

**National Oceanic and Atmospheric Administration (NOAA)**  
**National Environmental Satellite, Data, and Information Service (NESDIS)**  
**Office of Satellite Operations (OSO)**  
**Satellite Operations Control Center/Command and Data Acquisition Stations (SOCC/CDAS)**  
**006-48-01-12-01-3206-00-108-023**  
**Operational Analysis**  
**FY 2009**

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## Executive Summary

The Satellite Operations Control Center/Command and Data Acquisition Stations (SOCC/CDAS) program encompasses all operations and maintenance conducted by the Office of Satellite Operations (OSO). SOCC/CDAS provides uninterrupted availability of critical information and supports NOAA's critical National support functions that are not available commercially, such as real-time hurricane support. The function of the SOCC/CDAS is to command and control NOAA, as well as non-NOAA, environmental satellites, track the health and safety of the satellites; acquire and process all data delivered from the satellites; and pass these data to other Offices within NESDIS, primarily Office of Satellite Data Processing and Distribution (OSDPD). The SOCC/CDAS provides the vital link between the satellites and every data user.

The SOCC/CDAS Operational Analysis (OA) supports the 24x7 operations conducted at the Wallops Island, Virginia Command and Data Acquisition Station (WCDAS) [www.cda.noaa.gov](http://www.cda.noaa.gov), the Fairbanks, Alaska Command and Data Acquisition Station (FCDA) [www.fcdas.noaa.gov](http://www.fcdas.noaa.gov), and the Satellite Operations Control Center (SOCC), and OSO Headquarters at the NOAA Satellite Operations facility (NSOF) in Suitland, Maryland [www.oso.noaa.gov](http://www.oso.noaa.gov). These operations primarily support the Geostationary Operational Environmental Satellites (GOES), Polar-orbiting Operational Environmental Satellites (POES) Ground Systems, and the Defense Meteorological Satellite Program (DMSP).

The SOCC-CDAS major achievements during FY09 were:

- Jason-2 operations handover from the French space agency CNES to NOAA on October 29, 2008. Successful transition to Jason-2 high security strings in March 2009. Jason-2 is operational and performing well. NESDIS OSD and OSO are performing acceptance testing on Jason-2 prior to formal handover to OSO scheduled for November 2009.
- Successful launch of POES-N prime (now known as NOAA-19) on February 6, 2009 and NASA handover to NOAA NESDIS OSO on February 26, 2009. NOAA-19 is now the primary operational satellite in the PM orbit.
- Successful launch of GOES-O (now known as GOES-14) on June 27, 2009, followed by successful Launch and Orbit Raising (LOR) activities and Post Launch Testing (PLT) in summer 2009. GOES-14 is currently in PLT until December 15, 2009.
- Ground System Readiness tests were successfully completed in preparation for the DMSP F18 launch scheduled for October 2009.
- OSO SOCC-CDA Engineering and Mission Operations Support Services (EMOSS) II contract was recompleted and the EMOSS III contract was awarded in July 2009.
- Fairbanks Satellite Operations Facility (FSOF) contract was awarded in May 2009 and work has begun. The steel frame and roof trusses were installed in September 2009.
- Preparing for launches of DMSPF18 in October 2009 and GOES-P launch in March 2010.
- A SOCC-CDA Dual Factor Authentication Study Team was established and they are actively coordinating with the NESDIS Information Resources Management Team (IRMT).
- Full DCS capabilities including the database and the web interface included in DADDS, installed, and tested.
- The performance thresholds for data quality/timeliness, total data recovered, and data transmission rate were met or exceeded every month in FY2009
- In FY09 C&A certifications were completed for Jason-2 and WCDAS Administrative LAN.

This report focuses on the operational state of the program as of September 30, 2009, and is based on guidance developed by the Department of Commerce. The SOCC-CDAS program directly facilitates NOAA's Strategic Goal to "serve society's needs for weather and water information". The current program meets established cost, schedule and performance parameters. This OA is an annual, in-depth review of the program's performance based on customer results, strategic and business results, financial performance, and innovation.

