



NAVAIR Process Resource Team

Evolving Postmortems as Teams Evolve Through TxP

November 2014

**NAVAIR Public Release 14-0030
Approved for Public Release**

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE NOV 2014		2. REPORT TYPE		3. DATES COVERED 00-00-2014 to 00-00-2014	
4. TITLE AND SUBTITLE Evolving Postmortems as Teams Evolve Through TxP				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Air Systems Command (NAVAIR), Process Resource Team, 47123 Buse Road, Building 2272 Suite 540, Patuxent River, MD, 20670				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 37	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Agenda

- NAVAIR
- Team Process Integration (TPI)
- Team "X" Process (TxP)
- Time-Based Postmortem
- Size-Based Postmortem
- Quality-Based Postmortem



NAVAIR

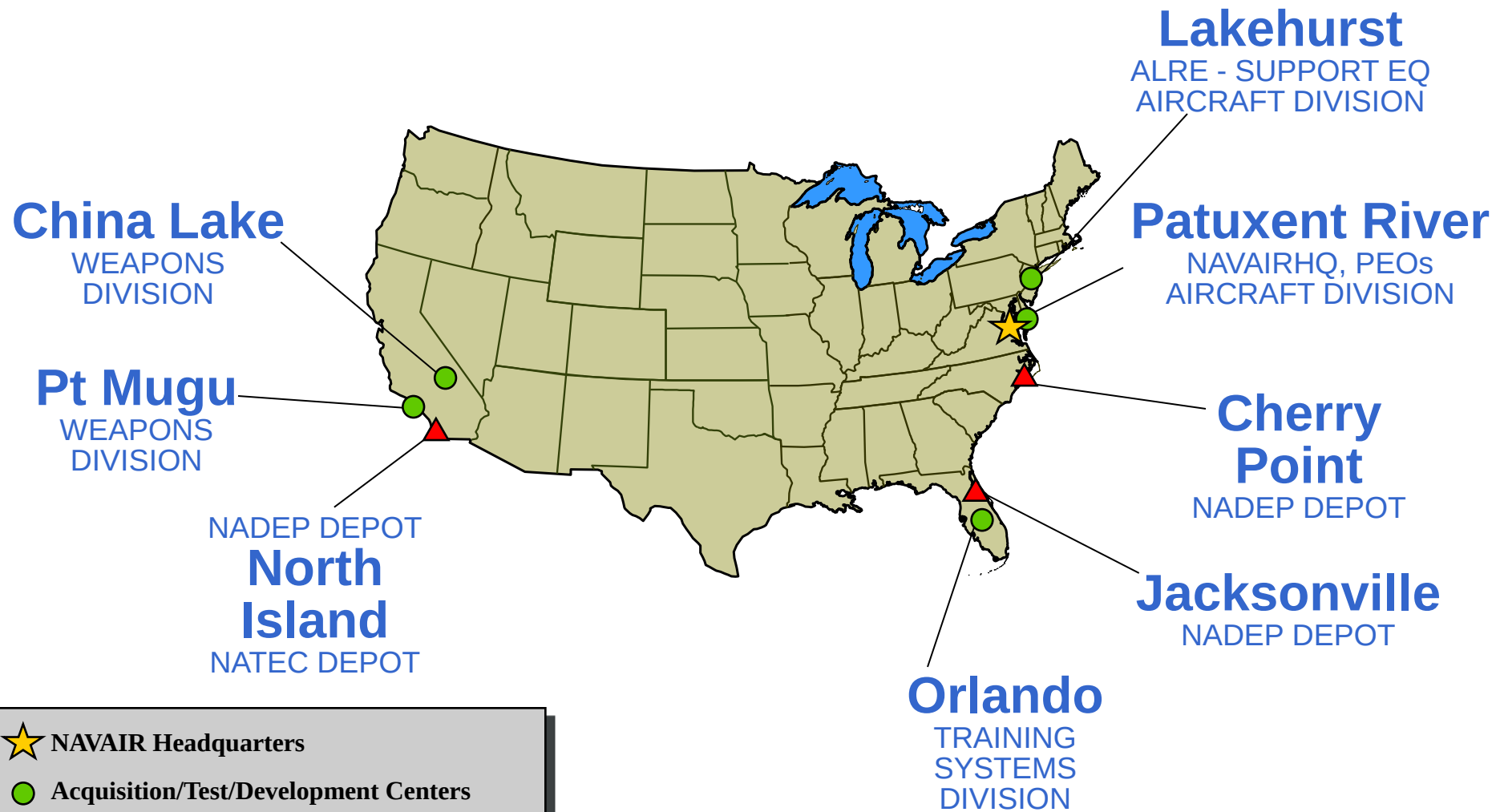


What is NAVAIR?

- 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



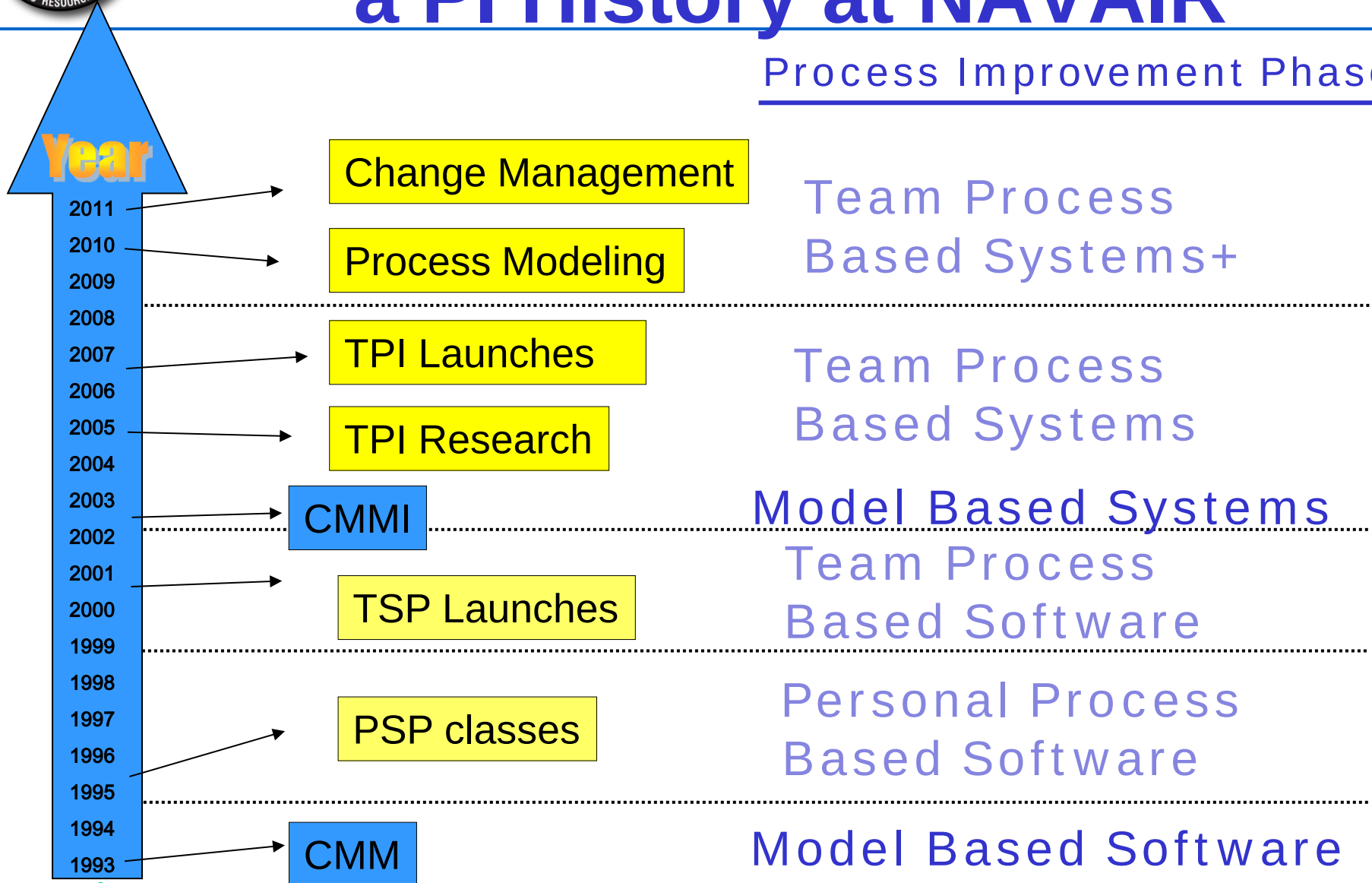
Where is NAVAIR?





