Consolidated Space Operations Contract

Past, Present & Future

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Fourth International Symposium on
Reducing the Cost of Spacecraft
Ground Systems and Operations

The Johns Hopkins University/Applied Physics Lab

April 25, 2001
Agenda

- Brief History of the NASA Infrastructure
- Consolidated Space Operations Contract
- CSOC Goals
- Operations Performance
  -- Data Services
  -- Mission Services
- Key Features
- Future Strategy
- Questions & Answers
Brief History

• DoD/NASA built infrastructure
  – Successfully met critical requirements
  – Complex set of organizations, facilities, and contracts
  – Problems with duplication and functional overlaps
  – Budget pressure on NASA
• NASA discretely contracts with private industry
• Space Operations Management Office (SOMO) is formed
  – Manage the transition of space operations to private industry
  – Reduce ops costs to NASA
  – Restructure to customer/service provider model
Role of CSOC

- **SOMO creates CSOC**
  - NASA returns to basic charter of pursuing cutting-edge Research, Science and Technology

- **Role of CSOC**
  - Perform/manage NASA’s data collection, telemetry and communications operations that support Earth-orbiting satellites, planetary exploration, and human space flight activities.
    - Data acquisition from spacecraft
    - Data processing and storage
    - Ground and space communications
    - Mission planning and control center operations
  - Ground Network, Space Network, Wide Area Network, Deep Space Network (Goldstone)
The Contract

- NASA Prime Contract NAS 9-98100 awarded September 1998 to Lockheed Martin-led team
- $3B+ Over 10 Years
- Contract performance began January 1, 1999
  - Three Month Phase-in Period (Oct 1-Dec 31, 1998)
  - Basic Period 5 Years (Jan 1999-Dec 2003)
  - Option Period 5 Years (Jan 2004-Dec 2008)
- 40+ Contractors including Honeywell, CSC, Booz-Allen & Hamilton, GTE, and others
- 13 Locations Around the Globe
- Transition over time of ~19 legacy space ops contracts
- Aggressive Small Business goals; 26.1%
CONSOLIDATED SPACE OPERATIONS CONTRACT

Goals

- Provide excellent and reliable mission and data services at significantly reduced costs
- Develop joint commercialization initiatives with NASA to further offset the cost of space operations
- Reduce costs through standardization, automation, and streamlining the delivery of services
- Adopt and implement private sector commercial business practices and services
- Transition space operations services to commercial providers
CSOC Imperatives

- Personnel, equipment & mission safety
- Ops services with no increase in risk
- Reduced cost to NASA and the end Customer
- Substantial & meaningful small business content
- Assume performance responsibility via completion form contracting
- Commercialization to further reduce costs
- Government/contractor partnership to enhance NASA’s performance of its core mission – research and science
Data Services

- Ground Network
- Space Network
- Deep Space Network
- Wide Area Network

CONSOLIDATED SPACE OPERATIONS CONTRACT
Mission Services

- Goddard Space Flight Center, MD
- Wallops Flight Facility, VA
- Jet Propulsion Laboratory, CA
- Johnson Space Center, TX
- Marshall Space Flight Center, AL
- Kennedy Space Center, FL
CONSOLIDATED SPACE OPERATIONS CONTRACT

Locations

- Poker Flat Research Range
  Fairbanks, AK
- Goldstone Deep Space
  Communications Complex
  Barstow, CA
- Jet Propulsion Laboratory
  Pasadena, CA
- Guam Remote
  Ground Terminal
  Guam, Pacific Ocean
- White Sands Complex
  Las Cruces, NM
- South Pole
- McMuro
  Ground Station
  Antarctica
- Johnson Space Center
  Houston, TX
- Marshall Space Flight Center
  Huntsville, AL
- Bermuda Tracking Station
  Bermuda, Atlantic Ocean
- Goddard Space Flight Center
  Greenbelt, MD
- Kennedy Space Center
  Cape Canaveral, FL
- Merritt Island Launch Annex
  Merritt Island, FL
- Wallops Flight Facility
  Wallops Island, VA

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CSOC’s work content is fairly evenly distributed across mission and data services.

- LOE and development efforts are primarily requested and paid for by specific customers.
• Operations, maintenance and sustaining engineering staff make up 75% of CSOC’s employee base
  – LOE and development activities are staffed throughout the country in support of specific customer requirements
## Staffing Profile by Area

