Next Generation
Continuous Process Improvement (CPI)
A Breakout Session @ DoD Maint Symposium

Stu Paul
Deputy, Aviation Fleet Readiness Branch of OPNAV N43

8-9:30 Tuesday 13Nov2012
Naval Aviation Fleet Readiness Centers

FRC NORTHWEST WHIDBEY ISLAND
- ELU Det
- P3 OPDET
- SEAOPDET
- VANOPDET
- Det Everett
- FRCSW Det

FRC WEST LEMOORE
- SEAOPDET Lemoore
- Det Fallon
- FRCSW Det
- Det Fort Worth
- Det China Lake

FRC SOUTHWEST NORTH ISLAND
- SEAOPDET
- Det Point Mugu
- SEAOPDET
- Det NAVCAL Lab
- Futemna
- Det NAVCAL Lab
- Iwakuni

AFFILIATION WITH:
- MALS-39 Pendleton
- MALS-13 Yuma

FRC SOUTHEAST JACKSONVILLE
- SEAOPDET
- P-3 OPDET
- Det Mayport
- Det Key West

FRC MID-ATLANTIC OCEANA
- SEAOPDET Oceana
- Det Norfolk
- SEAOPDET Norfolk Det Pax River
- Det New Orleans
- Det NAF Washington
- SEAOPDET Beaufort
- FRCMA ACFT Dept Voyage Repair Team

FRC EAST CHERRY POINT
- Det McGuire

AFFILIATION WITH:
- MALS-14 Cherry Point
- MALS-26 & 29 New River
- MALS-31 Beaufort
- HMX-1 Quantico
- MALS-49 Stewart

Oct 2012
FRC Products (Last 12 Months)

FRC Totals
Military: 6,293
Civilians: 9,349
Contractors: 2,314
Total Employees: 17,956

FRC NORTHWEST
AIRCRAFT (15)
E/A-6B, E/A-18G, P-3
ENGINES (146)
T56, J52
COMPONENTS (20,407)
ALQ-99, E/A-6, canopies, components for above TMSs

FRC WEST
AIRCRAFT (31)
F/A-18 (PMI 2, AEPD), E/A-18G
ENGINES (659)
F414, T56
COMPONENTS (28,690)
F/A-18 RADAR, composites, components for above TMSs

FRC WESTPAC
(Formerly NAPRA)
AIRCRAFT (30)
H-53, C-130, E/A-6B,
F/A-18, H-46, H-60, H-1
P-3, E-2, E/A-18G

FRC SOUTHWEST
AIRCRAFT (162)
F/A-18, E-2, C-2, H-1, H-60, AV-8 (PMI 2,3), H-53 (PMID), (PMI 1N, 2N, PMI 2 Mods, P&E)
ENGINES (309)
LM2500, T700, T56
COMPONENTS (40,823)
Instruments, E-2 radar, composites, components for above TMSs

FRC SOUTHEAST
AIRCRAFT (72)
E/A-6B (PMI 1, 2, 3, 4), P-3
(PH 1, 2, 3, SSI), F/A-18 (PMI 1, 2, 1M, 2M), H-60 (PMI 1N, 2N)
ENGINES (1280)
T56, J52, TF34, F414, T700, F404
COMPONENTS (50,956)
Electro-Optics, air refueling stores, racks/launchers, components for above TMSs

FRC MID- ATLANTIC
AIRCRAFT (85)
F/A-18 (PMI 2), E-2 (PMI 1),
C-2 (PMI 1, 2), H-53 (ISR), H-60 (PMI 1N, 2N)
ENGINES (1,904)
F404, T56, T700, T64, T400
COMPONENTS (56,936)
F/A-18 Electro-Optics, Radar, composites, E-2, C-2, H-60, H-1
C-130, EA-6B, Radar, instruments, components for above TMSs
VOYAGE REPAIR TEAM
Repair & Overhaul USN, USCG, FMS air capable assets and ALRE components