Process Resource Team – a PI History at NAVAIR

Process Improvement Phase





Team Process Integration (TPI)



Models and Processes

Capability Maturity Models:

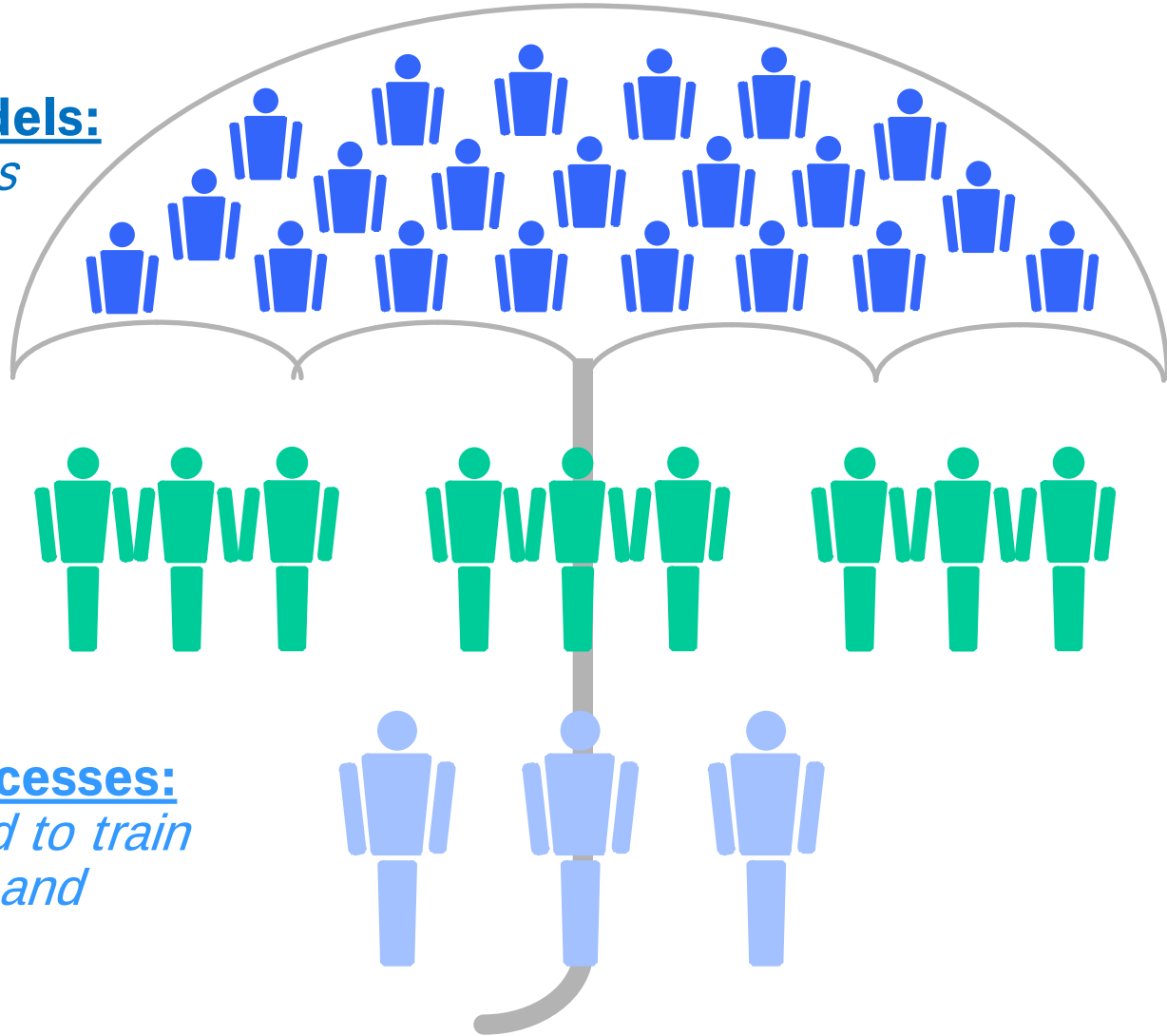
Reference for organizations building process capability

Team Processes:

Processes for teams building quality products on cost and schedule

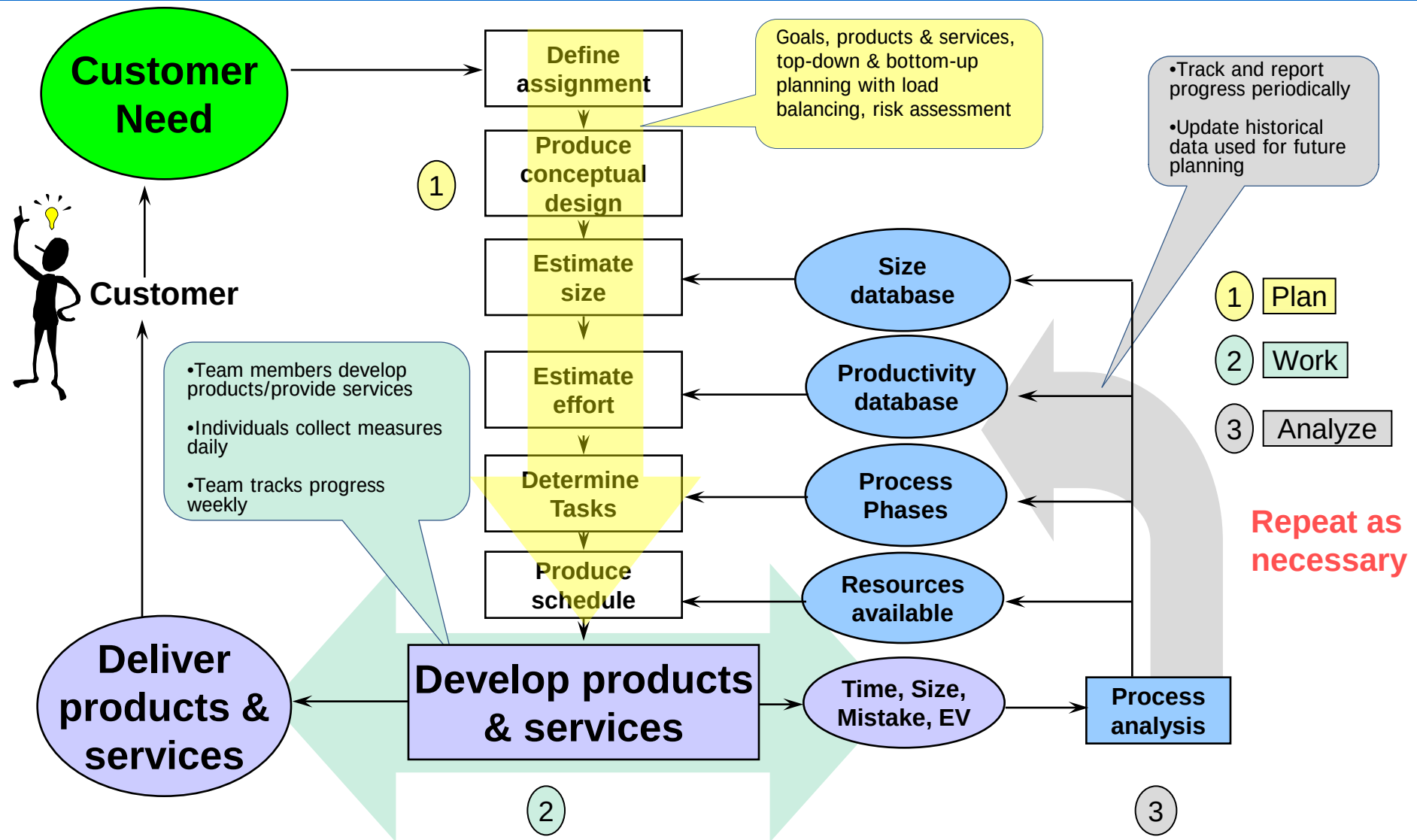
Personal Processes:

