Implementing and Measuring a Test Program in a Sustainment Environment

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Jim Miller
Chief Engineer
727 ACSG/EN
Phone: (405) 736-7996
james.c.miller@tinker.af.mil

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

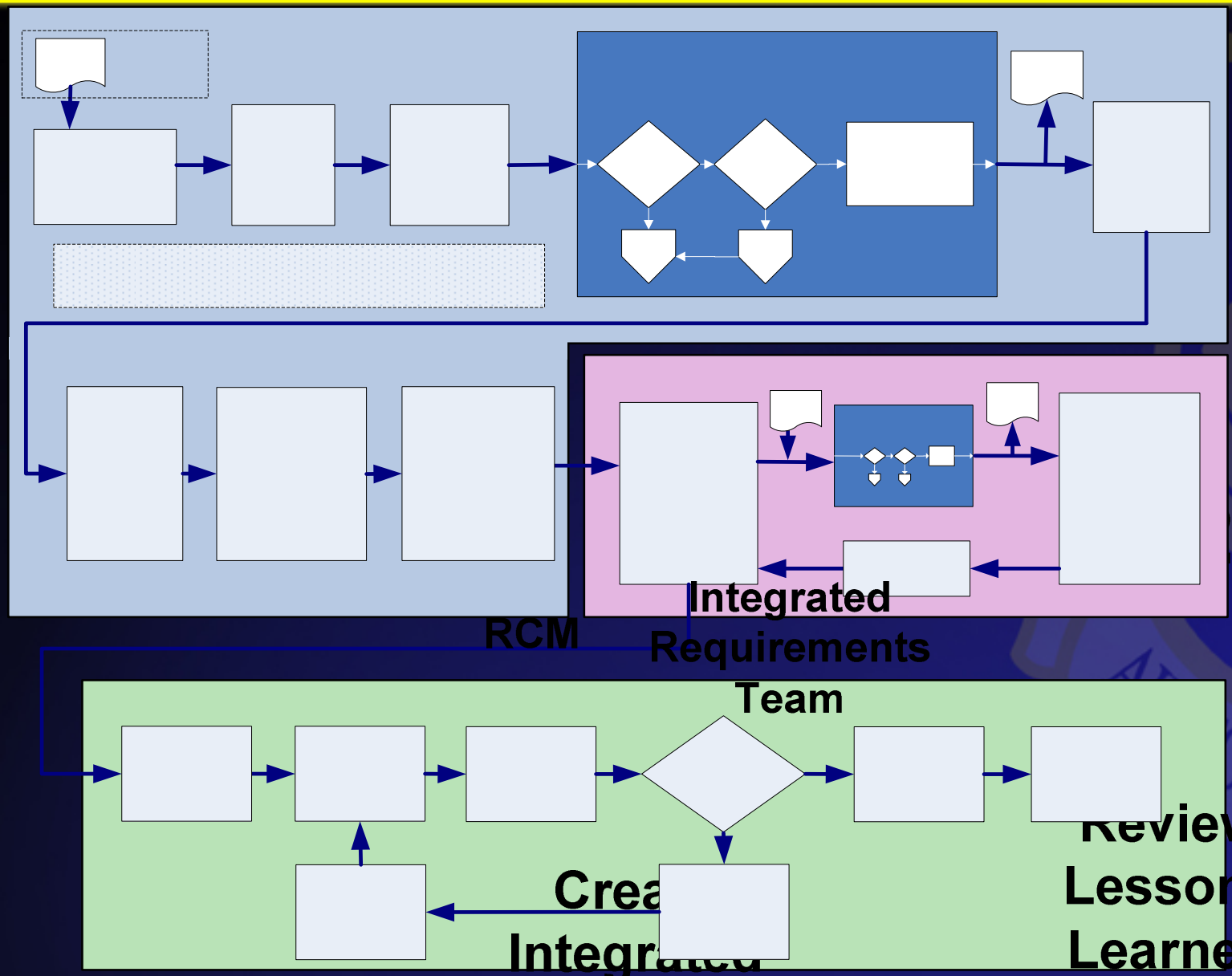
727 ACSG Responsibilities

Weapon System's Missions

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

Test Process Flowchart



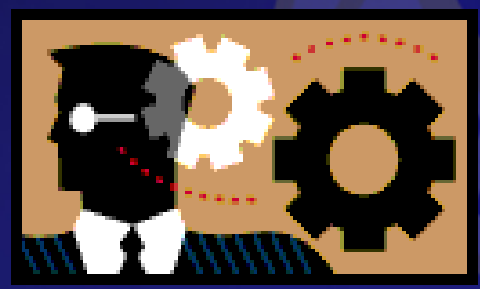
Step 1: Build an Integrated Test Team (ITT)

