NAVAIR
Process Resource Team

Broadening the Ability to Train and Launch Effective Engineering and Service Teams

Sep 2011

NAVAIR Public Release 11-0220
Approved for Public Release
Agenda

• NAVAIR

• TPI Implementation

• Process Modeling

• TPI and Beyond!

• NAVAIR Team Performance

• Things to Remember
What is NAVAIR?

• NAVAIR is the Naval Air Systems Command

• Develop, acquire, and support the aircraft and related weapons systems used by U.S. Navy and Marine Corps

• Our goal is to provide the fleet with quality products that are both affordable and available when most needed

• Our support extends across the entire life span of a product, including all upgrades and modifications to that product
Where is NAVAIR?

NAVAIR Headquarters
Acquisition/Test/Development Centers
Naval Aviation Depots

NADEP DEPOT
Jacksonville
NADEP DEPOT
Orlando
TRAINING SYSTEMS DIVISION

NADEP DEPOT
North Island
NATEC DEPOT

NADEP DEPOT
Pt Mugu
WEAPONS DIVISION

NADEP DEPOT
Cherry Point
NADEP DEPOT

NADEP DEPOT
China Lake
WEAPONS DIVISION

NADEP DEPOT
Lakehurst
ALRE - SUPPORT EQ AIRCRAFT DIVISION

NADEP DEPOT
Patuxent River
NAVAIRHQ, PEOs AIRCRAFT DIVISION
NAVAIR PI History

**Process Improvement Phase**

- **Team Process Based Systems+**
  - Change Management
  - Process Modeling
  - TPI Launches
  - TPI Research
  - CMMI

- **Team Process Based Systems**
  - Model Based Systems
  - TSP Launches
  - PSP classes

- **Model Based Software**
  - Personal Process Based Software
  - Model Based Software

Year:
- 2011
- 2010
- 2009
- 2008
- 2007
- 2006
- 2005
- 2004
- 2003
- 2002
- 2001
- 2000
- 1999
- 1998
- 1997
- 1996
- 1995
- 1994
- 1993
TPI Implementation
Models and Processes

**Capability Maturity Models:**
Reference for organizations building process capability

**Team Processes:**
Processes for teams building quality products on cost and schedule

**Personal Processes:**
Processes used to train individual skill and discipline
Key Team Process Framework

1. Plan
   - Define assignment
   - Produce conceptual design
   - Estimate size
   - Estimate effort
   - Determine Tasks
   - Produce schedule

2. Work
   - Size database
   - Productivity database
   - Process Phases
   - Resources available

3. Analyze
   - Time, Size, Mistake, EV
   - Process analysis

Repeat as necessary

- Team members develop products/provide services
- Individuals collect measures daily
- Team tracks progress weekly

Goals, products & services, top-down & bottom-up planning with load balancing, risk assessment

- Track and report progress periodically
- Update historical data used for future planning
Team Process Elements

**Scripts**
Document the process entry criteria, phases/steps, and exit criteria. The purpose is to guide you as you use the process.

**Measures**
Measure the process and the product. They provide insight into how the process is working and the status of the work.

**Forms, Logs, Charts**
Provide a convenient and consistent framework for gathering, retaining, viewing data

**Standards**
Provide consistent definitions that guide the work and gathering of data.
Team Measures and Metrics

- Each team member gathers four basic measures
  - Times
  - Sizes
  - Mistakes
  - Task completion dates

Charts and tables of project metrics are available (updated in real time)

- Earned Value
- Tasks in Progress
- many more...
NAVAIR TPI

- Success of software teams using TSP led their organizations to ask for same performance on other teams
  - Worked with the SEI to develop approach
  - Based on same TSP fundamental principles

- NAVAIR approach has become TPI for all teams
  - Teams plan all work from first launch forward
  - Work is based on all products and services defined in process modeling
  - PSP for Engineers training planned as part of project if appropriate
Evolution of the TPI Approach

- Training has become just-in-time
- Teams immediately begin to define quality for themselves
  - Log mistakes during first cycle
  - First postmortem analysis of mistakes leads to identification of mistake types
  - Second launch will begin the application of mistake types
- Explicit process modeling techniques added prior to launch
  - Better supports team’s unique measurement framework
  - Enables team ability to establish firm foothold on planning and tracking
Process Modeling
Process Modeling

- Method for describing processes
  - Existing “as is” processes
  - Desired “to be” processes

BEFORE

Something Happens!