Processes used to train individual skill and discipline





Key Team Process Framework

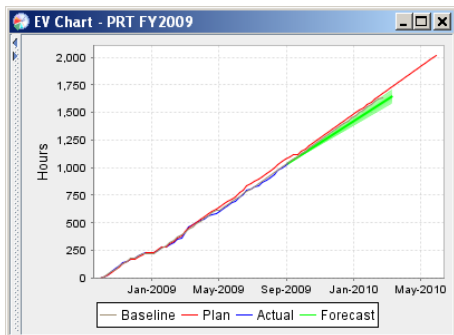
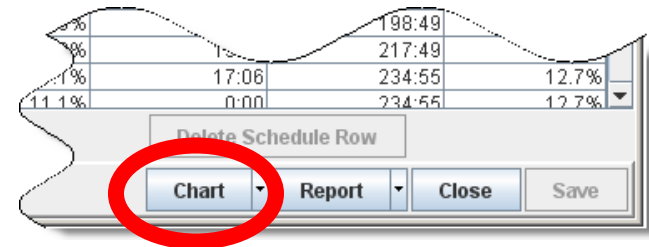




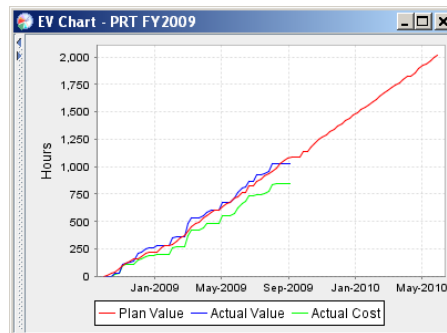
Team Measures and Metrics

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

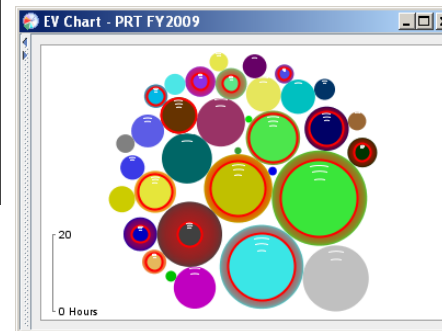
Charts and tables of project metrics are available (updated in real time)



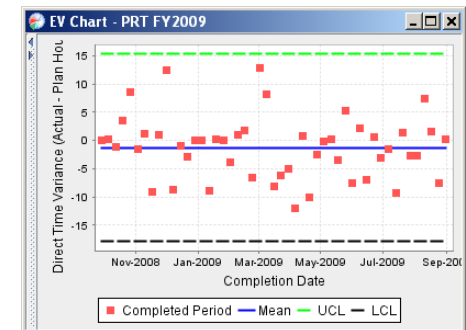
Direct Hours



Earned Value



Tasks in Progress



many more...



NAVAIR TPI

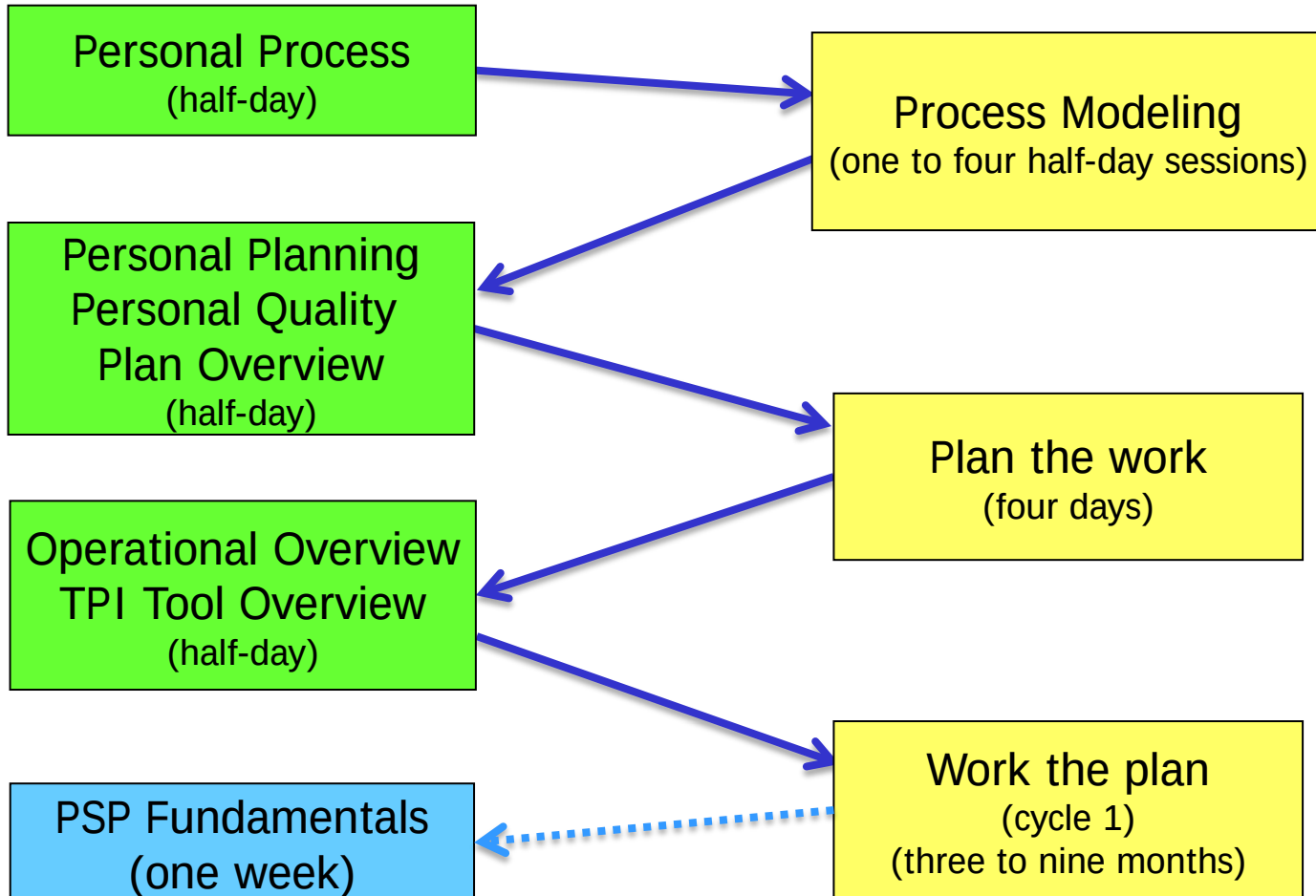
- Success of software teams using TSP led their organizations to ask for same performance on other teams
 - Worked with the SEI to develop approach
 - Based on same TSP fundamental principles
- NAVAIR approach has become TPI for all teams
 - Teams plan all work from first launch forward
 - Work is based on all products and services defined in process modeling
 - PSP for Engineers training planned as part of project if appropriate



Just-in-Time TPI Training

Learning

Doing





Team [topic-name] Process (TxP)



TPI **Pluses** & **Minuses**

- + A detailed plan!
- + Ability to track progress (weekly)
- + Improved estimating (over cycles)
- No mature processes
 - “Where do we put mistake-fixing phases?”
- No defect type standards
 - “What kinds of mistakes do I make?”
- No quality planning
 - “Will our plan produce a good product?”
 - No quality indicators (e.g., A/FR)



CMMI, TSP & PSP Relationship

???