- 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

Planning Phase

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



Planning Phase

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**

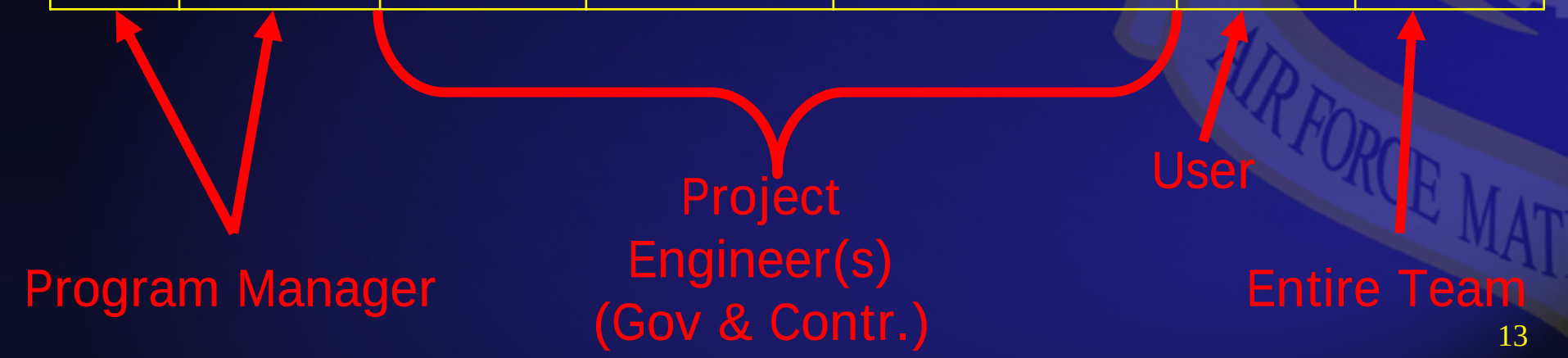
Planning Phase

Define Requirements

- Break intial 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

RCM

Req Title	Req Source	Derived Req	Req Definition	Quantification	Op Cases	Risk (R/Y/G)



