Virtual Mission Operations Center:
Transforming the conduct of space based operations

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Topics

- Operationally Responsive Space (ORS)
- Virtual Mission Operations Center (VMOC)
- VMOC Operational Experimentation
- VMOC Support to Tactical Satellite Four (TacSat-4) Operational Experimentation
- VMCO Support to Operations: ORS Sat-1
- VMOC Status and Transition
- VMOC Way Ahead
- Conclusion
Operationally Responsive Space

- ORS is defined “broadly as assured space power focused on timely satisfaction of Joint Force Commanders’ needs”

- ORS provides a known capability, but does so in a completely new way

- This approach requires exploration of new concepts of operations through enabling technologies
  - Allows technology to mature alongside emerging concepts of operations

- ORS Timeline:
  - 2003: OSD instructs DOD to create new business model for developing and employing space systems
  - 2003: OSD Office of Force Transformation (OFT) begins ORS effort
  - 2005: U.S. Space Transportation Policy makes ORS an explicit objective, and states an ORS initial capability be developed by 2010
  - 2006: Congress requests that DOD prepare a plan for ORS
  - April 2007: DOD delivers *Plan for Operationally Responsive Space*
  - May 2007: ORS Office stood up at Kirtland Air Force Base, NM
VMOC began as a platform to incubate, mature, and transition new and relevant technologies and concepts of operations relevant to tiered sensors and operationally responsive space.

VMOC is a pathfinder that explores, documents, and helps to articulate the needs of the community in the following areas:
- Technology (pathfind, mature, and transition enabling elements)
- Organization (experiment and document emerging CONOPS/TTPs)
- Policy (identification, application, and possibly modification of policies concerning ORS)

Specifically for ORS, VMOC is now transitioning to an operational role of tasking, managing and apportioning space vehicle sensors in support of actual operations.
VMOC Supports ORS CONOPS and Needs

• Tactical: Enable the Users
  – 1.A.(7) “…ORS capabilities will be net-centric and net-enabled”
  – 1.A.(8) “…information from and operations of ORS capabilities are generally expected to be classified at the collateral SECRET level…”
  – 4.A.1.(A) “… example of [new space capabilities] include dynamic ip-based tasking and data dissemination approaches which hold potential for enhancing the effectiveness of existing space system CONOPS.”
  – 4.A.(B).3 “[tier-2] on-orbit activities are characterized by rapid initialization and checkout, and real-time, dynamic internet protocol (ip)-based tasking and data flow focused on the user.

• Mission: Manage the Sensors
  – 4.C.(3).(C) “in the desired net-centric architecture, the requesting JFC will have direct tasking capability via the global information grid (GIG) and will receive satellite mission products directly via the GIG.”
  – 4.A.(2).(A).4 “A key enabler of tier-1 efforts will be the transformation to a data-centric/net-centric philosophy in which expanded data access and data movement will yield increased access to existing space products.”

• Apportionment: Establish the Rules
  – 4.C.(3).(C) “for ISR capabilities, JFCC ISR will coordinate user requests to ensure efficient allocation, collection, processing, [and] dissemination.”
VMOC Component Capabilities

- Tactical
  Enable Diverse Users

- Mission
  Manage the Sensors

- Apportionment
  Establish the Rules

Users

- Operational & Tactical Users
- Beginner to Advanced
- Wide Range of Equipment

- MOC/SOC Operators
- STRATCOM, JFCC Space, JSpOC
Mission Receives Rules from Apportionment, User Requests from Tactical, and Applies Modeled Sensor/Vehicle Engineering Constraints Automatically to Provide Schedules to MOC/SOC

Tactical: Enable Diverse Users
- Intuitive User Interface in Explorer to Task & View Resulting Schedules

Apportionment: Establish the Rules
- Apportion Assets with Automation & Visibility

Mission: Manage the Sensors
Featured Capabilities

• Web Based System
  – IE 6.0 Baseline
  – Flash Plug-In for Select Features
  – Low Foot Print at Organizations
  – Low Barrier of Entry

• Modular System
  – Modular Construction
    • Able to Change out Components as Technologies Change
  – APIs to External System Capable
    • Web Service Enabled

• Scalable Architecture
  – Not a point solution for one specific mission

• Multi-Mission Management
  – Effects based user tasking
  – Scalable to accommodate multiple assets
  – Automated processes

• Transparency in the Process
  – “Fed-Ex” style tracking of user tasks from request to data available
  – Prioritization Schema and Mission Schedule Visible

• Intuitive User Interface for Ease of Use
  – Supports beginner to expert users for access to space capabilities
  – Capable of Expanding User Base to Non Traditional Players

*Tasking here is referred to as a user request for satellite payload scheduling*
Operational Experimentation Overview

• Operational experimentation
  – A co-evolutionary process in which a new capability is developed and utilized in a realistic operational context so that the impact of the emerging capability on users can be evaluated and improved in a rapid manner

• Assessment in operational experimentation
  – A process by which the operational performance and effectiveness of a new and emerging capability is estimated and evaluated and needed modifications in the capability are identified
  – Provides rapid feedback to developers
  – Matures ORS capabilities (CONOPS, TTPs, technologies)