TRP

(Rqmts)

*Is
icts
d*

T TTP

(S/W)

(Sys Test)



TxP

PRP

*Is
kill
ne*

P PTP



PxP

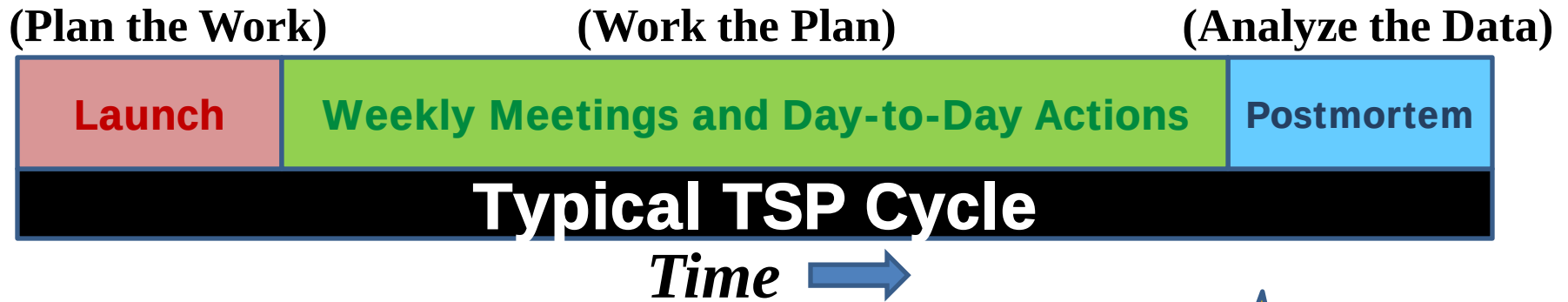


TPI is Only a Waypoint

- 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?



TSP Activities





TxP Planning Activities

	From The Start	Some Time Later	Get To Last
Project and Management Objectives	☒		
Team Goals and Roles	☒		
Project Strategy and Support	☒		
Overall Plan	☒		
Planned sizes and rates used to compute times		☒	
Quality Preparation	☒		
Planned Defects Injected/Removed			☒
Planned quality indicator values are acceptable			☒
Balanced Plan	☒		
Project Risk Analysis	☒		
Launch Report Preparation	☒		
Management Review	☒		
Launch Postmortem	☒		



TxP Working Activities

	From The Start	Some Time Later	Get To Last
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	☒		



TxP Analyzing Activities

	From The Start	Some Time Later	Get To Last
Evaluate plan vs. actual schedule hours	☒		
Evaluate plan vs. actual component hours	☒		
Evaluate plan vs. actual component sizes		☒	
Evaluate team performance vs. goals and quality plan			☒
Evaluate plan vs. actual quality of components			☒
Update planning data for schedule hours	☒		
Update planning data for lifecycle time-in-phase %s	☒		
Update planning data for productivity rates		☒	
Update planning data for defect densities		☒	
Update planning data for defect rates and yields		☒	
Update planning data for quality indicator thresholds			☒



Transitions

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

Stages

TIME-
Based

SIZE-
Based

QUALITY-
Based

TxP

Planning
Activities

Working
Activities

Analyzing
Activities



Time-Based Postmortem

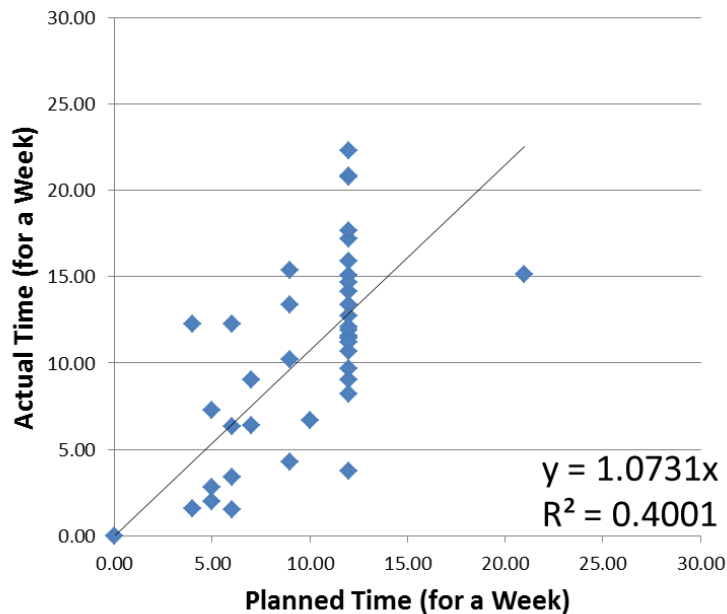
- The team's most consistent data at first is time
 - Time on Task by Team Member
 - Planned vs. Actual Time by Component
 - Planned vs. Actual Time by Product/Service Type
 - Planned vs. Actual Time by Workflow
- Sample Time Log

Logged To	Start Time	Delta
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/AV-8B SW/Do	Tue Oct 08 08:00:52 PDT 2013	0:10
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 08:20:49 PDT 2013	0:17
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 08:45:47 PDT 2013	0:05
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 09:08:18 PDT 2013	0:21
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 10:00:13 PDT 2013	0:05
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/Informal/Do	Tue Oct 08 10:17:40 PDT 2013	0:10
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 10:29:44 PDT 2013	0:10
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 10:54:50 PDT 2013	0:07
/Project/PRT FY2014/TPI/Checkpoints/H-1 SIT - Aug 2013 part 2/Follow-up	Tue Oct 08 11:23:09 PDT 2013	0:12
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/AV-8B SW/Do	Tue Oct 08 13:53:34 PDT 2013	0:07
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/CEI SSAT/Do	Tue Oct 08 14:01:02 PDT 2013	2:16
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/CEI SSAT/Do	Tue Oct 08 16:59:59 PDT 2013	0:33
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/CEI SSAT/Do	Tue Oct 08 17:44:18 PDT 2013	0:42
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/H-1 SIT/Do	Wed Oct 09 06:35:14 PDT 2013	0:11
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/H-1 SIT/Do	Wed Oct 09 07:20:14 PDT 2013	0:21
/Project/PRT FY2014/Common/Monthlies/Oct 2013/TPI Coaching/CCS/Do	Wed Oct 09 08:00:06 PDT 2013	0:48



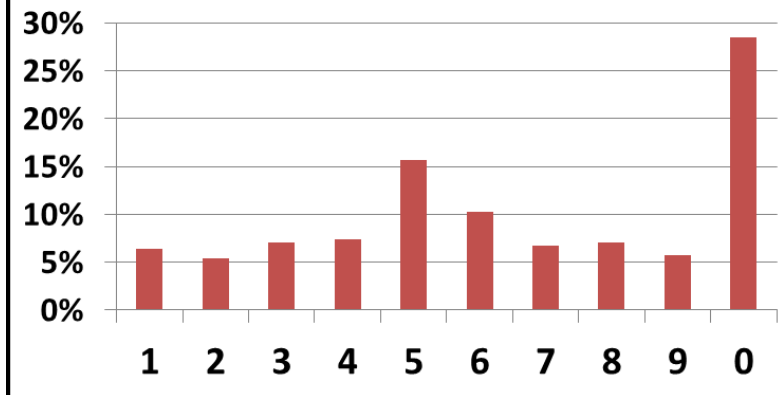
Time on Task by Team Member

Planned vs. Actual Time by Week



Planned Time	Count	Avg Actual Time	% of PT
0	1	0.0	
1	0		
2	0		
3	0		
4	2	6.9	173%
5	3	4.0	80%
6	4	5.9	98%
7	2	7.7	110%
8	0		
9	4	10.8	120%
10	1	6.7	67%
11	0		
12	21	13.5	113%
13	0		
14	0		
15	0		
16	0		
17	0		
18	0		
19	0		
20	0		
21	1	15.2	72%
22	0		