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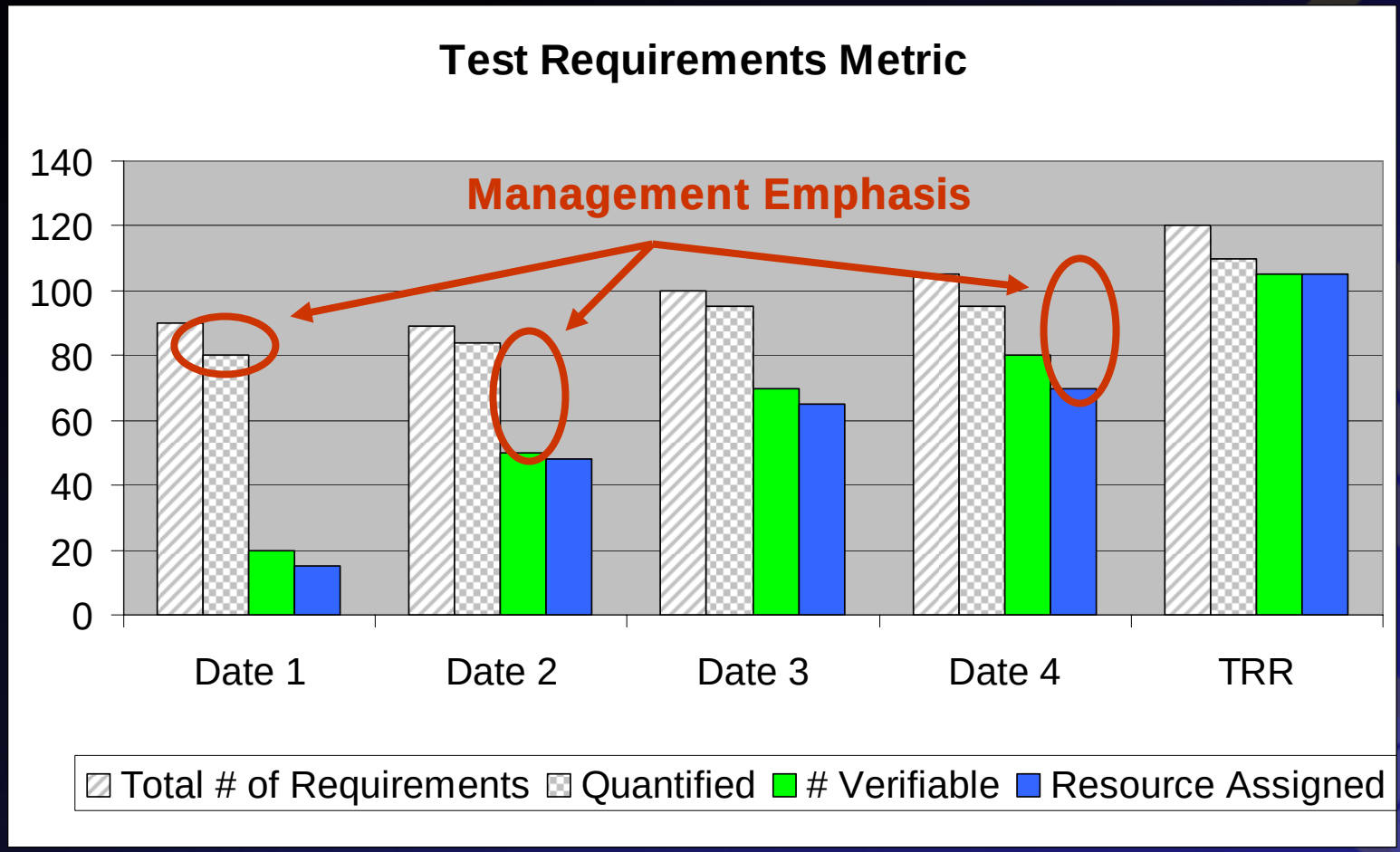
Planning Phase

