Implementing and Measuring a Test Program in a Sustainment Environment

23 Oct 07

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What Sustainment Environment?

727th Aircraft Sustainment Group

Col. James Fulton
Commander

Ms. Jerri Hulme
Deputy Director

Mr. James Miller
Chief Engineer

PROVIDING EFFECTIVE & EFFICIENT WEAPON SYSTEM SUPPORT
727 ACSG Mission

- Single Manager for Sustainment and Modernization of
  - 250 USAF Commercial-Derivative Aircraft
  - HF Global Communications System Network
- Preserves FAA Certification and Operational Safety, Suitability & Effectiveness (OSS&E) of Commercial Derivative Aircraft
- 4 Squadrons Manage Services Acquisition

“Cradle-to-Grave CLS Support”
Weapon System Support

727th Aircraft Sustainment Group
Contractor Logistics Support (CLS)

Weapon Systems
- KC/KDC-10
- VC-25
- E-4B
- C-9
- C-12
- C-20
- C-21
- C-26
- C-38
- E-9
- T-41
- T-43
- T-51
- TG-10
- TG-15
- UV-18
- Peace Lotus
- HFGCS

Customers
- AMC
- ACC
- ANG
- AFRC
- AETC
- USAFE
- PACAF
- AFMC
- USAF ACADEMY
- AF FLIGHT STD AGENCY
- Army
- NAVY
- US MARINE CORP
- DIA
- DSCA
- FMS
- USSOCOM
727 ACSG Responsibilities

19 Weapon Systems

250 Active
41 Inactive Aircraft Mgd

19 Commands

FY07 50 PDM Scheduled

FY07 $913M Obligation Authority

56 USAF Bases
2 FMS Nations

FY07 $6.6B Contracts

727 ACSG Responsibilities
Weapon System’s Missions

- Presidential Airlift “Flying White House”
- Tanker Aerial Refueling & Airlift Support
- Intelligence Surveillance & Recon (ISR)
- Special Duty Support
- Intelligence Surveillance & Recon (ISR)
- Sea Surveillance Radar & HF Relay
- Pilot & Navigator Training & Seasoning
- MEDEVAC
- HF Communications
- Diplomatic, VIP & DV Travel
- Counter-drug Support
- Highly Survivable NMCS Node “Flying Pentagon”

727
ACSG
So What is the Problem?

• Sustainment environment different
  – Not one big pass/fail test
  – Most tests associated with mods

• Our organization had an ad hoc, contractor dependent, aircraft unique test approach

• Instigated a step-by-step Operating Instruction
  – Approach
  – Management
  – Expectations
  – Throughout the organization

• Implemented tangible approach that is:
  – Aimed at the working level
  – Applicable throughout entire organization
  – Accounts for progress through metrics
  – Always starts with requirements
Step 1: Build an Integrated Test Team (ITT)

- Program Manager formally establishes ITT in writing
  - Standard Letter

- ITT consists of, at a minimum:
  - Program Manager
  - Project Engineer
  - Center Test Authority
  - Responsible Test Organization
  - Representative from the customer
  - Representative from the contractor
Step 2: Review Lessons Learned

- Everyone thinks their test is unique—but they are usually wrong
- Review established lessons learned for:
  - Quantifiable criteria (e.g. noise)
  - Testing Techniques (e.g. analysis, M&S...)
  - Test Methods
  - Previous Problems
  - Operational Scenarios
Step 3: Define Test Requirements

- Review established Requirements Correlation Matrix (RCM)
  - Ensures test requirements has direct link to source requirements
- For each requirement ask:
  - Is it quantified?
  - Is it verifiable/testable/measurable?
  - What verification method?
- If need be, send requirements back to program manager for clarification
- For risky verifications/testability, send risk to Risk Management Team
• Break initial requirements down into a Requirements Correlation Matrix (RCM):
  – Spreadsheet with following columns:
    • Requirement
    • Requirement Source
    • Derived Requirements
    • Quantification
    • Operational Conditions
    • Initial Risk Assessment

• Give RCM to
  – Test Team for their planning
  – Risk Mngt Team for their planning
<table>
<thead>
<tr>
<th>Req Title</th>
<th>Req Source</th>
<th>Derived Req</th>
<th>Req Definition</th>
<th>Quantification</th>
<th>Op Cases</th>
<th>Risk (R/Y/G)</th>
</tr>
</thead>
</table>

Program Manager

Project Engineer(s) (Gov & Contr.)