% of Time Entries Ending in

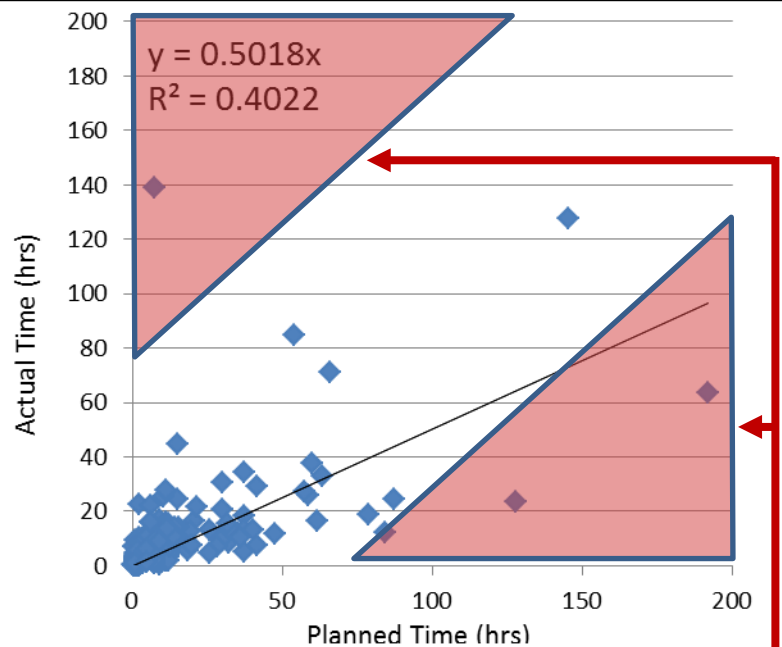


- Time Log analysis
 - Accuracy & precision of estimates
 - Real-time logging vs. backfilling

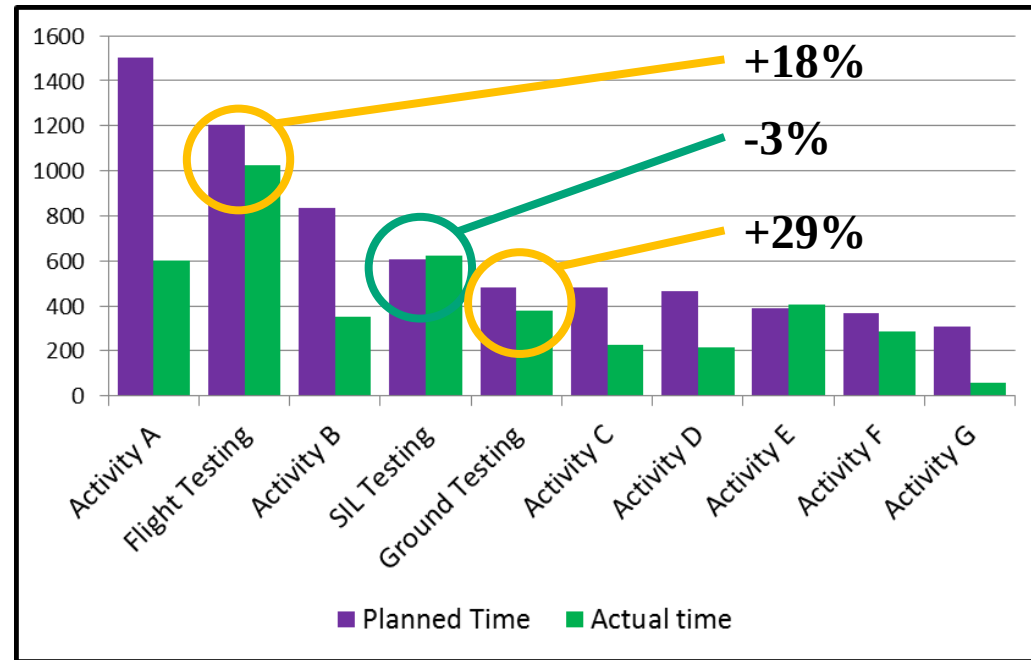


Time by Component

By Component



By Component Type



- Study any points in red regions
- Adjust team productivity rates for next cycle





Time by Workflow

	Plan Time	Actual Time	Plan %	Actual %	Act - Plan	Next Plan	Normalized
Planning	68:06	41:03	2.4%	1.4%	-1.1%	2.4%	2.3%
High-Level Design	248:01	251:46	8.8%	8.4%	-0.4%	8.8%	8.4%
HLD Inspection	103:07	65:44	3.7%	2.2%	-1.5%	3.7%	3.5%
Detailed Design	356:52	339:32	12.7%	11.3%	-1.4%	12.7%	12.2%
Detailed Design Review	129:06	90:59	4.6%	3.0%	-1.6%	4.6%	4.4%
Test Development	61:44	34:58	2.2%	1.2%	-1.0%	2.2%	2.1%
Detailed Design Inspection	294:44	220:51	10.5%	7.4%	-3.1%	7.4%	7.1%
Code	435:48	575:10	15.5%	19.2%	3.7%	19.2%	18.4%
Code Review	143:08	112:39	5.1%	3.8%	-1.3%	5.1%	4.9%
Compile	21:04	16:06	0.7%	0.5%	-0.2%	0.7%	0.7%
Unit Test	349:58	485:12	12.4%	16.2%	3.7%	16.2%	15.5%
Code Inspection	365:50	444:37	13.0%	14.8%	1.8%	13.0%	12.5%
Build and Integration Test	189:47	290:05	6.7%	9.7%	2.9%	6.7%	6.5%
Postmortem	46:48	29:26	1.7%	1.0%	-0.7%	1.7%	1.6%
Total	2814:03	2998:08	100.0%	100.0%		104.3%	100.0%

- Isolate times for one kind of activity
 - Analyze & discuss big differences
 - Proposed planned %s for next cycle



Size-Based Postmortem

- Once the team has consistent size data...
 - Productivity Rates by Team Member
 - Planned vs. Actual Size by Component
- Example of Size Documentation

BASE PROGRAM SIZE		Estimated SIZE	Actual SIZE
BASE SIZE (B)		150	150
DELETED SIZE (D)		75	75
MODIFIED SIZE (M)		8	8

BASE ADDITIONS	Estimated				Actual	
	TYPE	ITEMS	REL. SIZE	SIZE	SIZE	ITEMS
Report Altitude				10	13	
				Total:	10	13

[add more rows for base additions...](#)

PARTS ADDITIONS	Estimated					Actual		
	TYPE	ITEMS	REL. SIZE	SIZE	NR	SIZE	ITEMS	NR
GUI	I/O	1	Medium	16	☐	22		☐
Altimeter Referencing	Logic	1	Large	23	☐	33		☐
					Total:	39	55	

[add more rows for parts additions...](#)



Productivity Rates by Team Member

- All individuals have their own rates...per product type

PROBE

Method: PROBE Method C3 for Time

Correlate: New & Changed LOC

with: Time

Estimate: % range: 70

L. Regression

Projection = ????

Beta0 = -43.9625

Beta1 = 1.6923

r² = 0.7169

p = 3.35%

Variance = 38413.02

StdDev = 195.992

Range = ????

UPI = ????

LPI = ????

Average

Projection = ????

