2006 ... Ran like a “normal” launch

- Two year overall plan
- Near-term plan is 4 months
- 475 tasks
- 12 team members
- 22,000 task hours
- Gantt Chart didn't provide visibility into all of the tasks that had to be completed
- Team members engaged in discussions of what the work would entail, dependencies, and what “task complete” meant

Issues:

- Level of granularity of the plan
- Defining appropriate roles for SE Projects
- Defining the SE process
- Developing a quality plan

What's Next?

Complete NAVAIR pilots

Expand NAVAIR use as warranted

Incorporate lessons learned in TSP Program
Plans

Evaluate prototype tools and courses for broader
use