FRC EAST
AIRCRAFT (130)
AV-8B (PMI 1, 2, 3, 4, SWRK), H-53 (AWI, SDLM, PMID), H-1
(BSL, 1N, 2N, SDLM), EA-6B
(PMI 2, 3, 4), CH-46 (PMID, SDLM, AWI)
ENGINES (144)
T58, F402, T64, T400, T56
COMPONENTS (26,395)
Dynamic components, rotor blades, props, blades/vanes, APU/GTC, components for above TMSs as well as E-2 and P-3 props

FRC Totals
October 2012
Maint Is Complicated and Interesting and possible to ‘BPR’ and ‘CPI’
**Naval Aviation Platform Introductions**

<table>
<thead>
<tr>
<th>Year</th>
<th>Platforms</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>F-14/18C, EP-3A, C-2A</td>
</tr>
<tr>
<td>2008</td>
<td>H-60B/F, T-34C, EA-6B, T-39</td>
</tr>
<tr>
<td>2009</td>
<td>E-2C, P-3C, FA-18C</td>
</tr>
<tr>
<td>2010</td>
<td>T-6A, EA-18G, T-45C</td>
</tr>
<tr>
<td>2011</td>
<td>Firescout, E-2D, P-8A</td>
</tr>
<tr>
<td>2012</td>
<td>BAMS UAS, F-35C JSF</td>
</tr>
<tr>
<td>2013</td>
<td>EP-X ?</td>
</tr>
<tr>
<td>2014</td>
<td>C-X ?</td>
</tr>
</tbody>
</table>

**Legend:**
- **Green**: Transition underway; NEPA/Basing decision complete
- **Red**: Projected transition timeline; NEPA and Basing decision required
- **PB12**:
Navy has a history of ‘CPI’ that causes ‘Cost Change’ with better ‘Readiness’ generation.

Aug-11

<table>
<thead>
<tr>
<th>COMFRC</th>
<th>Totals</th>
<th>% ACTUAL TO:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FY</td>
<td>BRAC Plan</td>
</tr>
<tr>
<td></td>
<td>07</td>
<td>$877,131</td>
</tr>
<tr>
<td></td>
<td>08</td>
<td>$164,367</td>
</tr>
<tr>
<td></td>
<td>09</td>
<td>$264,097</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>$311,231</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>$314,518</td>
</tr>
<tr>
<td></td>
<td>FYDP</td>
<td>$1,161,344</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FY</th>
<th>BRAC Plan</th>
<th>FRC Projection</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>129.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>126.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>117.8%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>105.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>106.7%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>COMFRC</th>
<th>FRC Projection</th>
<th>ACTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>07</td>
<td>$94,833</td>
<td></td>
</tr>
<tr>
<td>08</td>
<td>$208,484</td>
<td></td>
</tr>
<tr>
<td>09</td>
<td>$311,153</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>$326,835</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>$335,516</td>
<td></td>
</tr>
</tbody>
</table>

$1.3B in past cost change carefully counted.

Source: FMB / N1

Great, but what are you doing lately and tomorrow?
Numerous new CPI ideas in-work

- Maint Optimization
- Event Based Maint
- ARAT
- BCM-I (more of it)
- I-level AIRSpeed w/ FCAP
- ILSMS
- Ideas in ‘Imagineering’ phase
If Level 2 capability exists, no component goes BCM without going through a site that has capability

- Aggregate repair capability & demand to the most successful, high throughput Level 2 sites
  - Minimize redundant Level 2 capability (some consolidations)
  - Allow potential to draw down some sites to mostly Flight-Line Services
  - Use repair hub allowances to replenish sites without repair capability

- No item enters the wholesale system (Level 3) without passing through a Level 2 site that has established repair capability
Candidate Example – F/A-18 APU