Beta0 = 0.0

Beta1 = 1.5869

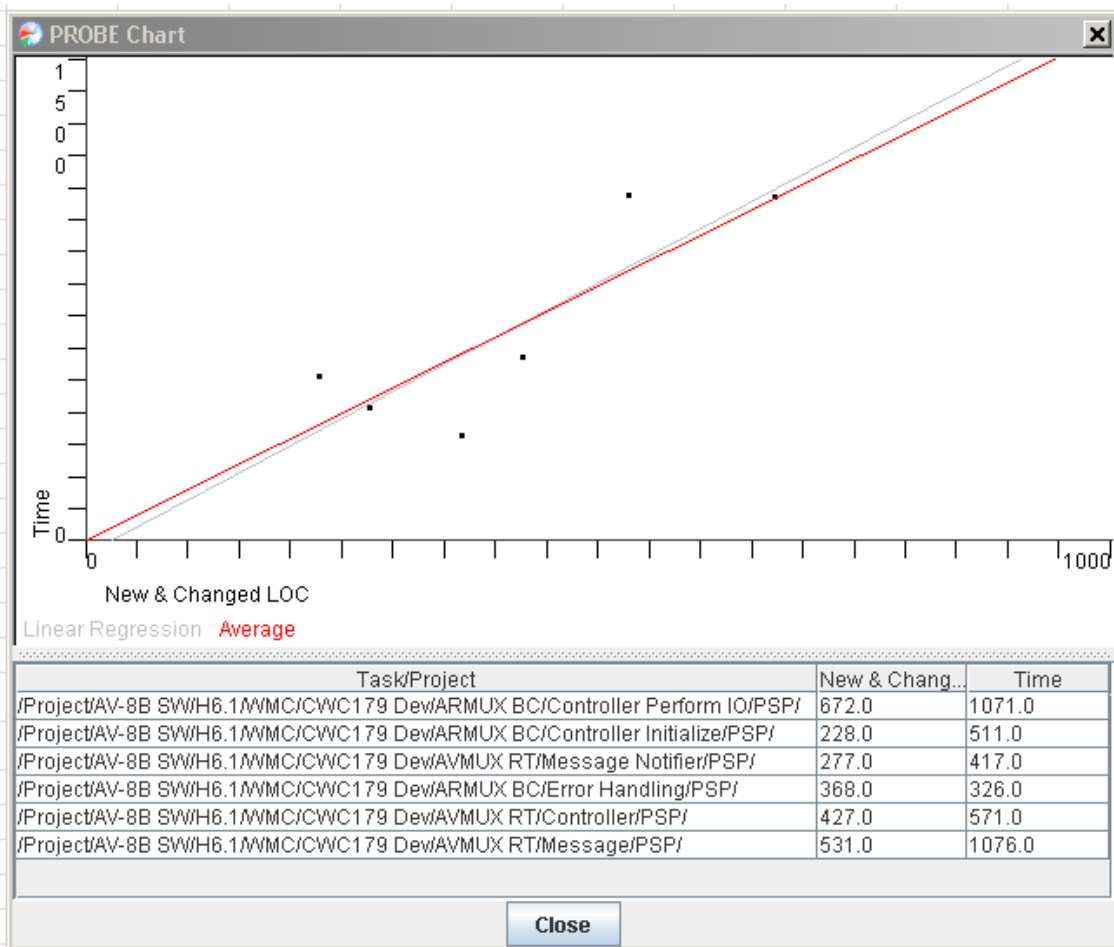
Filter...

Chart...