AFTER

I1 → A1 → A2 → A3 → A4 → O1

C1 → I1

C2 → I2

C3
Each field captures certain aspects of the process activity

- Activity Name
- Activity Purpose: Why?
- Activity Constraints: Conditions?
- Inputs
- Entry
- Tasks
- Exit
- Outputs
- Tailoring: Exceptions?
- Participants: Who?
- Measurements: What?

The nouns and verbs identified here become key in the definition of the life cycle models unique to each team.
Scripted Process Results

- Given to team for peer review prior to launch
- Reviewed by team in launch for quality removal potential
- Maintainable process artifacts post launch
TPI And Beyond!
Just-in-Time TPI Training

Learning

- Personal Process (half-day)
- Personal Planning
  - Personal Quality
  - Plan Overview (half-day)
- Operational Overview
  - TPI Tool Overview (half-day)
- PSP Fundamentals (one week)

Doing

- Process Modeling
  - (one to four half-day sessions)
- Plan the work
  - (four days)
- Work the plan
  - (cycle 1)
  - (three to nine months)
TPI Pluses & Minuses

+ A detailed plan!
+ Ability to track progress (weekly)
+ Improved estimating (over cycles)

- No mature processes
  - “Where do we put defect removal phases?”
- No defect type standards
  - “How do we populate Review Checklists?”
- No quality planning
  - “Will our plan produce a good product?”
- No quality indicators (e.g., A/FR)
CMMI, TSP & PSP Relationship

CMMI - Builds organizational capability

TSP - Builds quality products on cost and schedule

PSP - Builds individual skill and discipline

TPI

TRP (Rqmts)

T (S/W)

TTP (Sys Test)

TxP

PRP

P

PTP

PxP

Approved for Public Release
TPI is Only a Waypoint

- TPI teams will hit a glass ceiling
- TPI teams need to evolve to achieve TSP-like performance (become a Txp team)
- What else does a TPI team have to do in order to become a Txp team?
- **What does a TSP team do?**
What Does a TSP Team Do?

Typical TSP Cycle

- **Launch**
- **Weekly Meetings and Day-to-Day Actions**
- **Postmortem**

TSP Activities

- **Planning Activities**
- **Working Activities**
- **Analyzing Activities**

And they develop software too!
**TxF Planning Activities**

<table>
<thead>
<tr>
<th>Activity</th>
<th>From Start</th>
<th>Some Time Later</th>
<th>Get To Last</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project and Management Objectives (LAU 1)</td>
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<tr>
<td>Team Goals and Roles (LAU 2)</td>
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<td>Project Strategy and Support (LAU 3)</td>
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<tr>
<td>Overall Plan (LAU 4)</td>
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<td></td>
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<tr>
<td>Planned sizes and rates used to compute times (LAU 4)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Quality Preparation (LAU 5)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planned Defects Injected/Removed (LAU 5)</td>
<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Planned quality indicator values are acceptable (LAU 5)</td>
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<td>✔️</td>
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<tr>
<td>Balanced Plan (LAU 6)</td>
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<td>Project Risk Analysis (LAU 7)</td>
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<tr>
<td>Launch Report Preparation (LAU 8)</td>
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<tr>
<td>Management Review (LAU 9)</td>
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<tr>
<td>Launch Postmortem (LAU 10)</td>
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</table>

