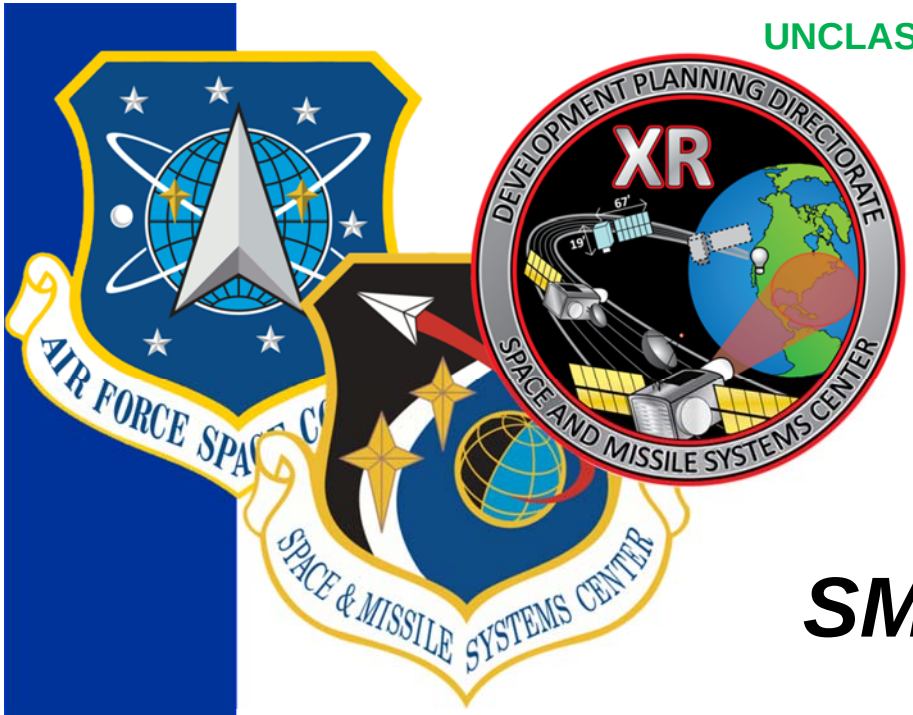


SMC Enterprise Ground Architecture (EGA) Project

26 Feb 2014

Capt Sarah Mashburn
SMC/XRDE

SMC Enterprise Ground Architecture (EGA) Project Overview

- **Overview**

  Develop, analyze and propose architecture options to modernize the SMC Enterprise Space Operations ground systems

- **Objectives**
  - **Ground system architectures with significantly more affordable life cycle costs**
  - **Operational resilience to existing and emerging threats**
  - **Ensure space superiority-based capability delivery to the warfighter globally**
- **Approach**
  - **Leverage lessons learned from OGAs and CSOs in architecting space operations centers**
  - **Leverage significant proven advances in commercial data center technologies and practices**
  - **Focus on non-proprietary architectures which are adaptable over longer life cycles, which encourage innovation and competition**
  - **Create roadmaps which identify on-ramps for acquiring and consolidating ground architecture capabilities**

OGA – Other Government Agencies, CSO – Commercial Satellite Operators

Motivation For SATOPs Evolution

- **AFSPC Directives / Guidance**
  - **2008 AFSPC/CC**
  - **2011 AFSPC/CC**
  - **2013 Gen Whelan – 4 Nov**
  - **2013 AFSPC/CC requested ISAG on future Ground Enterprise options**
- **Drivers for the transformation**
  - **Increasing budget constraints**
  - **Increasing sustainment cost**
  - **Evolving mission requirements**
  - **Tech maturity & emerging threats**
  - **Success by other Gov't offices**
    - **NRL**
    - **NRO**
    - **JPL**
    - **SMC (MMSOC)**

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE SPACE COMMAND

NOV 21 2011

MEMORANDUM FOR 14 AF/CC
SMC/CC
HQ AFSPC DIRECTORS

FROM: AFSPC/CC
150 Vandenberg Street, Suite 1105
Peterson AFB CO 80914-4020

SUBJECT: Commander's Intent for Air Force Satellite Operations (SATOPS) Enterprise Transformation

1. This letter codifies the operational and ... enterprise to overcome procedural, orga... support joint warfighter needs, promote fiscally efficient space systems acquisition and fully integrate and normalize space and cyber ... Enterprise Transformation (SET) effort will focus ... by managing requirements at the enterprise level, eliminating stovepipe processes and solutions, consolidating common functions, reducing duplication ... interoperability at all levels.

2. In order to achieve transformation, the Launch, Ranges and Networks (LRN) Command Lead will convene a cross-functional team to develop a "to be" AFSPC SATOPS enterprise architecture to s... enterprise data standards. The transformation will enable an on-demand, protected and agile SATOPS capability across the AFSPC enterprise to m... objectives in an increasingly contested ...