Close

Beta1 (minutes/LOC) = 1.587

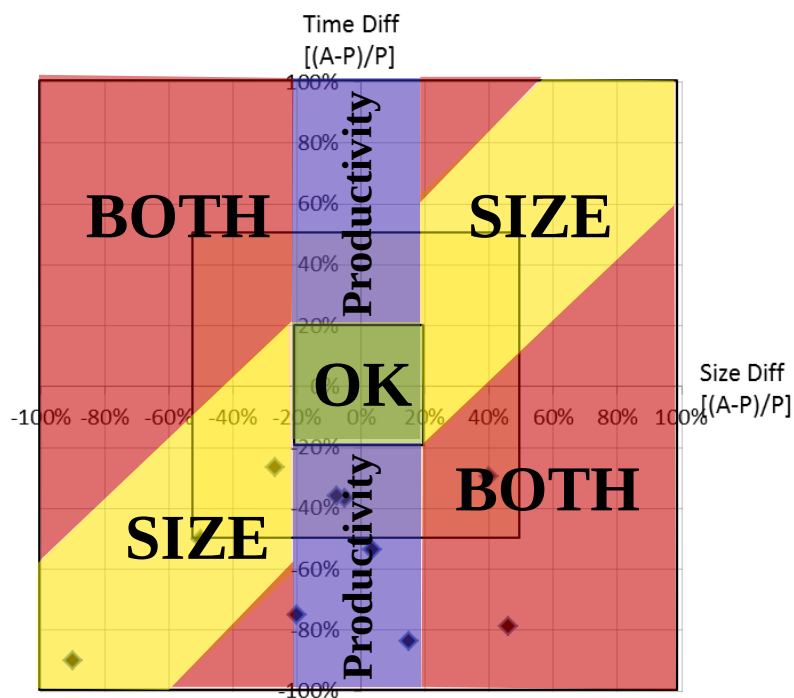
PSP Productivity Rate (LOCs/Hr) = 38



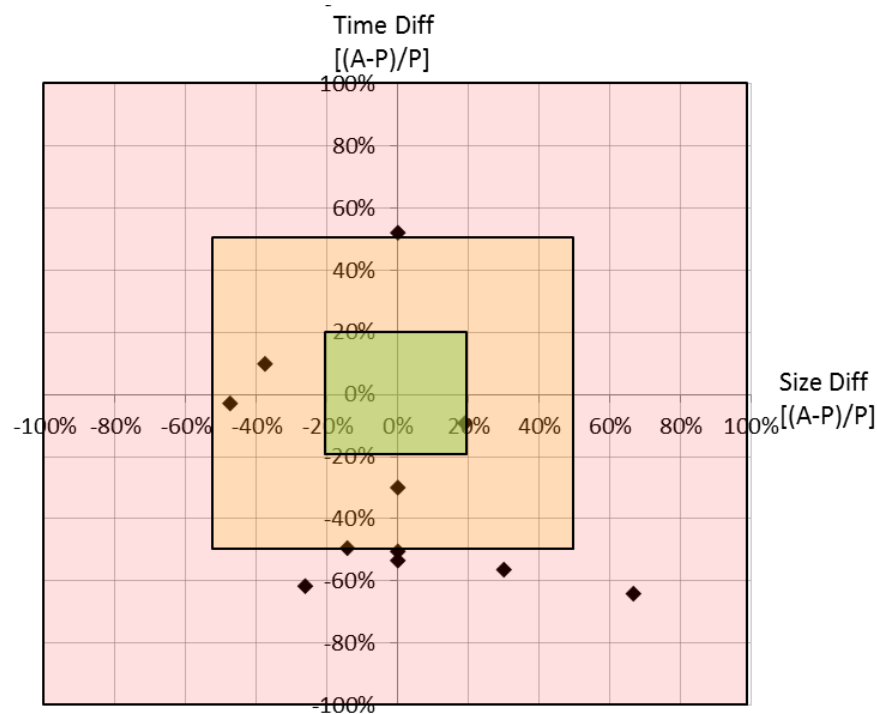


Size by Component

Previous Cycle Components



Current Cycle Components





Quality-Based Postmortem

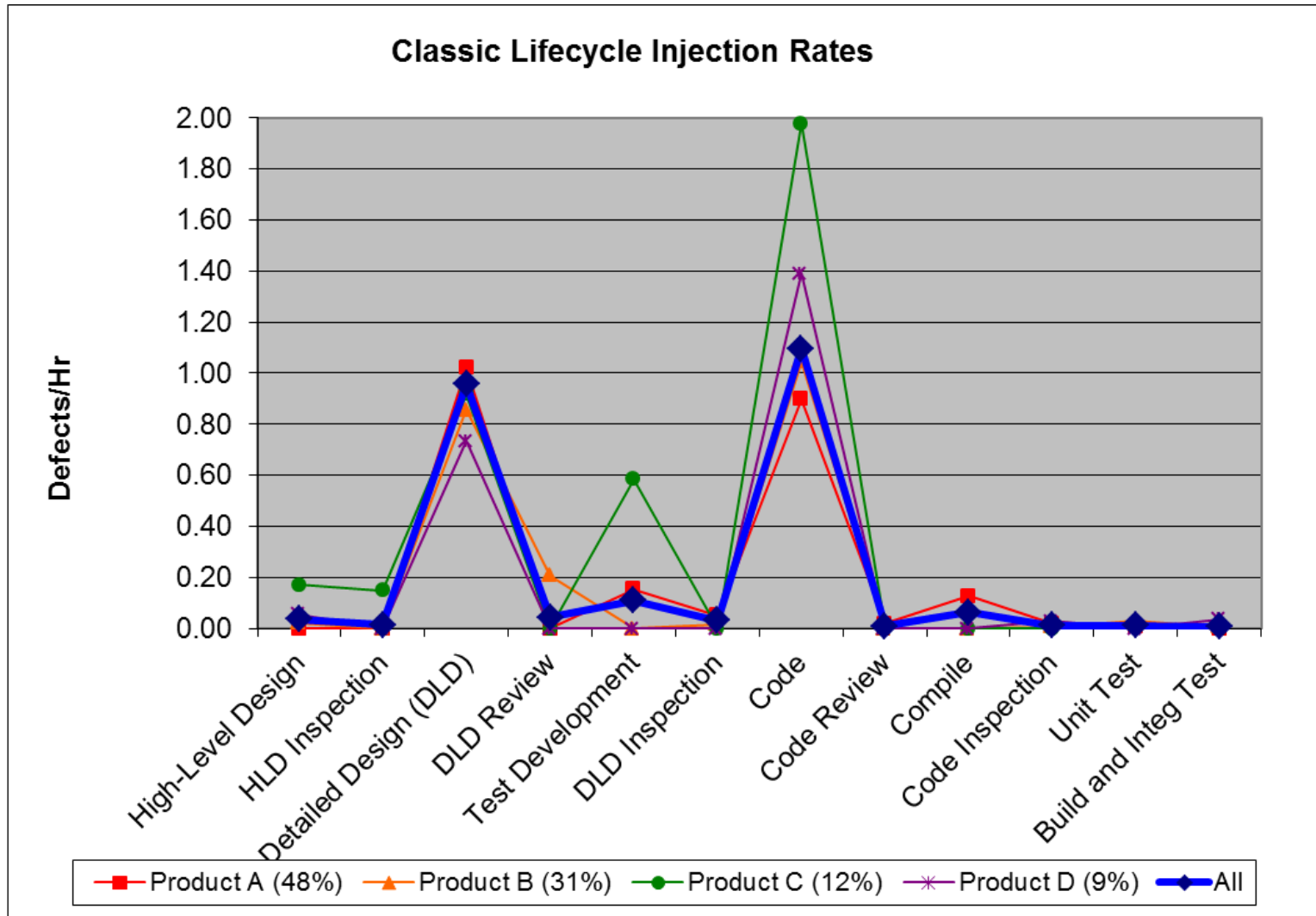
- Getting a handle on defects usually happens last
 - Defect Injection Rate by Phase
 - Defect Measures by Defect Type
 - Defects Injected by Phase
 - Defects Removed by Phase

- Sample Defect Log

Project	ID	Type	Injected	Removed	Time	Count	...	...	Description	Date
/Non Project/PSP for Engineers/Program 5	1	Environment	Test	Test	0.6	1			did not configure wires properly during board test	09/03/2009
/Non Project/dev/PMPT/JDAM Cross Range	1	Interface	Design	Design Review	5.3	1			forgot to consider general architecture classes in my ...	08/25/2010
/Non Project/dev/PMPT/JDAM Cross Range	2	Assignment	Design	Design Review	10.8	15			didn't initialize parameters	09/10/2010
/Non Project/dev/PMPT/JDAM Cross Range	3	Documentation	Design	Design Review	5	1			did not draw data flow arrows in correct direction bet...	10/13/2010
/Non Project/dev/PMPT/JDAM Cross Range	4	Interface	Design	Design Review	0.6	1			forgot to flesh out paras for func Compute Angle	11/17/2010
/Non Project/dev/PMPT/JDAM Cross Range	5	Interface	Design	Design Review	1.2	1			forgot to flesh out paras for func Compute Range	11/18/2010
/Non Project/sw history/Prod A Reqt 3	1	Function	Code	Test	1.1	1			inverted to variables	01/28/2009
/Non Project/sw history/Prod A Reqt 3	2	Unclear	Design	Design Review	0.9	3			did not give vars initial values...	10/11/2011