Step 4: Develop Test Metrics

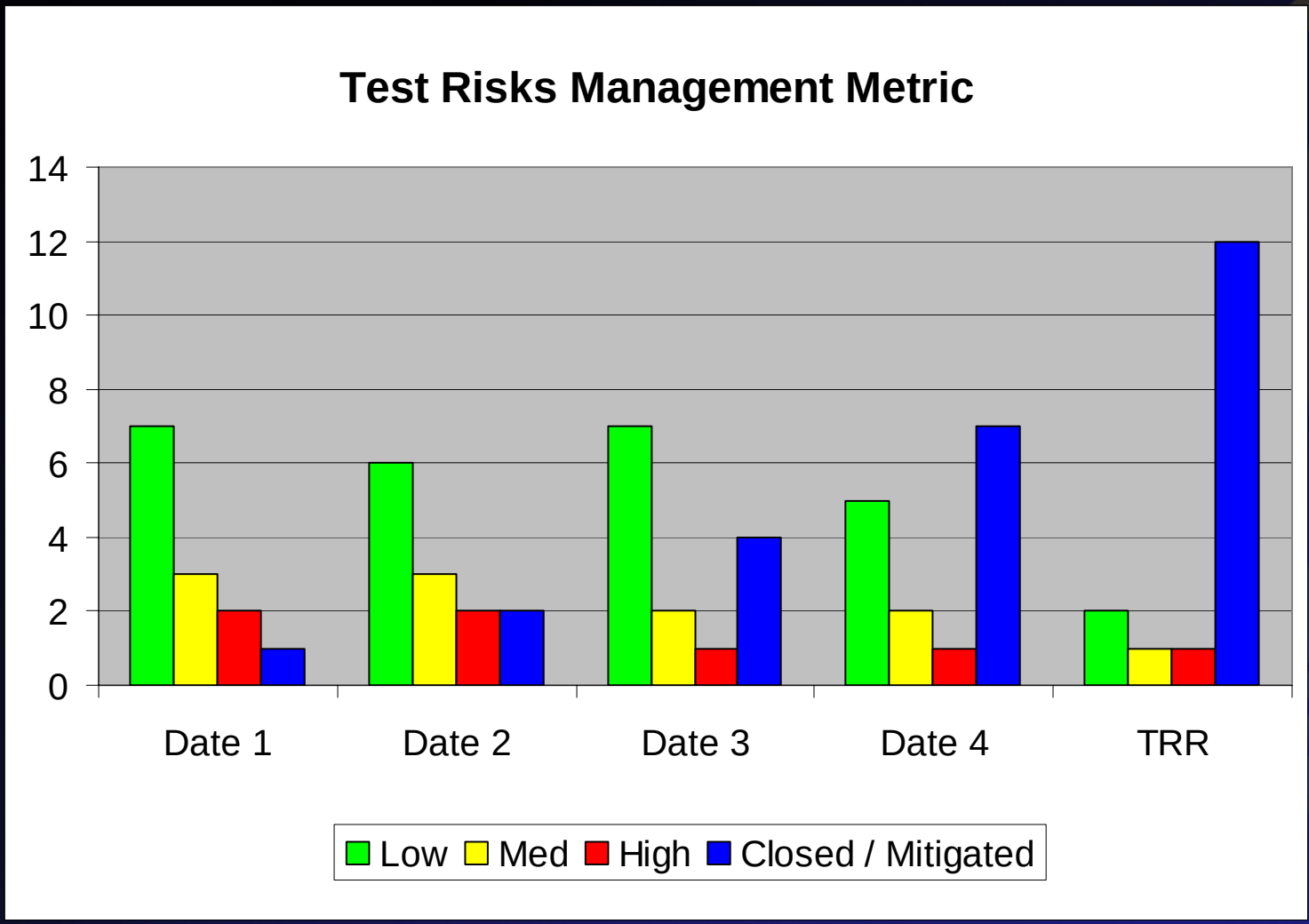
- Three minimum metrics
  - Test Requirements Metric
  - Test Risk Management Metric
  - Deficiency Report Metric
    - Required only during the Test Execution Phase
- Update the RCM
- Metrics shown to management at quarterly Weapon Systems Review
  - Shown elsewhere as required (PMRs, PDRs, CDRs, TIMS,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