# 1.0 Customer Results

The SOCC/CDAS program primarily serves internal NESDIS customers, i.e. the Environmental Satellite Processing Center (ESPC) within the Office of Satellite Data Processing and Distribution (OSDPD). The data provided by SOCC/CDAS to ESPC is used to generate products which impact all economic sectors of the nation. The impact of these data and products are documented in the Economic Statistics for NOAA. The current edition of Economic Statistics for NOAA, 6<sup>th</sup> Edition, April 2008 is produced by the Office of the NOAA Chief Economist – Program, Planning, and Integration (PPI) and is available at <http://www.economics.noaa.gov> or [http://www.ppi.noaa.gov/PPI\\_Capabilities/Documents/2008\\_06\\_04\\_EconStatsFinal.pdf](http://www.ppi.noaa.gov/PPI_Capabilities/Documents/2008_06_04_EconStatsFinal.pdf)

## 1.1 Customer Requirements and Costs

The SOCC/CDAS program is fully meeting the customers’ needs/requirements and is delivering the data and services as outlined in the NOAA and NESDIS operational plans. The cost to the customer remains stable with only an inflation factor increase as seen in the IT Dashboard Summary of Spending Table for FY04 through FY10. There are annual measured improvements in SOCC-CDA capabilities and performance.

## 1.2 Performance Measures

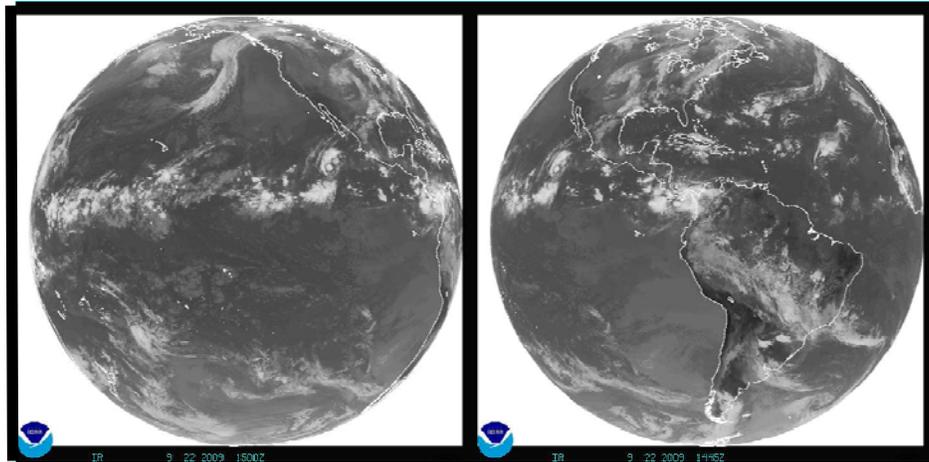
System performance is constantly monitored and the results are summarized daily and monthly. There are two performance measures which specifically address the customer results for the SOCC/CDAS internal customers. The FY09 performance levels are shown in Table 1.

**Table 1 Customer Results Performance Measures**

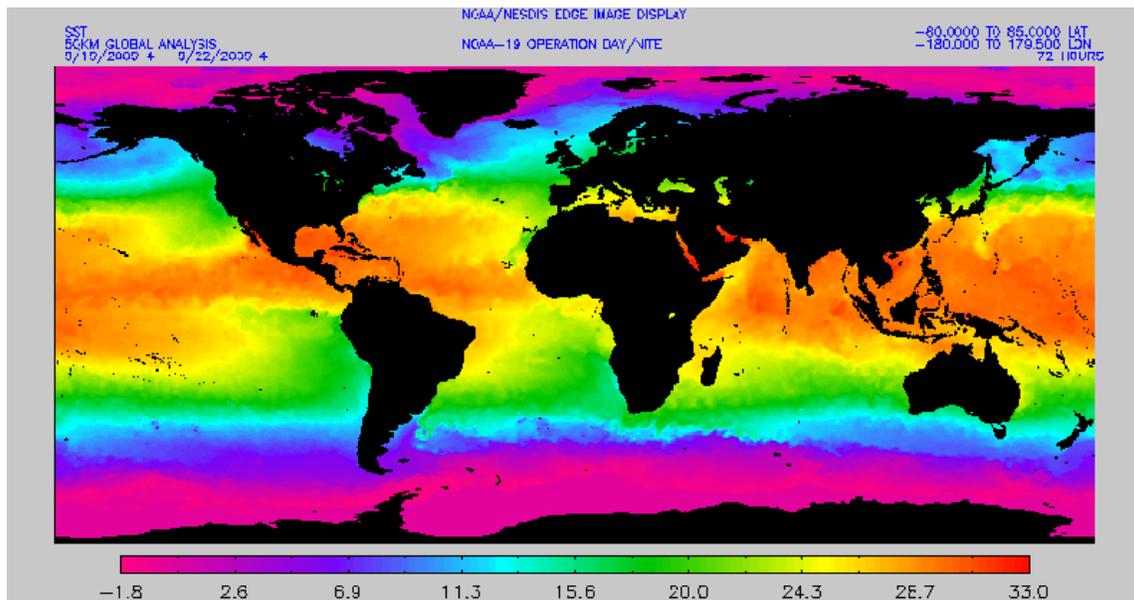
Measurement Area	Indicator	FY 09 Baseline	FY09 Actual Result	Comments
Customer Results	Percent of data meeting quality requirements	97%	99.89%	+2.89% over baseline as of September 30, 2009
Processes and Activities	Percent of data meeting timeliness requirements	98%	99.8%	+ 1.8% over baseline as of September 30, 2009