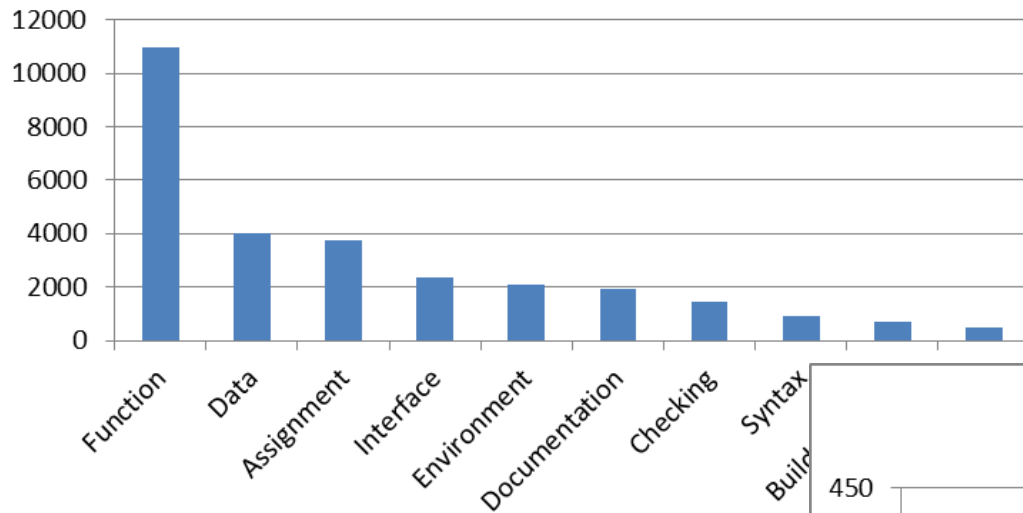
Defect Injection Rate by Phase





Defect Measures by Defect Type

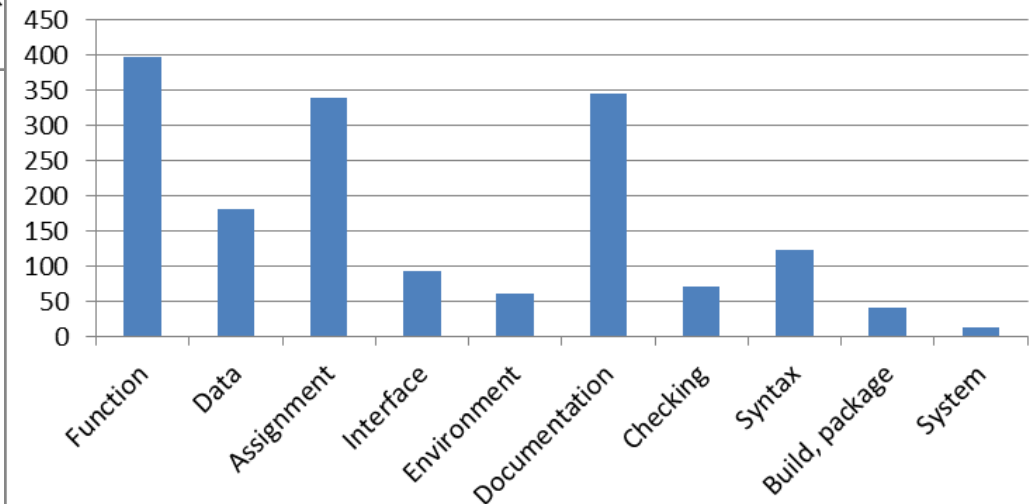
Defect Fix Times



How many doesn't
always matter

- Sorted by Fix Time

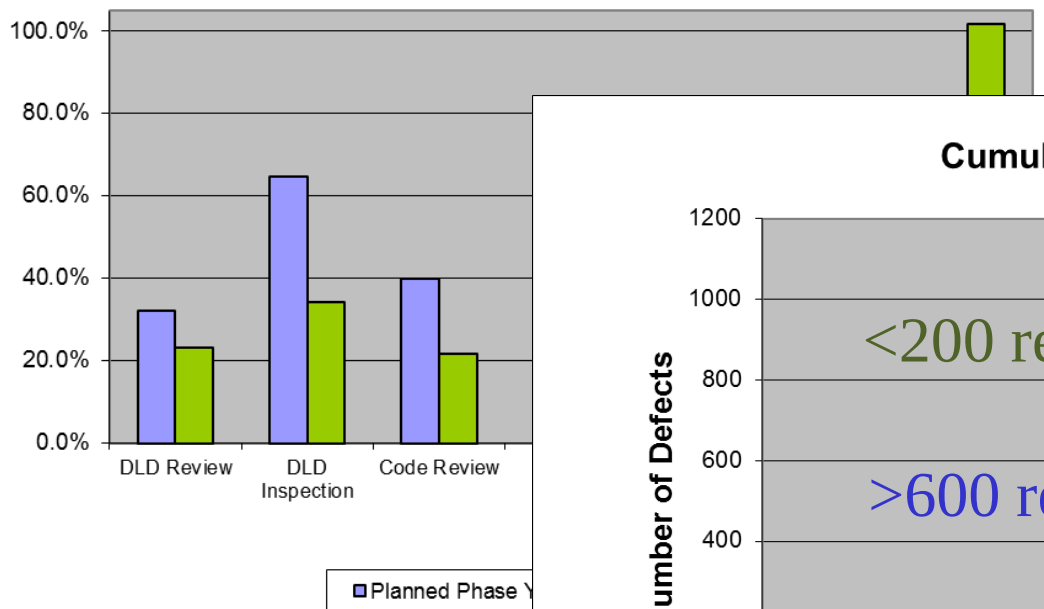
Defect Counts





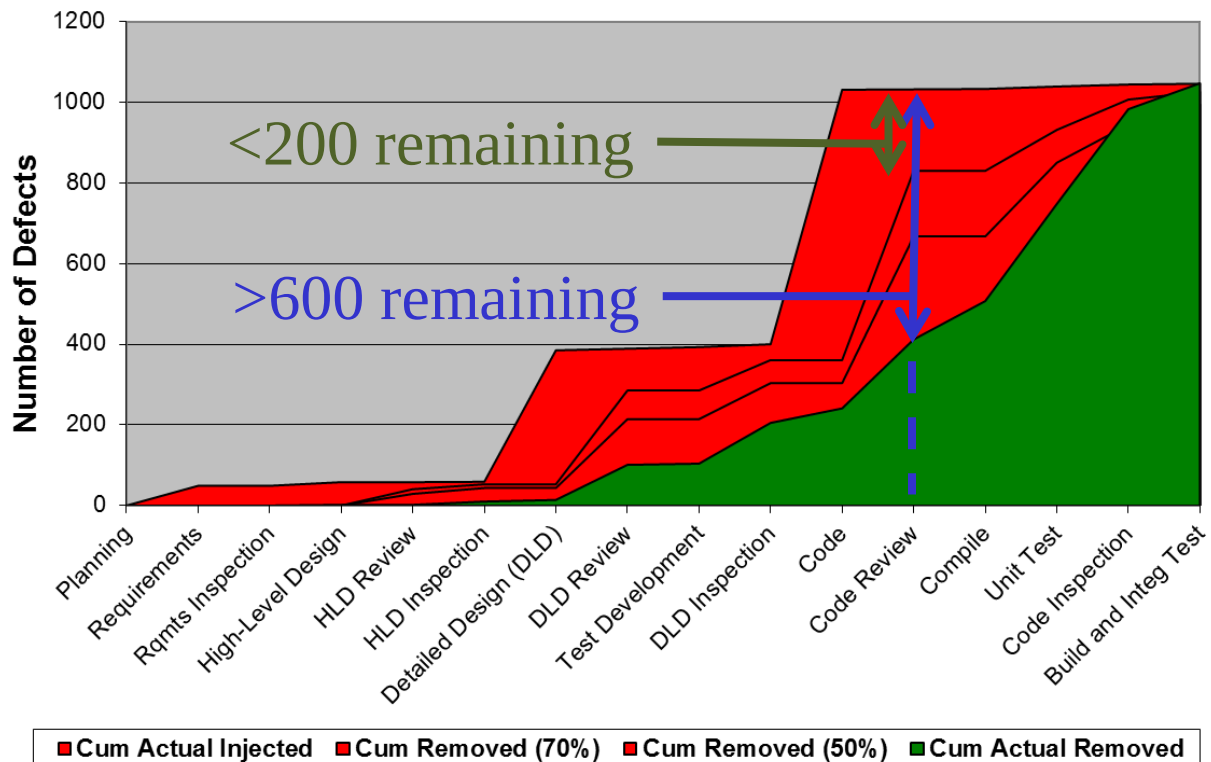
Defects Injected/Removed by Phase

Planned vs. Actual Phase Yields



Height of Red above Green indicates how many mistakes were in the product at that phase of development

Cumulative Defects Injected and Removed





TxP Postmortem

- Only after the team knows what level of process performance results in a quality product, then they can set goals and compare planned values to actual values.

RATIOS				
Plan	Actual	Phase		
0.36	0.27	DLD Review/DLD Ratio		
0.82	0.59	DLD/Code ratio		
0.33	0.20	Code Review/Code		
0.00	3.15	Compile Defect Density		
8.86	7.81	Unit Test Defect Density		

REVIEW RATES (LOCs/hr)				
Plan	Actual	Phase		
336	829	DLD review		
71	136	DLD inspection		
147	266	CODE review		
60	62	CODE inspection		

Cost of Quality (COQ)		
Topic	Plan	Actual
% Appraisal COQ	36.8%	30.8%
% Failure COQ	19.9%	26.1%
Appraisal / Failure Ratio (AFR)	1.85	1.18



Things to Remember

- As a team's process evolves from TPI to TxP, the analysis of their data needs to evolve too
- Focus on what is value-added to the team and they will strive to collect the data
- This analysis gives them insight into the quality of their processes used to produce their products and provide their services



Questions?

NAVAIR Process Resource Team
Brad Hodgins

bradley.hodgins@navy.mil
(760) 939-0666



Trademarks and Service Marks

- The following are service marks of Carnegie Mellon University.
 - Team Software ProcessSM
 - TSPSM
 - Personal Software ProcessSM
 - PSPSM
- The following are registered trademarks of Carnegie Mellon University.
 - Capability Maturity Model[®]
 - CMM[®]
 - Capability Maturity Model Integration[®]
 - CMMI[®]
 - CERT[®]



Acronym List

- A/FR – Appraisal Failure Ratio
- CMM – Capability Maturity Model
- CMMI – Capability Maturity Model Integration
- COQ – Cost of Quality
- DLD – Detailed-Level Design
- EV – Earned Value
- HLD – High-Level Design
- LOC – Line of Code
- NAVAIR - Naval Air Systems Command
- PI – Process Improvement
- PROBE – PROxy-Based Estimating
- PRT – Process Resource Team
- PSP – Personal Software Process
- SEI – Software Engineering Institute
- TSP – Team Software Process
- TPI – Team Process Integration
- TxP – Team [topic name] Process