3. The HQ AFSPC/A5 and A8/9 are ... (PROTAF) to govern our SET effort p... *Systems Management*. The PROTAF ... and timeline to realize our objectives in a ... for this effort is Col Kurt K... kurt.kuntzelman@peterson.af.mil.

WILLIAM L. SHELTON
General, USAF
Commander

GUARDIANS OF THE HIGH FRONTIER

SATOPs Enterprise Transformation (SET)

- **Eliminate stovepipes**
- **Consolidate common functions**
- **Utilize data standards**

...T OF THE AIR FORCE
...AIR FORCE SPACE COMMAND

DEC 2 3 2008

...HQ AFSPC DIRECTORS

...Satellite Operations (SATOPS) Enterprise

...d emerging threats require us to reevaluate our ...orbit systems. Today's stove-piped SATOPS ...rmation fusion and drives operational and fiscal ...ve expeditiously toward open/service-oriented ...hs for AFSPC satellite programs.

...efficient SATOPS architectures and identify ...functions and capabilities, reducing ...to include the 614th Air and Space ...OPS enterprise architectures must not only address ...nts and infrastructures ensuring we ...e space control and operationally ...PC to meet National Security Space objectives and

...ohn Hyten, HQ AFSPC/A5, will form a broad-based ...itecture roadmap. This team will consist of key ...roadmap will include the status of the ...OPS programs); efforts to define a ...d architecture; development of an integrated ...of operations and organizational and operational

...a progress report on this effort within 90 days. My ...mmand Lead for Launch, Ranges and Networks, ...ppell@peterson.af.mil.

C. ROBERT KEHLER
General, USAF
Commander

cc:
ORS Office
AFRL/CC
ESC/CC
SIDC/CC

GUARDIANS OF THE HIGH FRONTIER

Transform AFSPC SATOPS into On-Demand, Protected and Agile Enterprise

GAO Recommendation – Apr 2013

"Satellite Control" – Report to Congressional Committees

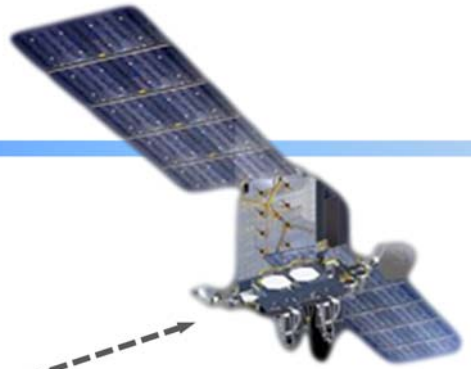
"GAO recommends that the Secretary of Defense direct future DoD satellite acquisition programs to determine a business case for proceeding with either a dedicated or shared network for that program's satellite control operations and development-wide long-term plan for modernizing its AFSCN and any future shared networks and implementing commercial practices to improve DoD satellite control networks. DoD concurred with our recommendation"*

- **SASC NDAA - SR 133-44, accompanying S.1197 - Reported 20 June 2013, Congress directs the Air Force to provide a long term plan for modernizing its Satellite Control Network and any future shared satellite control services and capabilities consistent with the second recommendation found on page 28 of the Government Accountability Office report, "Satellite Control Operations" (GAO-13-315).**

- **SMC RN and XR provided draft response to Congress, Nov 2013, summarized as: Air Force Space Command is currently planning an extensive project to develop and select a new satellite control operations architecture and the associated concept of operations. The goal of the "Enterprise Ground Architecture" project is to improve future satellite control operations and cyber protection for future resilient space systems, while reducing life cycle cost.**

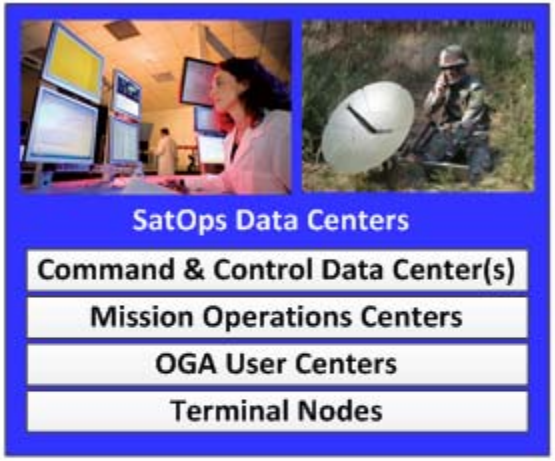
** GAO Report (GAO-13-315) "SATELLITE CONTROL: Long-Term Planning and Adoption of Commercial Practices Could Improve DOD's Operations" – April 2013*

Scope of EGA



The scope of EGA includes:

- **Transmit/Receive Networks**
- **SatOps Data Centers**
- **Architectures which utilize these elements**



"*The ultimate goal of achieving space superiority should be to maintain our own space capabilities when contested and ensure unhindered mission continuity through any conflict*." Space Operations, AFDD 3-14