<table>
<thead>
<tr>
<th>Program Area/Factory</th>
<th>Location</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mission Services</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Space Science &amp; Earth Observation (SSEO)</td>
<td>GSFC</td>
<td>570</td>
</tr>
<tr>
<td>Space Science Exploration</td>
<td>JPL</td>
<td>40</td>
</tr>
<tr>
<td>Human Space Flight (HSF)</td>
<td>JSC</td>
<td>480</td>
</tr>
<tr>
<td>Payload Mission Services (PMS)</td>
<td>MSFC</td>
<td>30</td>
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<tr>
<td>Launch Services</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>Data Services</strong></td>
<td></td>
<td></td>
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<tr>
<td>Ground Network (GN)</td>
<td>WFF/MILA/Other</td>
<td>220</td>
</tr>
<tr>
<td>Space Network (SN)</td>
<td>WSC/GSFC</td>
<td>330</td>
</tr>
<tr>
<td>Deep Space Network (DSN)</td>
<td>JPL/GDSCC</td>
<td>370</td>
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<tr>
<td>Wide Area Network (WAN)</td>
<td>MSFC</td>
<td>115</td>
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<tr>
<td><strong>Support Services</strong></td>
<td></td>
<td></td>
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<tr>
<td>Logistics</td>
<td>All Locations</td>
<td>90</td>
</tr>
<tr>
<td>Documentation/Training</td>
<td>All Locations</td>
<td>100</td>
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<tr>
<td><strong>Development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mission Control Center Changes</td>
<td>JSC</td>
<td>85</td>
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<tr>
<td>Checkout Launch Control System (CLCS)</td>
<td>KSC</td>
<td>150</td>
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<tr>
<td>IOA Development &amp; Sys Engr</td>
<td>All Locations</td>
<td>90</td>
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<tr>
<td><strong>Other</strong></td>
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<td></td>
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<tr>
<td>Center Unique Services</td>
<td></td>
<td></td>
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<tr>
<td>SODAs (LOE)</td>
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<td></td>
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<tr>
<td>Program &amp; Business Management (PRGM)</td>
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<tr>
<td></td>
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<tr>
<td>Total</td>
<td></td>
<td>3,155</td>
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</table>

*1 Represents estimate of GFY02 staffing levels  
*2 Based on partial year; work transitions into CSOC late in GFY01
## CSOC Service Delivery Performance (Feb. 2001 = Typical)

<table>
<thead>
<tr>
<th>Factory</th>
<th>Metric</th>
<th>Measure</th>
<th>Requirement</th>
<th>February 2001 Benchmark</th>
<th>February 2001 Performance Analysis</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td>SOE <strong>1</strong> Level %</td>
<td>CE <strong>2</strong> Level %</td>
<td>Available Units</td>
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<tr>
<td>SSSEO</td>
<td>FOT Performance</td>
<td>Minutes Captured</td>
<td>99.00%</td>
<td>98.00%</td>
<td>139,376</td>
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<tr>
<td>SSSEO</td>
<td>Science Data Products</td>
<td>Products On Time</td>
<td>99.00%</td>
<td>98.00%</td>
<td>15,867</td>
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<tr>
<td>SSSEO</td>
<td>Flight Dynamics Accuracy</td>
<td>Acc. Prod. Delivered</td>
<td>99.50%</td>
<td>99.00%</td>
<td>37,588</td>
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<tr>
<td>SSE</td>
<td>Critical Minutes</td>
<td>Minutes Delivered</td>
<td>100.00%</td>
<td>100.00%</td>
<td>118</td>
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<tr>
<td>SSE</td>
<td>Non-Critical Minutes</td>
<td>Minutes Delivered</td>
<td>99.90%</td>
<td>98.00%</td>
<td>156,781</td>
</tr>
<tr>
<td>HSF</td>
<td>MCC Availability</td>
<td>Support Hours</td>
<td>98.00%</td>
<td>98.00%</td>
<td>1,751</td>
</tr>
<tr>
<td>HSF</td>
<td>IPS Availability</td>
<td>Support Hours</td>
<td>98.00%</td>
<td>98.00%</td>
<td>670</td>
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<tr>
<td>RMS</td>
<td>DRC Product Delivery</td>
<td>Products Delivered</td>
<td>95.00%</td>
<td>90.00%</td>
<td>64</td>
</tr>
<tr>
<td>GN</td>
<td>Availability</td>
<td>Minutes Delivered</td>
<td>99.50%</td>
<td>99.00%</td>
<td>107,589</td>
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<tr>
<td>SN</td>
<td>NW Operations Proficiency</td>
<td>Minutes Delivered</td>
<td>99.95%</td>
<td>99.50%</td>
<td>428,355</td>
</tr>
<tr>
<td>DSN</td>
<td>Radiometric Data Availability</td>
<td>Hours Delivered</td>
<td>98.50%</td>
<td>97.00%</td>
<td>4,431</td>
</tr>
<tr>
<td>DSN</td>
<td>Telemetry Data Availability</td>
<td>Hours Delivered</td>
<td>99.00%</td>
<td>97.60%</td>
<td>4,407</td>
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<tr>
<td>DSN</td>
<td>VLBI Delivery</td>
<td>Hours Delivered</td>
<td>95.00%</td>
<td>92.00%</td>
<td>253</td>
</tr>
<tr>
<td>DSN</td>
<td>Perf. Monitoring Availability</td>
<td>Hours Delivered</td>
<td>98.00%</td>
<td>94.00%</td>
<td>4,627</td>
</tr>
</tbody>
</table>