Sources: IT Dashboard version of the SOCC-CDA Exhibit 300 dated October 17, 2009, Section I.D Performance Information, the Federal Enterprise Architecture (FEA) Performance Reference Model (PRM) table and OSO FY2009 September Monthly Review briefing, dated 10/20/09, see OSO ORF Activities page 9.

Figures 1 and 2 illustrate sample products created by users of data from the geostationary and polar environmental satellites



**Figure 1 GOES West and East Full Disk Images**



**Figure 2 Global Sea Surface Temperature Map Created from NOAA-19 Polar Satellite Data**

## **2.0 Strategic and Business Results**

The SOCC/CDAS program is meeting its own goals and objectives and is contributing to NESDIS accomplishments. Program management and controls are in place to ensure that the program continues to meet its goals and objectives and to monitor how well the SOCC/CDAS program performs. Kathy Kelly, the Director of OSO, briefs NESDIS monthly on SOCC-CDA accomplishments, issues, and cost, schedule, and performance metrics. The OSO monthly reviews for FY09 were a data source for this report.

### **2.1 SOCC/CDAS Helps to Achieve Strategic Goals**

The SOCC/CDAS program directly supports the NOAA Strategic IT Plan for FY2008-FY2015 including the plan to invest in IT to deliver the products and services of the Weather and Water Mission Goals and to invest in IT to deliver the products and services of the Satellite Services Mission Goals. NOAA's Next Generation Strategic Plan Talking Points (August 2009) section on NOAA's Core Competencies and Strategic Priorities lists improve high impact weather and water forecasts as the first of the NOAA core competencies and sustain satellite-based earth observations is listed as a strategic priority for NOAA. Today there are significant demands on all of NOAA's programs to provide information to the Nation and the World community on the health of the environment in real-time. SOCC/CDAS provides 24x7 support for each NOAA geostationary and polar orbiting environmental spacecraft and actively prepares for and participates in new spacecraft launch operations. SOCC/CDAS supports the receipt and processing of the data which is required to meet the NOAA mission strategy of Monitor and Observe. In addition, the SOCC/CDAS supports the Department of Commerce (DOC) Goal #3 to Observe, Protect, and Manage the Earth's Resources to Promote Environmental Stewardship.

### **2.2 Business Results**

#### **2.2.1 Program Management and Controls**

The SOCC/CDAS program is managed by the Office of Management and Budget (OMB), DOC, and NOAA guidelines and policies. Oversight is provided by NESDIS, including the NESDIS Information Resources Team (IRMT) (formerly the Information Technology Architecture Team (ITAT)), and the NESDIS Chief Information Officer (CIO).

OSO performs extensive, continuous OA on the performance of its SOCC/CDAS operational components. This ensures system resources and ancillary supporting infrastructure (security, training, facilities, etc.) as well as labor resources remain optimally functional and configured to suit the NESDIS/NOAA's goals. OSO's OA covers a hybrid of system and non-system components.