Phase I Activities
Satellite Operations Benchmarking

Ground Operations – Benchmarking Working Group	
Objective	**Benchmark ground systems architectures at other government agencies (OGAs) and commercial space operations (CSOs) to capture the state of the industry.**
Benchmark Partners	**Site Visits** -- NASA Goddard/TDRSS/GMSEC, JPL AMMOS, MDA, NRL Blossom Point, NOAA, Intelsat (CA), **Initial Contact/Pending Visits** – NRO, NGA, ESA, Kratos/ISI, NAVSOC, Intelsat (VA), SES Americom

- **Benchmarking focus**
  - **Data Center architectures for satellite C2 and mission operations**
  - **Strategies for achieving common core and standardization**
    - ***Impact of data rights and adaptability to changing requirements***
  - **Proprietary versus COTS versus GOTS capabilities**
  - **Standardization versus innovation and competition**
  - **Life cycle cost management strategies**
  - **Cyber security strategies**

Phase I Activities
Commercial Capabilities Survey

Ground Operations – Commercial Capabilities Working Group		
Objective	**Survey commercial capabilities providers impacting commercial data centers and cloud services for potential application to future EGA.**	
Trends and Focus Areas	▪ Network virtualization ▪ "Big data" analytics ▪ IT service automation & orchestration ▪ Embedded configuration management	▪ Infrastructure as a Service (IaaS) ▪ Infrastructure services ▪ GS COTS integration services ▪ Satellite operations/TT&C services

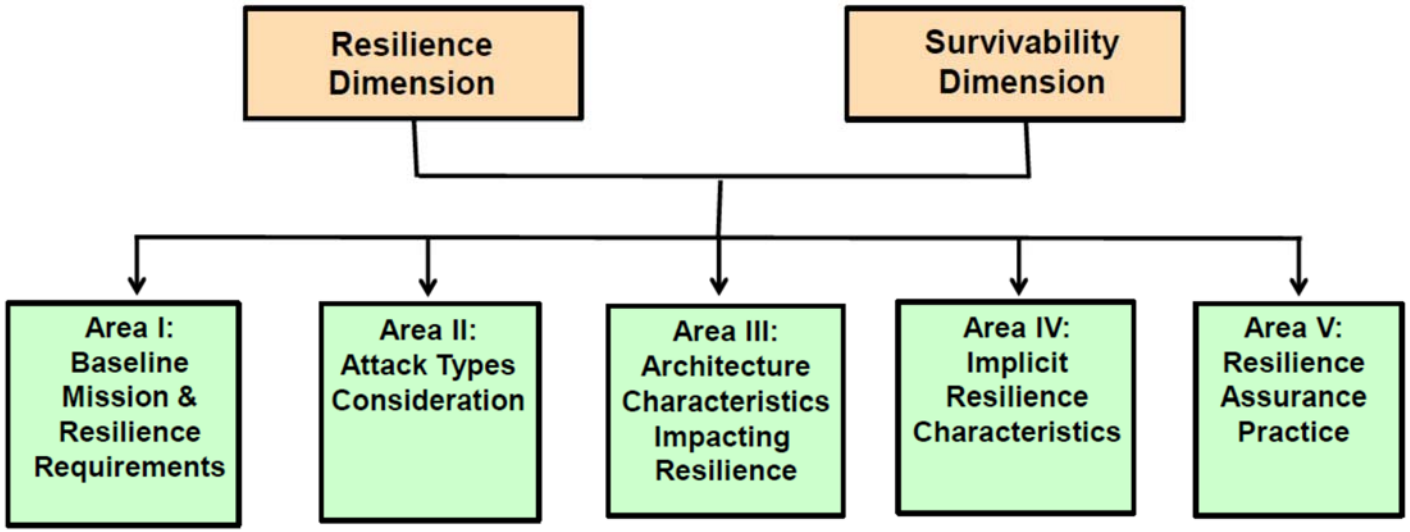
Trademarked symbols are used only for identification of companies surveyed.

Phase I Activities

Cyber Resilience in Ground System Architectures

Ground Operations – Cyber Resilience	
Objectives	**Investigate cyber resilience analysis methods for candidate architectures in the conceptual stage.** **Identify general architecture characteristics which support cyber security and resilience in ground systems.**

Cyber Resilience Assessment Framework



Cyber Resilience Assessment Framework, Aerospace ATR 2013-00809

Phase 2 Overview

- **Scope: SATOPs - SMC TT&C and Mission Planning/Data processing**
  - **Map existing functions/capabilities to common architecture**
  - **Engineers, documents, scores (MS&A) and costs several resilient, lower cost future SATOPs candidate architectures**
  - **Leverage common services**
  - **Evolve CONOPS**
  - **Impact assessment for classified/strategic contacts, cyber resilience, anomaly resolution, and overall mission TTPs/responsiveness**

Notional EGA Roadmap

Gap: Improved Integrated Satellite Control

Gap: Improved Cyber Protection / Resilience