**1** SOE = Standard of Excellence  
**2** CE = Contractual Expectation  
**3** Percentage changes for elements with no actual loss have been calculated assuming a loss of one (1)
Lockheed Martin Investment Profile

- Lockheed Martin’s investment in CSOC is evident in several areas
  - Development of a systems design and testing laboratory
  - Acquisition and engineering of equipment necessary to support commercialization initiatives
  - Capitalizing Non-Maintainable Equipment (NME) requiring replacement
Commercialization & Privatization

• CSOC has several initiatives underway to achieve cost savings through the commercialization and privatization of NASA’s space operations infrastructure
  – On the “Buy” side, CSOC is establishing commercial relationships with data service providers with the following benefits:
    - Reduce recurring operations cost
    - Avoid the high cost of system and equipment replacement
  – CSOC is currently developing plans to privatize NASA’s Ground Network, fully moving responsibility and accountability to industry
  – On the “Sell” side, CSOC is marketing potential customers for sale of available capacity on existing NASA assets
    - Cost offsets related to such sales will accrue directly to the program and NASA through reduced cost vouchers and NF533 financial reports

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CSOC’s objective is to meet all ground network data service requirements on a pay-as-you-go basis, rather than operating and maintaining an aging collection of government-owned assets.

- ~$15M in annual savings and avoided cost can be realized through privatization and closing down existing assets.
- CSOC has already put in place numerous ID-IQ subcontracts designed to purchase services when needed.
- CSOC proposes to effect the following additional activities by GFY03:
  - Svalbard consolidation and privatization
  - MILA/PDL Antenna commercial replacement
  - Polar Ground Network consolidation and privatization
  - Wallops LEO-T, TOTS, AWOTS offloading and antenna closure/privatization
  - Southern hemisphere coverage acquisition
• CSOC’s proposed Ground Network commercialization and privatization plan results in a 90% commercial operations base by GFY03
• CSOC has executed a contract with Space Data, Inc. to sell available Space Network capacity in support of SDI’s SeismicStar venture
  – SeismicStar allows for the transfer of seismic and other geological data from research ships to home office analysis centers using NASA’s TDRSS satellite constellation
  – Lockheed Martin is investing capital and development labor in an electronic interface switch to ensure the Government’s data security interests are served
  – Cost offsets through shared revenue will begin to accrue to the Government at the beginning of GFY02
  – SDI has completed its demonstration and test phase and forecasts outfitting an additional ship with SeismicStar capability each quarter

• CSOC is pursuing other commercialization opportunities with broadband communication carriers and other broadcasting entities
**SN Cost Offsets**

- NASA cost offsets related to the sale of available capacity could be significant, covering upwards of 25% of the SN’s recurring operating cost.

Potential SN Cost Offsets

![Graph showing annual and cumulative cost offsets over multiple fiscal years.](graph.png)
The bottom line conceptual objective of CSOC was to save cost

- NASA has realized $65M to date in savings through CSOC, $10M more than originally planned according to Government estimates.
- CSOC’s cost savings profile is significantly steep in the near future and is achievable only if CSOC/NASA collectively address important issues.
Key Accomplishments to Date

- Consolidated 14 heritage contracts into CSOC with outstanding Operational Performance
- Saved $65M in the first 2 years of performance
- Certified CSOC processes as ISO 9001 compliant within first 18 months of operation
- Supported all Shuttle Communications Operations
- Provide Flight Operations, Data Services and Mission Services for over 18 Robotic Space Projects
- Diversified staff—40 subcontractors with ~25% of total budget supported by SB/SDB/WOSB teammates
- Developed/evolved the first commercial catalog for pricing standard and unique space services

CSOC a NASA/Industry Success

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But, the Natives are Restless

- Cultural change continues to be a challenge
- NASA budget shortfalls
- Customers want the best possible service
- CSOC cost performance becomes more progressively challenging each year
- Completion form contracting acceptance is lagging
- Full cost accounting is partially implemented but not consistently supported with internal NASA budgeting
CSOC’s Responses – the Future Strategy

- Safe operations
- Continue levels of ops performance
- Improve Customer interface/responsiveness
- Continue to see additional cost savings
- Implement commercialization as much as possible to further reduce ops costs
- Maintain/improve the ops infrastructure
- Grow “available capacity” revenue stream back to NASA
- Focus on the Centers yet meet NASA-wide goals
New Organization Features
Center-based RAA

Administrative and Business
- Business/Financial
- Safety/QA/ISO
- Small Business Liaison
- Commercialization
- Information Systems
- Human Resources
- Program Integration
- Technical Support
- Communication
- Organizational Development

Program Support
- Engineering & Integration
- Operations Integration

GSFC
- Phil Johnson

JPL
- Ike Gillam

KSC
- Tom Bond (Acting)

JSC
- Dan Brandenstein

MSFC
- Mike Mink (Acting)

CSOC Program Mgr
- Doug Tighe

Deputy Program Mgr
- Johnny Parker

Johnny Parker
- Deputy Program Mgr

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