

SMC Detachment 12 - “The Dirty Dozen”

COBRA Architecture



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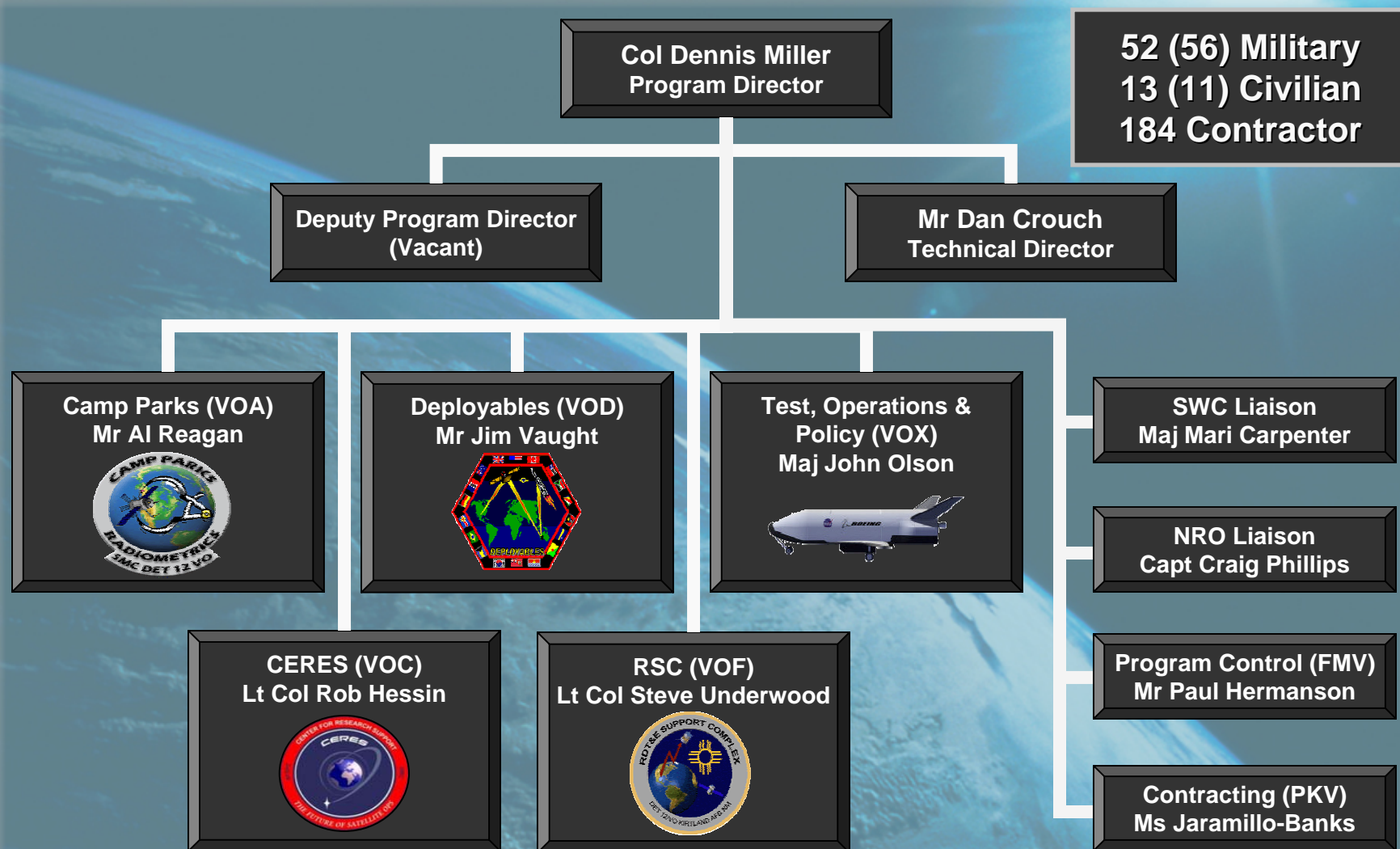