OSO conducts an objective measurement of resource and performance metrics of the SOCC/CDAS elements on a periodic basis, such as those included in Table 1 and Table 2 of this report, to ensure that operations are meeting all business and customer requirements. For all IT components, performance thresholds have been established and performance is measured continuously through mainly automated process, supplemented by a manual process when required. Performance data is gathered at the OSO functional level and reported to OSO management on a weekly basis. OSO Management reports to NESDIS senior management on a monthly basis. The OSO organization maintains sufficient resources to maintain performance at the required levels. Hardware issues are referred to the maintenance contractor for remediation; and software problems are referred to the in-house software maintenance group for resolution. Key performance issues and risks are identified through these weekly and monthly reviews and are tracked by OSO management.

Because the SOCC/CDAS operational environment includes a large IT component, OSO must keep abreast of changes in technology that would impact operations. Often, this is done in conjunction with the Office of Systems Development (OSD), which performs system development and identifies new technologies on behalf of OSO. Technical updates provide viable alternatives for improving systems and processes within OSO but may pose risks such as system incompatibility to current operations. Changes in available technology are analyzed by OSD and recommendations and implementation are coordinated with OSO.

### **2.2.2 Monitoring Cost, Schedule and Performance**

Cost – OSO conducts a variety of budget analyses throughout the fiscal year. Obligations and expenditures are tracked on a weekly basis. Labor costs and full time equivalent usage are tracked on a bi-weekly basis. Variances to budget plans are analyzed monthly and reported to OSO Management as well as NESDIS management. A Needs Analysis is conducted annually in conjunction with the Planning, Programming, Budgeting and Execution System (PPBES) and Ground System processes. Key budget issues and risks are identified through these reviews and tracked by OSO management.

Schedule – The matrix annual operating plan is used to track key milestones. The final matrix annual operating plan for the current fiscal year is finalized when FY's appropriations are received. Monthly staff meetings allow the program manager to track progress towards key milestones and other operational aspects of the program (e.g., IT security compliance, data availability, etc.).

Performance – Contract performance is monitored to support both budget and performance measurements. Although the majority of OSO operations are conducted utilizing government FTEs, contractors are utilized to support operations at the Fairbanks CDAS and also provide support to OSO software maintenance and engineering. For these contracts, OSO receives monthly status reports and meets at least quarterly with contract managers to review performance, priorities, lessons learned, and work plan. A more formal review is held at the end of each contract year to assess the performance, come to agreement on ways to maximize the efficiency and productivity, and decide on potential corrective actions and milestones. Hardware maintenance contracts are reviewed on a semi-annual basis for technology advances impacting system maintainability, reliability, and interoperability.

All of these elements are provided to NESDIS senior management in monthly and quarterly quad charts that summarize cost, schedule, and performance.

### **2.3 Reviews**

As part of the NOAA program structure, the SOCC/CDAS program is reviewed continuously throughout the year. Each data center and program manager is responsible for monitoring their individual monthly spending and reporting to NESDIS Headquarters Financial Officer. Any unacceptable deviations should be reported, along with explanations and a correction plan.

### **2.4 Security**

SOCC/CDAS systems have been through a Certification and Accreditation (C&A) Process and have been granted Full Authority to Operate (ATO). All SOCC/CDAS systems have approved System Security Plans, Risk Assessments, and Contingency Plans in place. Management, operational, and technical security controls are in place to ensure the confidentiality, integrity, and availability of information. In FY09 C&A certifications were completed for Jason-2 and WCDAS Administrative LAN. Systems scheduled for C&A certification in FY10 are POES, Data Collection System (DCS), SRAS, Satellite Antenna System (SAS), and COSMIC.

## 2.5 Performance Measures

Table 2 shows the SOCC/CDAS Strategic and Business performance for FY09.

**Table 2 Strategic and Business Performance Measures**

<b>Measurement Area</b>	<b>Indicator</b>	<b>FY09 Baseline</b>	<b>FY09 Actual Result</b>	<b>Comments</b>
<b><u>Mission and Business Results</u></b>	<b>Recovery rate = Data sets that were recovered and sent to users as a % of total data sets scheduled to be available during spacecraft availability time in routine operations.</b>	<b>98%</b>	<b>99%</b>	<b>+ 1% over baseline</b>
<b><u>Technology</u></b>	<b>Percent availability of critical information.</b>	<b>100%</b>	<b>100%</b>	<b>Meets performance criteria of 100% availability of critical information.</b>

Sources: IT Dashboard version of the SOCC-CDA Exhibit 300 dated October 17, 2009, Section I.D Performance Information, the Federal Enterprise Architecture (FEA) Performance Reference Model (PRM) table and OSO FY2009 September Monthly Review briefing, dated 10/20/09, see OSO ORF Activities page 9.