Level 2 Repair Cost $1K
AFM

BCM Repair Cost $32K AVDLR

Does not include manpower, repair or shipping costs

Potential $2M ROI

*Under PBL contract. Navy is charged by each item processed.
**FRC NIIN ANALYSIS PROJECT IDENTIFICATION:** FY2011

**FRCSE JAX**

**TOTAL SITE POTENTIAL:** $6,960,341.20

**W/C: 05A**  
**Potential:** $3,843,020.93

<table>
<thead>
<tr>
<th>NIIN</th>
<th>COG</th>
<th>NOMENCLATURE</th>
<th>RFI</th>
<th>RFI%</th>
<th>BCM</th>
<th>BCM-1</th>
<th>TRRm</th>
<th>BCM COST</th>
<th>ORG</th>
<th>W/C</th>
<th>RFI%</th>
<th>TRRm</th>
<th>ARTISAN</th>
<th>POTENTIAL ROI</th>
</tr>
</thead>
<tbody>
<tr>
<td>012396184</td>
<td>7R</td>
<td>FAST PROBE ASSEMBLY</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$297,850.00</td>
<td>P9A</td>
<td>62A</td>
<td>0</td>
<td>100</td>
<td>205</td>
<td>None</td>
</tr>
<tr>
<td>012436186</td>
<td>7R</td>
<td>HOIST, MAIN PROBE</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$292,089.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
<tr>
<td>012396186</td>
<td>7R</td>
<td>AMPLIFIER CONTROL</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$249,704.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
<tr>
<td>012396186</td>
<td>7R</td>
<td>AMPLIFIER CONTROL</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$249,704.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
<tr>
<td>012461976</td>
<td>7R</td>
<td>TRANSMITTER MODULAT</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$201,270.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
<tr>
<td>014660156</td>
<td>7R</td>
<td>RADIO SET</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$159,912.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
<tr>
<td>015533021</td>
<td>7R</td>
<td>DISPENSER SET COUNT</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>$146,750.00</td>
<td>A9S</td>
<td>D2A</td>
<td>6</td>
<td>81</td>
<td>42</td>
<td>None</td>
</tr>
</tbody>
</table>

**Potential $3.8M ROI in 05A**

**FRC SE North Island has 100% RFI Rate**

**FRC Mayport (Only 20 Miles Away)**
Mitigation - Candidate Sequencing

**Approaches**
- NIIN
- Work Center
- Whole Site
- AT/FLIR
- NAS Fallon

**Candidate Sequencing**

- **Sequence 1**
  - No constraints – can be executed within 90 days
- **Sequence 2**
  - Simple constraints – can be executed within 180 days (SE, Allowance Relocation)
- **Sequence 3**
  - Moderate constraints – can be executed within 1 year (TRR Redux)
- **Sequence 4**
  - Difficult constraints – can be executed within 2 years (Manpower)
- **Sequence 5**
  - Extreme constraints – can be executed within 3 years (MILCON)

**Results**

Ensures manpower, performance and allowancing postures are fully capable prior to implementation.

Candidate sequencing handbook available in Word format.
Must take an ‘Enterprise’ view of the FRC’s

Current manning levels support these changes
EBM Concept

- EBM: a maintenance concept enabled by detailed RCM and maintenance task analysis data and a robust software application for efficient maintenance scheduling
  - Instead of packages (phases, specials, etc.) each maintenance task and relevant aircraft usage parameters are tracked individually by their engineering derived intervals
  - Tasks are grouped into preventive maintenance events whose content and schedule are based on:
    - Unique operating profile (usage and environment) of each aircraft
    - Planned operational schedules
    - Other planned “events” such as modifications (budget driven)
    - Unplanned “events” such as unscheduled down-time (random)

“What the aircraft needs, when it needs it, based on operating conditions and schedule”
EBM Benefits

• Anticipated cost savings
  – Decreased consumable demands for preventative maintenance

• Reduced maintenance burden (MMH)
  – Includes reduction from updated RCM analysis and EBM savings