Planning Phase

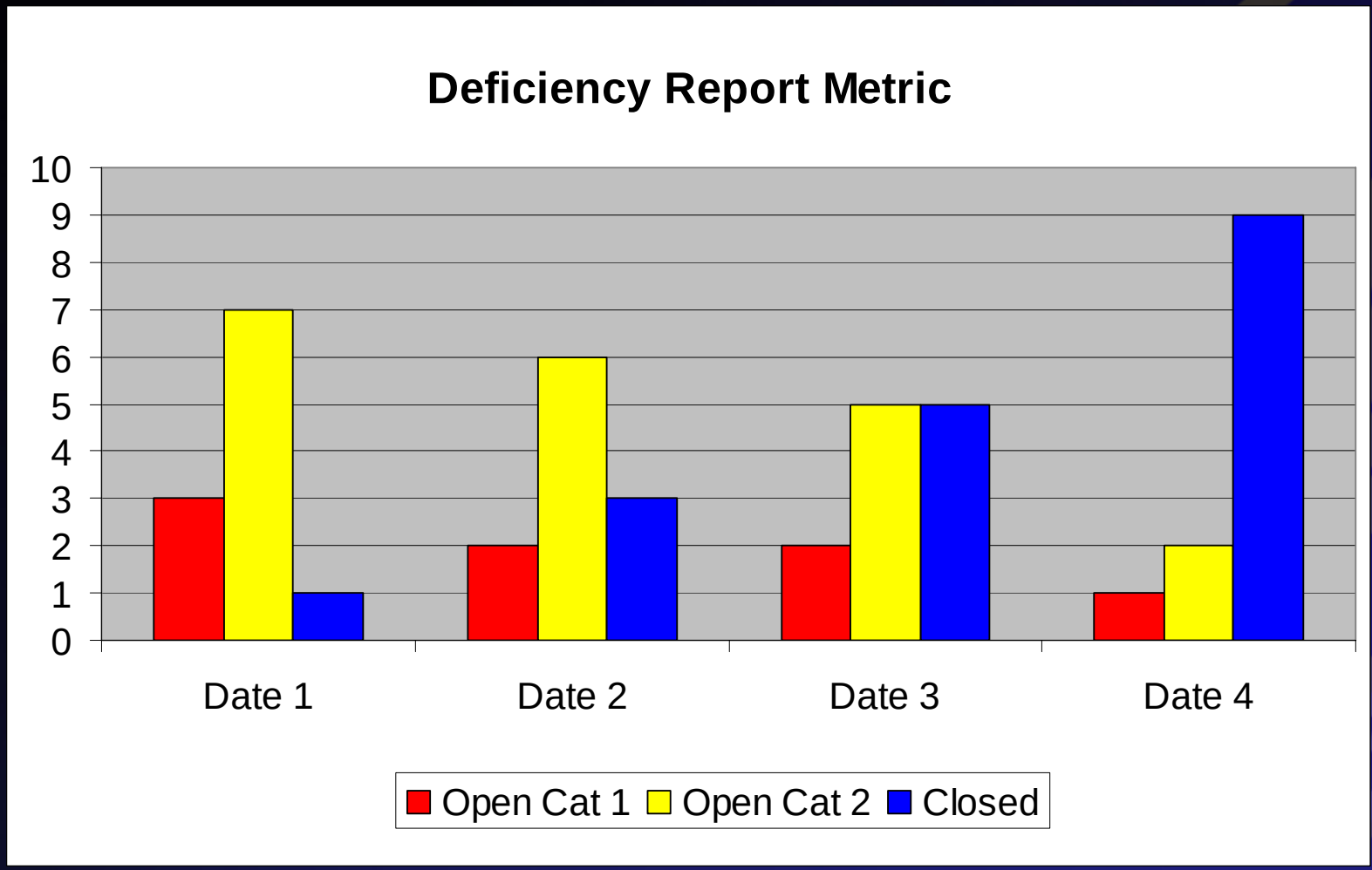
Test Requirements Metric



Test Risks Management Metric



Deficiency Metric Report



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)

Planning Phase

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

Design Phase

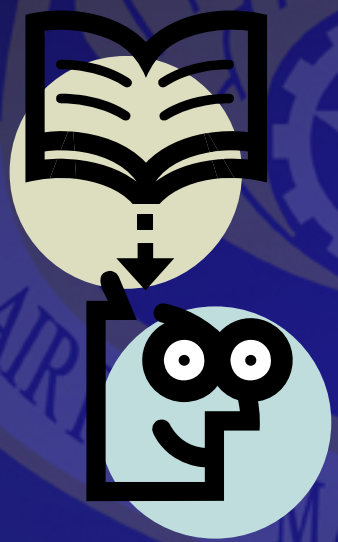
Step 9: Test Readiness Review (TRR)

- 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



Execution Phase

DR Quad Chart

E-4B 1677 MB1 Deficiencies
VHF/FM Red to Black Audio (DRB-139)

Deficiency – Category I

Description
- During transmissions via VHF/FM through the Black Switch w/ the radio in secure mode the signal bleeds over onto the unsecure channel
- Not E-4 unique issue
  - Proposed solution part of s/w release for all fielded radios

Requirement
- Derived security/certification requirements

Exit Criteria
- Transmit via VHF/FM through the Black Switch w/the radio in secure mode without the signal bleeding over onto the unsecure channel

Technical ●

Actions to date
- Identified after the installation of the new VHF/FM radio
  - Issue identified to radio manufacturer (Wulfsberg)
  - Wulfsberg identified a s/w solution
- Minor software anomalies discovered in prototype testing

Way Ahead
- Wulfsberg setting up representative test lab
- Scheduled to complete lab testing by 9 Dec 05
- A/C integration testing scheduled by 16 Dec 05

Technical POC: Jim Barnaby

Funding ●

Funding: Solution covered under warranty

POC: John Smith (E-4 SPO) DSN: 336-2547

Schedule ●

Aggressive: 28 Nov 05
Moderate: 6 Dec 05
Low Risk: 6 Jan 06

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

Execution Phase

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?

Basic Systems Engineering Process