## 2.6 Other Alternatives.

Currently, there are no other organizations capable of doing this work better, more efficiently, or at lower cost. Cost estimates and C-Requests are monitored, reviewed, and approved by the program manager. Details can be found in the SOCC/CDAS OMB Exhibit 300. A formal alternatives analysis is not required in the OMB 300s for an O&M system.

## 3.0 Financial Performance

### 3.1 Current Performance vs. Baseline

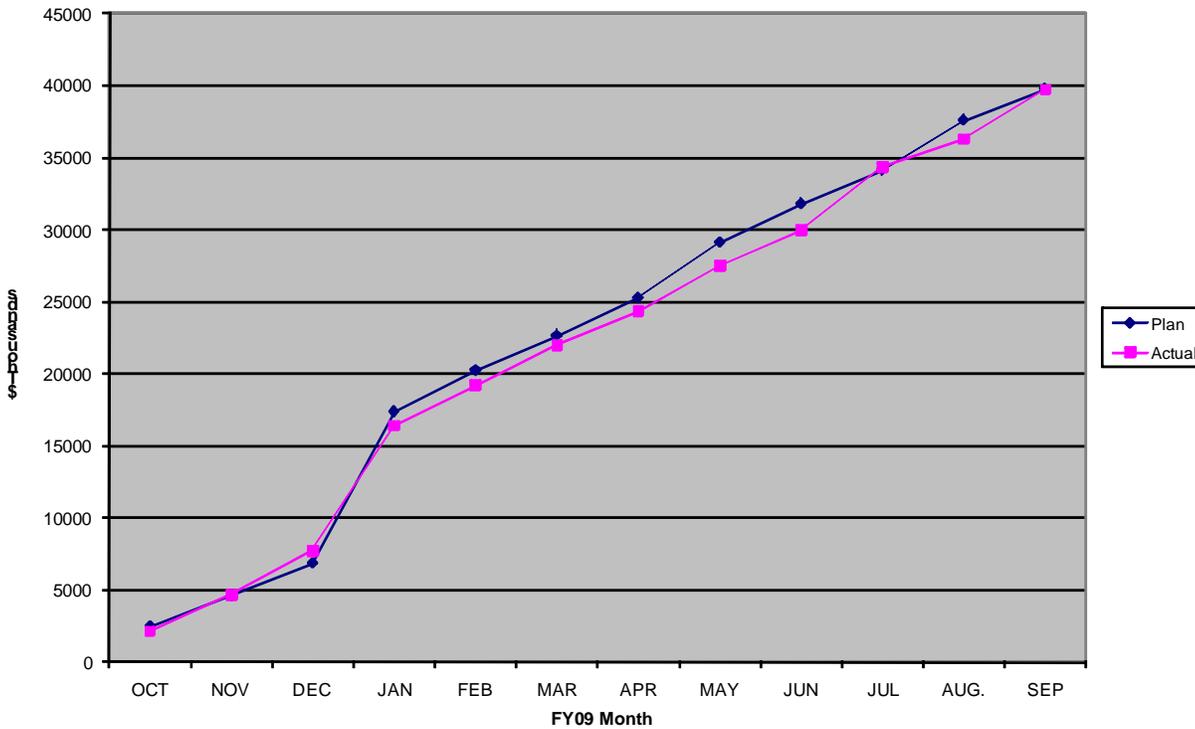
The current SOCC/CDAS financial performance, shown below, compares actual cost of the program compared to a pre-established cost baseline (i.e., annual spend plan). Financial performance information is provided for FY2009.

The SOCC/CDAS program planned costs vs. actual costs are shown in Figure 3. Program costs consist of contract staff dedicated to SOCC/CDAS activities and funds to support relevant sub-systems and archive/access systems and SOCC/CDAS infrastructure components such as both internal and external communications.

The dollars on the Y-axis are in thousands. The financial operational analysis includes only Steady State IT dollars for fiscal year 2009. The total OSO SOCC-CDA Steady State IT planned expenditures for FY2009 were \$39,742K in the OSO plan versus \$37,938K in the OMB Exhibit 300 Summary of Spending Total including est. FTE costs. Actual FY2009 OSO ORF expenditures were \$39,722K; see OSO FY2009 September Monthly Review, page 9 Budget/Funding table.