• Improved planning capability
  – Better prediction of when maintenance is due based on planned usage (FH, landings, cats / traps, etc.)
  – Improved knowledge of future maintenance resource requirements by calculating the logistics requirements of each task as far into the future as needed
  – Easier to adjust to changing operational requirements (e.g. Surge)

• Better aircraft material condition
  – Right maintenance at the right time as driven by the RCM interval for when tasks should be done

• Improved aircraft availability
  – Decreased downtime for maintenance
## Consumables Results

<table>
<thead>
<tr>
<th>TMS</th>
<th>Fleet Size</th>
<th>Savings</th>
<th>Implementation Year +1</th>
<th>Implementation Year +2</th>
<th>Implementation Year +3</th>
<th>Implementation Year +4</th>
</tr>
</thead>
<tbody>
<tr>
<td>AH-1W</td>
<td>150</td>
<td>$3.7 M</td>
<td>E-6</td>
<td>C-130</td>
<td>F-18</td>
<td>AH-1Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>90</td>
<td>1056</td>
<td>8</td>
</tr>
<tr>
<td>UH-1N</td>
<td>82</td>
<td>$2 M</td>
<td>EA-6B</td>
<td>AV-8B</td>
<td>C-130</td>
<td>V-22</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>97</td>
<td>129</td>
<td>90</td>
<td>99</td>
</tr>
<tr>
<td>E-2C</td>
<td>63</td>
<td>$1.6 M</td>
<td>T-45</td>
<td>H-60</td>
<td>H-53E</td>
<td>AH-1Z</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>205</td>
<td>463</td>
<td>183</td>
<td>8</td>
</tr>
<tr>
<td>C-2A</td>
<td>35</td>
<td>$0.9 M</td>
<td>P-3</td>
<td>H-53E</td>
<td>H-53E</td>
<td>UH-1Y</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>169</td>
<td>183</td>
<td>26</td>
<td>26</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior Yr. Total:</td>
<td>$0</td>
<td>Prior Yr. Total:</td>
<td>$8.2 M</td>
<td>Prior Yr. Total:</td>
<td>$23.1 M</td>
<td>Prior Yr. Total:</td>
<td>$41.9 M</td>
</tr>
<tr>
<td>FY Total:</td>
<td>$8.2 M</td>
<td>FY Total:</td>
<td>$23.1 M</td>
<td>FY Total:</td>
<td>$41.9 M</td>
<td>FY Total:</td>
<td>$71.7 M</td>
</tr>
</tbody>
</table>

**Five year savings total $216.6M**
ARAT - Aviation Rapid Action Teams
“Targeted, Applied, Direct Engineering and Logistics at Fleet Maint levels”

- ARAT mines Logistic data + talks to Fleet level Maintainers directly.
- ARAT musters hand picked Engineers, Super-techs and Loggee’s and ‘boats-on-the-deck’ investigates opportunities to resolve critical costs and readiness degraders.
- Enhance I-level repair capability
- Enhance I-level by imbedding D-level expertise (BCM-I’ish approach)
- Works with FST directly to resolve maintainability or even engineering deficiencies (ex PLCU A-7 SRA 35mA transformer)
- Challenges the ICRL’s, LORA, etc.
- Price challenges

PLCU: a $52,515 consumable that could easily be repaired that we were using 1 per week
COMFRC ARAT
September 2012 Cost Avoidance Summary

- COMFRC ARAT R-TOC Initiative surpassed it’s first year goal of $15.7M by more than $2M in FY12!
- Finalizing FY13 candidate list
- September total cost avoidance by type / model
  - V-22: $237,903
  - F/A-18: $646,131
  - Sep total: $884,034
  - FY12 cumulative total: $17,850,604