Overview

- ▶ RDSMO Overview
- ▶ COBRA Design Philosophy
- ▶ COBRA Architecture
- ▶ Lessons Learned
- ▶ Way ahead



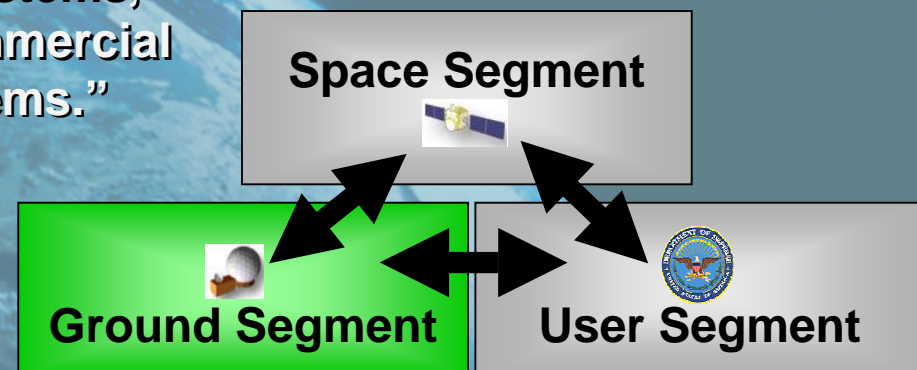
RDSMO Organization





RDSMO Vision

- ▶ Test and support space systems as a comprehensive RDT&E ground segment center of excellence
- ▶ Based on PMD [9267(9), 19 Sept 01]
 - ▶ “Act as the research, development, and test operations agent for assigned DoD experimental/demonstration satellites, missiles, and/or launch boosters, satellite ground control systems, tracking systems, and commercial applications of these systems.”



Become the “Edwards” of Space!

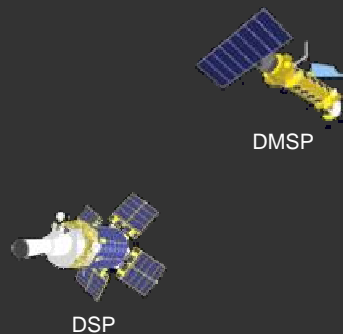


Center for Research Support



Space Operations Test Bed

- ▶ Rapid Capabilities of
 - ▶ Prototyping
 - ▶ Evaluation
 - ▶ Activation
- ▶ 24/7 Access to Ground/Space Assets
- ▶ Residual Satellite Operations





RDT&E Support Complex



Satellite Operations Center

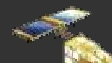
- ▶ **Manages and Supports RDT&E missions from inception through end of life**
- ▶ **Mission planning: orbit dynamics, scheduling, command generation**
- ▶ **Mission data archival & distribution**
- ▶ **Satellite TT&C**
 - ▶ Telemetry processing, analysis, display, trending