User

Entire Team
Step 3: Define Test Requirements

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- If need be, send requirements back to program manager for clarification

- For risky verifications/testability, send risk to Risk Management Team
Step 4: Develop Test Metrics

- Three minimum metrics
  - Test Requirements Metric
  - Test Risk Management Metric
  - Deficiency Report Metric
    - Required only during the Test Execution Phase
- Update the RCM
- Metrics shown to management at quarterly Weapon Systems Review
  - Shown elsewhere as required (PMRs, PDRs, CDRs, TIMS, TRRs, etc)
Test Requirements Metric

Management Emphasis

- Total # of Requirements
- Quantified
- # Verifiable
- Resource Assigned
Test Risks Management Metric

Test Risks Management Metric

- Date 1
- Date 2
- Date 3
- Date 4
- TRR

Legend:
- Green: Low
- Yellow: Med
- Red: High
- Blue: Closed / Mitigated
Deficiency Metric Report

Deficiency Report Metric

Date 1 | Date 2 | Date 3 | Date 4
--- | --- | --- | ---
Open Cat 1 | Open Cat 2 | Closed

Legend:
- Red: Open Cat 1
- Yellow: Open Cat 2
- Blue: Closed
Step 5: Create TES or TEMP

- Tailored to size of project
- Documents strategy for conducting test
- Documents Roles and Responsibilities
  - How Redlines handled
  - How DRs handled
  - Use of TIMs
  - Scheduled Test Events (TRB, TRR, etc.)
  - Mishap Accountability
- Rationale for test verification methods (inspection, analysis, demonstration, test)
Step 6: Integrate Test Plan IMS & Funding

• Program Manager will:
  – Ensure the test program schedule in the TES/TEMP is incorporated into IMS
  – Work with contractor’s processes/timelines— not duplicative
  – Ensure appropriate test program funds are available to support TES/TEMP
  – Schedule technical interchange meetings as required

End of Planning Phase
Step 7: Technical Reviews

• Testing Addressed in Periodic Reviews
  – System Requirements Review
  – System Design Review
  – Preliminary Design Review
  – Critical Design Review
  – Safety Reviews

• ITT meets periodically to review that all requirements are:
  – Tested
  – Quantified
  – Verifiable/testable/measureable
  – Resourced
  – Risks mitigated

Design Phase
Step 8: Update TES/TEMP

- Update at, or immediately after, each review
- Update RCM as required
- Update all metrics
Step 9: Test Readiness Review (TRR)

- TRR required before any formal test
- OI has a clear checklist for TRR
  - Approved test procedures
  - Test scheduled defined
  - Hardware installation complete
  - Software configuration is stable (passed FQT)
  - Support requirements defined and scheduled
  - Test team identified
  - User training integrated
  - Mishap accountability identified
  - Etc.

Execution Phase
Step 10: Test Execution

• Execute the Test
• Document Deficiencies
  – Important to have a formal process
  – Hold deficiency reviews
  – Correct deficiencies
  – Retest the system
### E-4B 1677 MB1 Deficiencies
#### VHF/FM Red to Black Audio (DRB-139)

<table>
<thead>
<tr>
<th><strong>Deficiency</strong> – Category I</th>
<th><strong>Technical</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Actions to date</strong></td>
</tr>
<tr>
<td>• During transmissions via VHF/FM through the Black Switch w/ the radio in secure mode the signal bleeds over onto the unsecure channel</td>
<td>• Identified after the installation of the new VHF/FM radio</td>
</tr>
<tr>
<td>• Not E-4 unique issue</td>
<td>– Issue identified to radio manufacturer (Wulfsberg)</td>
</tr>
<tr>
<td>– Proposed solution part of s/w release for all fielded radios</td>
<td>– Wulfsberg identified a s/w solution</td>
</tr>
<tr>
<td><strong>Requirement</strong></td>
<td><strong>Way Ahead</strong></td>
</tr>
<tr>
<td>• Derived security/certification requirements</td>
<td>• Wulfsberg setting up representative test lab</td>
</tr>
<tr>
<td><strong>Exit Criteria</strong></td>
<td>• Scheduled to complete lab testing by 9 Dec 05</td>
</tr>
<tr>
<td>• Transmit via VHF/FM through the Black Switch w/ the radio in secure mode without the signal bleeding over onto the unsecure channel</td>
<td>• A/C integration testing scheduled by 16 Dec 05</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th><strong>Funding</strong></th>
<th><strong>Schedule</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Funding:</strong> Solution covered under warranty</td>
<td><strong>Aggressive:</strong> 28 Nov 05</td>
</tr>
<tr>
<td><strong>POC:</strong> John Smith (E-4 SPO) DSN: 336-2547</td>
<td><strong>Moderate:</strong> 6 Dec 05</td>
</tr>
<tr>
<td></td>
<td><strong>Low Risk:</strong> 6 Jan 06</td>
</tr>
</tbody>
</table>

**Updated:** 16 Nov 05 CU
Step 11: Test Report and Lessons Learned

- Tests are not snowflakes
- Lessons Learned repository contains:
  - Possible tests to consider
  - Potential test plans
- Repository is not program specific, but for entire organization
- Future plans are to make the lessons learned repository a database with keyword searches
What’s Next

• Continue implementation throughout organization
• Continue Measure/Track results
• Populate Lessons Learned database
• Refine as needed
• Document successes
  – We are having some!

Test Management can be implemented, applied AND make a difference
Summary

- 727th ACSG developed grass-roots means to implement Test Management as part or our Systems Engineering in Sustainment Environment
- Clear-cut, tangible processes steps for the working-level
- Metrics to measure progress for management
- It works

In Place and In Use Now
Questions?