<table>
<thead>
<tr>
<th>FY-12 COMFRC ARAT Summary Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Avoidance By TM</td>
</tr>
<tr>
<td>V-22</td>
</tr>
<tr>
<td>F/A-18</td>
</tr>
<tr>
<td>Cumulative Avoidance (1A1A)</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Planned</td>
</tr>
<tr>
<td>Planned to Actual % through September</td>
</tr>
</tbody>
</table>
BCM-I (more of it)

- BCM-I looks at the tens of thousands of AVDLR’s (LRU’s) coming off aircraft and going thru I-levels that can’t be repaired, then determines ‘if’ embedded D-level artisans are appropriate to effect repairs on site.
- ~$125M per year in ‘cost avoidance’ being achieved now; some possibility for expansion.
- Tangential technical rub-off and increased level II to level III to FST comms important.
- Readiness ‘lift’ important, but harder to measure.
I-level AIRSPEED

- ‘Continuous’ Airspeed events and CPI pressure on all activities
- Examine differing RFI/BCM success rate from site to site and take steps to bring all retained repair sites to ‘best performance’ capability of most successful site.
FCAP Elements
(Fleet Capability Alignment Program)

• The FCAP Process
  • Overall program involved NIIN Analysis, ‘FCAP Projects’ and reporting

  – NIIN Analysis Tool
    – Analysis & AIRSpeed project identification
      – Enables sites to compare their repair success globally against all other ‘I’ level activities with like capabilities
      – Identifies opportunities to improve repair success
      – Target AIRSpeed events at those opportunities

  – The FCAP software tool
    – Measures the impact of improved repair processes & capabilities to the Flying Hour Program (FHP)
Lemoore has a very successful repair rate. Large variation of repair success fleet-wide. MALS-11 and Oceana could potentially save $1M on this NIIN through CPI.
Integrated Logistics Support Management System

(If You Can't Scrutinize It, It's Hard To CPI It)

• Standardized Data Triage Process, Tools and Language
  – TMS Logistics Assessment enhanced by the implementation of Integrated Logistics Support Management System (ILSMS)
    • Exploit unprecedented access to maintenance and supply data
    • Advanced analytical and demand forecasting capability
• Improve Visibility of T/M/S Readiness & Cost Drivers
• Root Cause Analysis of Identified Issues
• Actionable Mitigation POA&M’s with provider organizations

Unprecedented Data Availability

ILSMS Aggregates Data in One Tool

Logistics Assessment will be a key enabler in enhancing weapons system availability and reducing O&S cost.
ILSMS Data Sources

Current Stock Posture
NIIN-PN/Cage Cross Reference
Allowances
Organic repair schedules
FRC G drivers
Backorders
ERP Schedule Board
(Due in/Projections)

Material Usage History

Current Readiness Metrics

Historical Fleet/Program Cost

Current FY Fleet Cost

AFAST ICRL

Flight Records(NAVFLIRS)
Supply History (60 Series)
Maintenance Actions

X-ray data
Audited Flight Hours
RT-79 Records

Applicability List
Completed TD’s

WUC Baselines

Tracked Issues:
Program specific issues that require tracking/data or tie into other decision processes i.e. (IMC/BULKHEADS/KAPTON)
Comments:
Allows for commenting by all stakeholders on most critical areas—especially part number/NIIN and BUNOs

Track/Reference Tables
PN_NIIN_HOFNIIN_WUC_XREF
ORG codes
TEC Codes
Supply Codes
Most codes apx E of 4790
Readiness “Kill Chain”

Logistics Impacts Each Link of the “Kill Chain”

Provider Organizations

Resource Sponsors

T/M/S Data Driven Analysis

Issues Affecting Readiness & Cost

Root Cause Analysis

Actionable POA&M

NAE Readiness & Costs Metrics

Current Readiness & Cost

Future Readiness: Design for Supportability
This was a fast raster scan of the CPI activities we in Naval Aviation are pursuing; I’ll be happy to talk to any of you off-line if you’d like more info.

Stu Paul
C:703.835.7558
stupaulnavy@aol.com
stuart.paul@navy.mil