TEX



RADCAL



POAM III



TSX-5



Coriolis



MSTRS



XSS-10



CloudSat



STPSat 1



C/NOFS



X-37

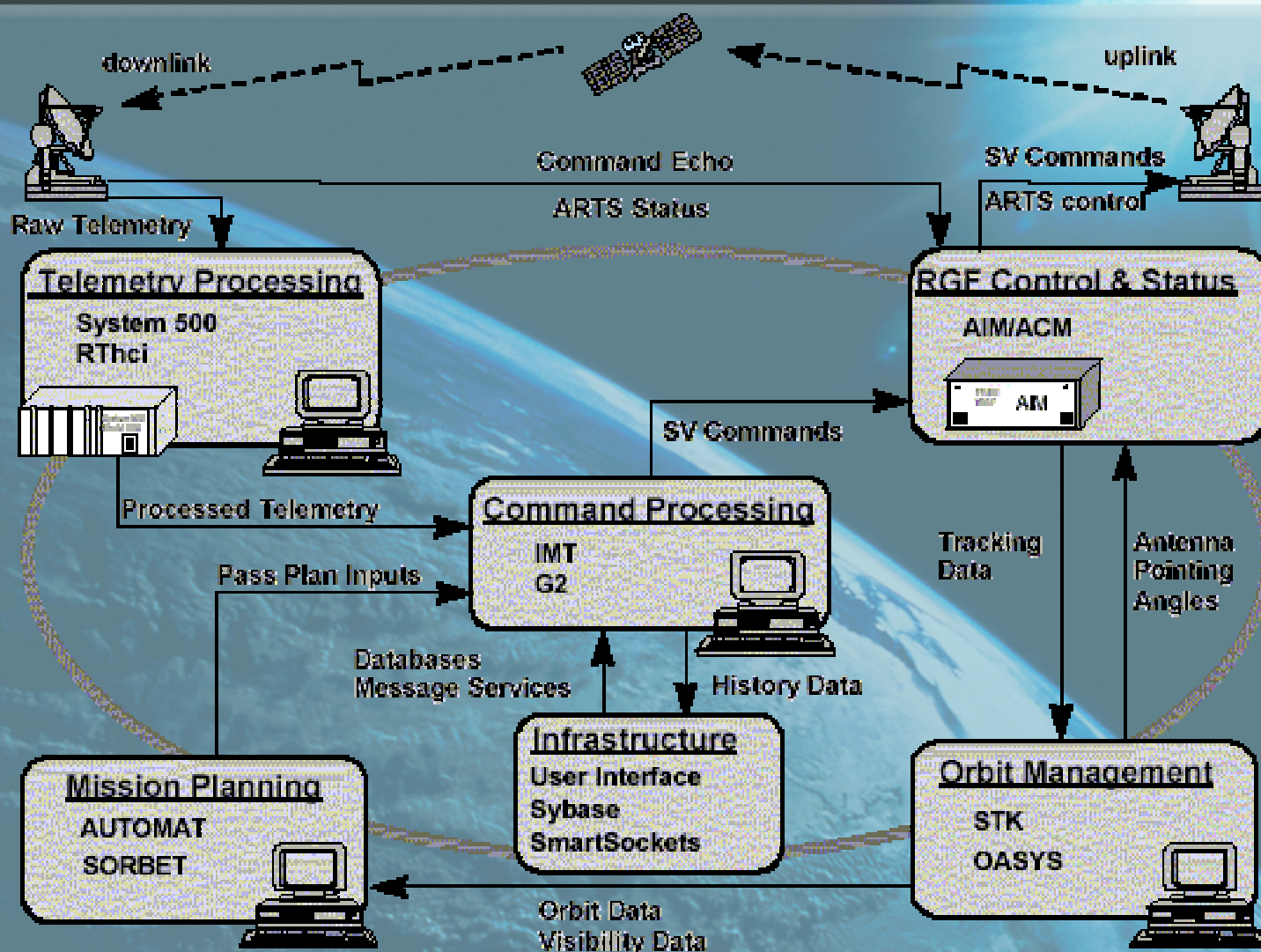


COBRA Design Philosophy

- ▶ Use COTS to minimize cost & maximize functionality
- ▶ Arranged into 'strings'
 - ▶▶ Each string contains necessary hardware/software to conduct a space vehicle contact
- ▶ Products picked based on 'best in class' approach
- ▶ Architectural decision based on system risk
 - ▶▶ String architecture ensured like systems were available for use if needed
- ▶ Payload Test Center
 - ▶▶ Displays same data as strings, but tailored to the experimenter's needs
 - ▶▶ Gives non-real-time systems a look into real-time data



