Ground System Test Standard: 
Replacing cancelled Mil-Std-1833

Brian Shaw
Systems Engineering Directorate
Space Systems Group
The Aerospace Corporation

GROUND ARCHITECTURE WORKSHOP (GSAW) 2011
2 March 2011

© The Aerospace Corporation 2011
Outline

• Standards
  – Characteristics of a Standard
  – Overview of SMC Standards Process

• MIL-STD-1833
  – Background and history
  – Overview of content

• New Ground System Test Standard
  – Overview
  – Status
Specifications and Standards = Technical Practices

Source: SMC/EN briefings (various)

• Application of sound technical processes are at the heart of achieving successful space systems development and acquisition
  – Systems; Subsystems; Components; Assemblies; Parts & Materials
  – Primes; Subcontractors; Major Vendors; Suppliers

• Military, International and Industry standards document and capture the basis/principles of sound and effective technical practices
  – Documents proven and accepted technical parameters and/or provides roadmap of critical technical elements of a process/Lessons Learned

• What, not how; Products and their attributes; Design/Test criteria

Specs & Std only enforceable if clearly specified on SMC contracts
SMC Systems Engineering Process Overview
Source: SMC/EN briefing (Col. David Swanson) presented to SMC Seniors at 2010 Off-Site meeting

Baseline Technical Command Media
- Policies, specs/stds
- Best practices
- Handbooks and guides
- Data deliverables

Program Planning, Tailoring, and Management
- Spec and std tailoring
- Program management planning
- Technical planning
- Technical data sharing
- Government/contractor working group relation
- Critical process tailoring
- KPP/TPM criteria
- Definitive pedigree and sell-off criteria

Program Execution Assessment and Metrics
- Gated technical reviews
- MA verification assessment
- Verification management process
- Independent V & V
- Configuration status
- KPP/TPM mgmt
- Test effectiveness
- TLYF deviations and risk assessment
- Critical process escape assessment
- Schedule slip

Mission Readiness Certification

Lessons
- Best practices
- Process improvement
- Education and training

Feedback and improvement

Gold Standard

Brian.e.shaw@aero.org
Systems Engineering Directorate
SMC Compliance Standards Development Process

### SMC Specs and Standards Functional Areas

#### MANAGEMENT
- Program Management
- Systems Engineering
- Product Assurance
- Subcontract Management
- Design Reviews
- Configuration Management
- Manufacturing and Production Management
- Parts Management
- Risk Management
- System Safety
- Occupational Safety and Health

#### TECHNICAL
- Electrical Power, Batteries
- Electrical Power, Solar
- Electromagnetic Interference & Control
- Environmental Engineering; Cleanliness
- Human Systems Integration
- Interoperability
- Logistics
- Maintainability
- Mass Properties
- Moving Mechanical Assemblies
- Ordnance
- Pressurized Systems & Components
- Parts, Materials & Processes
- Reliability/Availability
- Information Assurance/Program Protection
- Software Development
- Structures
- Survivability
- **Test, Space & Ground**
SMC Contract-Specific Implementation Process

Overview

**Title:** TEST REQUIREMENTS FOR GROUND EQUIPMENT AND ASSOCIATED COMPUTER SOFTWARE SUPPORTING VEHICLES (NO S/S DOCUMENT)

**Scope:** This document establishes the test and evaluation requirements baseline for new or modified ground equipment supporting space vehicles and the associated new or modified computer software.

**Status:** Canceled

**Document Date:** 13-NOV-1989; Notice 1 (Cancellation) 04-MAY-1998

**FSC/Area:** 1810  **Doc Category:** Military Standard

Responsibilities

**Lead Standardization Activity:** 19 Space and Missile Systems Center

**Preparing Activity:** 19 Space and Missile Systems Center

**Coordination:** Limited

**Air Force Custodian:** 19 Space and Missile Systems Center
Mil-Std-1833: Overview of Content

• Section 4: General Requirements
  – Test Plans and Procedures
  – Retest
    • Compliance Testing
    • Integrated System Testing
    • Operational Test and Evaluations
  – Documentation
  – Firmware tests
Mil-Std-1833: Overview of Content (cont.)

• Section 5: Detailed Requirements
  – *Categories of Inspections and Tests*
    • Part, Material, and Software Unit Development Tests and Evaluation
    • Component Tests and Evaluation
    • Configuration Item Compliance Tests (qualification and acceptance)
      including COTS and GFE
    • Integrated System Testing
    • Initial Operational Tests and Evaluations
    • Follow-on Operational Tests and Evaluations
New Ground System Test Standard: Overview

• Goal: Establish a current standard for testing ground systems
  – Update for current acquisition practices
  – Balance breadth and depth of requirements
  – Optimize requirements between associated standards
    • Minimize redundancy
    • Eliminate differences
  – Ensure actionable and measurable requirements
  – Implement “lessons learned” from years of ground system experience
  – And, ultimately, improve system suitability and effectiveness
New Ground System Test Standard: Test Philosophy

Diagram:

- **System Specification** → **Verification/Validation** → **Operational Test**
- **Ground Segment Specification** → **Verification** → **Ground Segment Test**
- **Ground Element Specification** → **Verification** → **Ground Element Test**
- **Subsystem Specification** → **Verification** → **Subsystem Test**
- **Unit Specification** → **Verification** → **Unit Test**
- **Requirements Definition, Analysis, Decomposition**
- **Procurement, Assembly, Coding**

**Source:** Brian.e.shaw@aero.org
**Department:** Systems Engineering Directorate
New Ground System Test Standard: Test Strategy

Development Tests
Section 5.i
- Design Verification/Prototype
- COTS/Reuse Evaluation
- HCI Validation
- Unit
- Simulator/Test Driver validation
- Integration
- Performance
- Operational stress/life/longevity
- Site Installation/Checkout

Qualification/Acceptance Tests
Section 5.x
- Subsystem Qualification
- System Qualification
- Acceptance
- Site Acceptance

Transition to Operations
- Operational Test
  Section 5.y

Regression Tests

Operational Test
- Pre-launch/ops Evaluation
- Operations Readiness
- Launch/ops Rehearsal
- Post launch Evaluation

Sustainment Test
Section 5.y
- Tests same as a Development iteration

For Each Development Iteration*
Section 5.x

For Each Acquisition Cycle
Section 5.x

Sustainment Phase
Section 5.x

*Increment, Spiral, Build...
New Ground System Test Standard: Status

• The Aerospace Corporation Internal Working Group
  – *First draft: 2010*

• The Aerospace Corporation Subject-Matter Expert review
  – 2011

• Initial publication anticipated FY 2011

• Industry review and comment resolution

• Implement as SMC Standard

• Promulgation to higher-level standard TBD
Thank you

QUESTIONS?