• User Support
  – Operational focus: CONOPS, TTP development
  – Training and user manuals
  – Socializing VMOC and ORS concepts and capabilities with user groups
    • Disadvantaged users
    • Non-space savvy users
VMOC Operational Experimentation Objectives

- Facilitate the development of ORS technologies, CONOPS and TTPs
- Evaluate the performance and value-added of VMOC as a maturing ORS capability
- Expand the ORS and VMOC community of users and create opportunities to expose new users to ORS concepts and assets
- Evaluate the performance and utility of VMOC tasking, apportionment and mission capabilities
- Evaluate the appropriateness, functionality and usability of the evolving VMOC 2015 Architecture
VMOC Operational Experimentation Constraints

• Focused on:
  – Evaluation of the operational utility of VMOC as a tactical space C2 capability supporting the development of ORS related tasking, CONOPS, policies and authorities – and tasking, processing, exploitation and dissemination (TPED) processes when appropriate

  – Selected evaluation of the operational utility of TacSats to warfighters

• Not intended to replace a formal joint military utility assessment (JMUA) or T&E of particular systems
  – OP EXP efforts augment formal JMUA of VMOC/TacSats

• The OP EXP assessment approach utilized is consistent with the DoD’s practical operating guidelines for evaluation of Joint Capability Technology Demonstrations (JCTD)
VMOC Experimentation Efforts

• Twelve operational experimentation events conducted to date
  – Across a variety of operational contexts: PACOM, USCG, STRATCOM, others
  – Focused on different functional areas: Tactical, Apportionment, and Mission

• Specific Events
  – TERMINAL FURY 05, 06, 07 (2005-2007)
  – Space Apportionment for Effect (2006)
  – Multi Use Ground Station (2006)
  – Cap Archer (2006)
  – Project Spotlight (2007)
  – Valiant Shield (2007)
  – Talisman Saber (2007)
  – VMOC Demonstration (2008)
  – TacSat-4 (2009-2010)
TacSat Experimentation

- ORS Office has identified seven enabling elements required in order to develop and mature responsive space capabilities.
- Development of each of the elements, in the pillars below, contributes to an end-to-end ORS architecture.
- Each TacSat experiment is designed to further the ORS effort and cumulatively will facilitate the development of ORS capabilities.
VMOC Support to TacSat-4 Experimentation

• TacSat-4:
  – Will provide military users with communications on the move (COTM), data from unmanned sensors (Data X-Filtration and Ocean Data Telemetry Microsatellite Link) and Friendly Force Tracking (FFT) support
  – Intended to enhance the ORS effort by developing and maturing relevant technologies, policies and objectives, CONOPS and TTPs

• VMOC:
  – Will provide tasking, apportionment and mission planning and scheduling capabilities to TacSat-4 users
  – Intended to enhance the ORS effort by maturing VMOC capabilities and providing ‘risk reduction’ for VMOC support to operations

• Operational Experimentation will evaluate
  – Operational utility of TacSat-4’s payloads
  – Impact of using VMOC to support TacSat-4 operations
  – Development of related tasking processes, CONOPS, policies and authorities
VMOC Support to Operations: ORS Sat-1

• First operational mission being conducted by the ORS Office

• Designed to meet critical quick-response intelligence, surveillance and reconnaissance (ISR) needs

• VMOC will interface with existing TPED systems in a timely process to meet user needs and successfully conduct the mission
VMOC Status

• Continuing ongoing research and development efforts
  – Recently merged disparate VMOC systems into one integrated system featuring three distinct components: tactical, mission and apportionment
  – Conducting operational evaluation in support of ORS objectives and other sponsor needs (such as ONR)

• Transitioning VMOC to operational system in support of ORS-1
  – Adhering to design requirements established for ORS-1
  – Participating in formal system review
    • Preliminary Design Review (March 2009)
    • Critical Design Review (June 2009)

• Beginning the transition path toward becoming a Program of Record (POR):
  – Discussions with Joint Space Operations Center (JSpOC) indicate interest in VMOC becoming a POR
VMOC Way Ahead (1)

• ORS 2015 Ground System Enterprise (GSE): Presents an integrated approach to ISR missions
To support the ORS 2015 GSE -

- VMOC is building a common mission planning, apportionment, and tasking interface
  - Interface is integrated with tasking tools currently used by Collection/Asset Managers and is being integrated into an overarching C2 TPED process

- The automated interface between the Tactical, Apportionment, and Mission VMOC components plays a key role in the GSE:
  - Allows scalable multi mission planning
  - Provides a “Fed-Ex” style tracking capability
Conclusion

• VMOC’s path to space operations has been a multi-year process
  – Emerged from a need to make space capabilities more accessible to users and to dynamically manage responsive space systems
  – Matured through user experimentation and demonstrations

• Currently expanding the ORS community of users and establishing ORS CONOPS and TTPs
  – Supporting TacSat-4 operational experimentation
  – With the launch of ORS Sat-1, VMOC will transition from experimentation status to a fully operational program

• VMOC is a key element of the ORS GSE and will provide a scalable, dynamic, and flexible set of services to support and further the ORS vision
Thank you!

Questions?