From

The Start

Some Time Later

Get To Last
TxE Working Activities

- Logging time
- Logging defects
- Tracking EV
- Using PROBE in Planning phase
- Entering actual sizes in Postmortem phase
- Defining Defect Types
- Using Review checklists
- Holding periodic team meetings
- Following an agenda during team meetings
- Performing/reporting on assigned roles
- Reviewing action items
- Reviewing assigned goals and risks
- Maintaining project plan and workbook

From The Start | Some Time Later | Get To Last

- [ ]
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Some Time Later

Get To Last

The Start

From

The

Start

Some

Time

Later

Get

To

Last
### TxP Analyzing Activities

<table>
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<th>From The Start</th>
<th>Some Time Later</th>
<th>Get To Last</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evaluate plan vs. actual schedule hours</td>
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<tr>
<td>Evaluate plan vs. actual component hours</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Evaluate plan vs. actual component sizes</td>
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<tr>
<td>Evaluate team performance vs. goals and quality plan</td>
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<tr>
<td>Evaluate plan vs. actual quality of components</td>
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<tr>
<td>Update planning data for schedule hours</td>
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<tr>
<td>Update planning data for lifecycle time-in-phase %s</td>
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<tr>
<td>Update planning data for productivity rates</td>
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<tr>
<td>Update planning data for defect densities</td>
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<td></td>
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<tr>
<td>Update planning data for defect rates and yields</td>
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<tr>
<td>Update planning data for quality indicator thresholds</td>
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</tbody>
</table>
**Slide 28**

**Training & First Launch**
- ✓ 3-part TPI Training
- ✓ Process Modeling
- ✓ First Launch

**Product Size Definition**
- ✓ Define size measures
- ✓ Add Planning and Postmortem phases
- ✓ Begin use of PROBE

**Defect Removal**
- ✓ Define Defect Types
- ✓ Refine Processes with Defect Removal Phases

**Quality Indicators**
- ✓ Define Product Quality Indicators
- ✓ Define Process Quality Indicators

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**Stages**
- TIME-Based
- SIZE-Based
- QUALITY-Based
- TnP

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**Planning Activities**

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**Working Activities**

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**Analyzing Activities**
Things to Remember

• TxP may be applied to any team that has recurring work to perform

• TxP teams should plan their work, work their plans, and analyze their data to improve

• This analysis gives them insight into the quality of their processes used to produce their products and provide their services
Questions?

NAVAIR PRT

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Brad Hodgins: 760 939-0666
Backup Slides
## NAVAIR Team Data Profiles
### FY10-FY11

<table>
<thead>
<tr>
<th>Description</th>
<th>Min</th>
<th>Avg</th>
<th>Max</th>
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<tbody>
<tr>
<td>Num of Team Members</td>
<td>2</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Performance Period (months)</td>
<td>4</td>
<td>9</td>
<td>18</td>
</tr>
</tbody>
</table>

- **Num of Teams**: 19
- **Num of Teams (by type of work performed)**
  - Tactical/Embedded Software Dev: 12
  - Desktop Software Dev: 6
  - Systems Integration: 1
NAVAIR Teams
Schedule

Schedule Deviation Comparison
NAVAIR Teams versus Industry Standards

* 2009 Chaos Report, Standish Group (300+ organizations surveyed)
NAVAIR Teams

Effort Performance

![Bar chart showing effort deviation comparison between NAVAIR Teams and industry standards.](image)

*2009 Chaos Report, Standish Group (300+ organizations surveyed)*
NAVAIR Teams

Quality in Test Time

Test Percentage Comparison
NAVAIR Teams versus Industry Standards

NAVAIR Teams
Cost of Improvement

*Average percentage of on-line ROI Process Improvement case studies
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  – TSP℠
  – Personal Software Process℠
  – PSP℠

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  – CMM®
  – Capability Maturity Model Integration®
  – CMMI®
  – CERT®