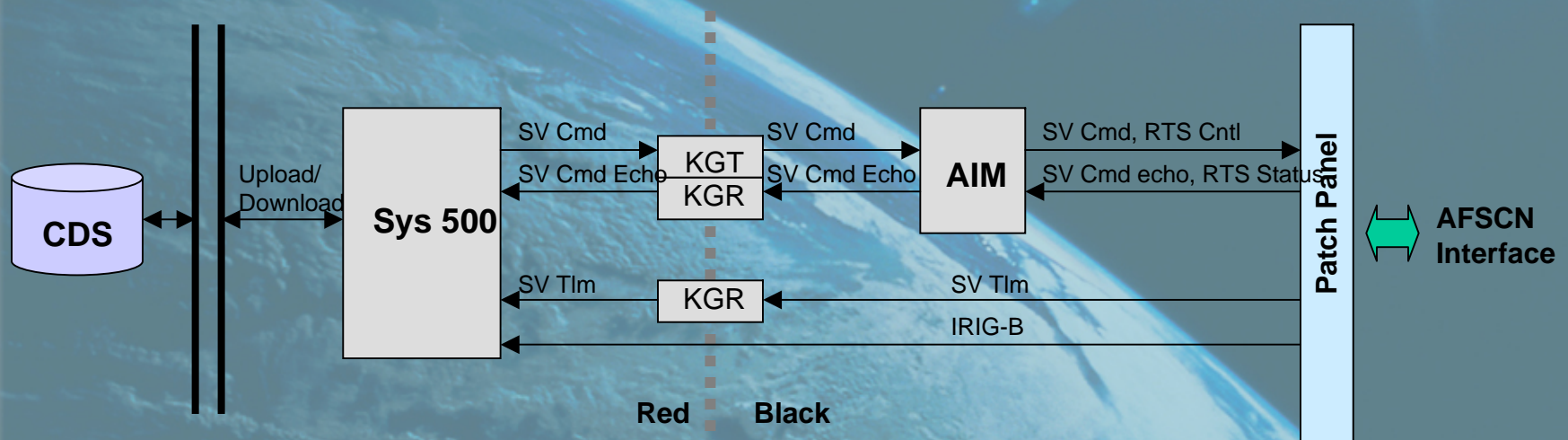
Functional Elements





String Architecture

RSC Operational String Simplified Block Diagram SV Commanding and Telemetry Interfaces





COBRA Evolution

- ▶ **SDLC**
 - ▶▶ Installed SDLC capable SIO cards
- ▶ **Increased throughput**
 - ▶▶ Installed more powerful FPP cards and increased memory
- ▶ **More intricate telemetry processing**
 - ▶▶ Integrated OS/COMET into existing COBRA architecture
 - ▶▶ Created a hybrid solution
- ▶ **Changed to KI-17 per NSA requirements**
 - ▶▶ Dropped in w/o incidents



COBRA to ITS

► Reasons

- New missions required greater capabilities (CCSDS)
- Previous system becoming unsupportable

► The transition

- Previous effort established a mid-point
- New missions being developed to new system
- Old missions will stay on COBRA until they die or can get transitioned to ITS
- Provides opportunities to do things better
- Eventually will be a “wholesale” change over



Lessons Learned

► Maintenance

- Basically the same system for 7 years
- Utilized Block upgrades for major system changes
- Upgrades limited based on hardware/software compatibility

► Extensibility

- Older products cannot be upgraded cost effectively in some situations (CCSDS)
- Best in class approach required “glue ware” to hook everything together
 - Put large burden on in house developers/maintainers
 - Industry standards may have made this easier



Way Ahead

- ▶ **Focus on industry standards**
 - ▶ Agreed upon interfaces allow for better product integration
 - ▶ Eases development/sustainment burden
- ▶ **Ensure we don't get stuck in compatibility vs. upgrade situation**
 - ▶ Recognize these early
 - ▶ Upgrade 'core' system regularly
 - ▶ Ensure products can work without version dependence on other products