SOCC/CDAS is a steady state, operations and maintenance system. Government FTE labor costs are over 60% of total annual costs. Because the OMB Exhibit 300 estimated Government FTE labor costs are estimated by the OMB eCPIC software based on the estimated number of FTEs in 5 functional areas not job categories and GS-levels, they will not exactly match the OSO SOCC/CDA planned costs that are based on SOCC-CDAS historical actual costs and existing contracts. The SOCC-CDA planned and actual costs are based on the actual labor categories used, existing contract costs, and adjustments for the 24x7 shift work and the three geographical areas; Suitland, MD, Wallops Island, VA, and Fairbanks, Alaska. Thus, the SOCC-CDA planned and actual FTE costs will differ from the FTE cost estimate in the OMB 300.

**FY09 SOCC-CDA Cumulative Monthly IT Steady State Funds including FTEs**



Source: Office of Satellite Operations ORF Budget/Funding table, September 2009.

**Figure 3: SOCC-CDA FY09 Cumulative Monthly Planned and Actual Steady State Funds including FTEs**

**3.2 Performance Measures**

The current SOCC/CDAS financial performance is based on a pre-established cost baseline (e.g., annual spend plan). Program costs consist of labor and benefits for full time permanent staff dedicated to OSO, travel, communications, supplies and equipment, contracts, and corporate overhead. During FY2009 the SOCC/CDAS program consistently stayed within a ten percent variance.

**3.3 Cost Benefit Analysis**

SOCC/CDAS operate and maintain the IT hardware and software, antennas, and telecommunications systems that are used to navigate and calibrate spacecraft instrument data, and to collect the environmental data that is delivered to the Environmental Satellite Processing Center (ESPC) for further processing. The ESPC uses the data to generate products which impact all economic sectors of the nation. The economic analysis and impacts of the availability of environmental satellites data and products are documented in Economic Statistics for NOAA 6<sup>th</sup> Edition, April 2008 produced by the Office of the NOAA Chief Economist – Program Planning and Integration and available at

<http://www.economics.noaa.gov> or  
[http://www.ppi.noaa.gov/PPI\\_Capabilities/Documents/2008\\_06\\_04\\_EconStatsFinal.pdf](http://www.ppi.noaa.gov/PPI_Capabilities/Documents/2008_06_04_EconStatsFinal.pdf)

### **3.4 Financial Performance Review**

Financial performance is typically subjected to a periodic review for reasonableness and cost efficiency. Monthly budget reviews are held with the program manager, contracting officer technical representatives (COTR) and contract managers to ensure contracts are within cost and on schedule. Monthly reports from contractors are required to ensure the Government has the information it needs to evaluate cost performance. A detailed review of work and priorities is undertaken if cost is significantly above base lined values. Also, any necessary corrective actions are also identified and implemented.

## 4.0 Innovation to Meet Future Customer Needs

### 4.1 Number and Types of Users

SOCC-CDAS primary user is the NOAA NESDIS OSO Environmental Satellite Processing Center (ESPC) which produces products for a variety of users including the National Weather Service, university climate research projects, commercial navigation services, and other government agencies including the Department of Agriculture, the Federal Emergency Management Agency, and the Environmental Protection Agency.

### 4.2 Improving Technology and Meeting User Needs

The following projects/initiatives have been implemented in FY2009, or were identified and initial planning to implement in the future has begun, to address future challenges, better meet customer needs, make better use of technology, and lower operating costs. Many of the 2009 activities included planning for future projects which will help to better meet customer needs while also resulting in lower operating costs and providing a project management approach to IT Security.

#### 4.2.1 Better Use of Technology

The SOCC/CDAS office performed an analysis to identify opportunities to better utilize technology to meet operational requirements as well as emerging IT Security mandates. As a result of this planning activity, the following projects were identified.

##### Enterprise backup solution:

Identification of, and planning for, an Enterprise backup solution continues. FIPS-200 and NIST 800-53 requires that all mission critical systems have some form of backup and disaster recover system. Currently OSO uses nine different software products to backup the current OSO enterprise and there are seven different individuals trained to perform these backups. An Enterprise backup solution consists of a software agent that is robust enough to allow for multiple operating systems management, as well as, a centralized data storage device that will allow for the safe and reliable storage of the data. In addition, it will reduce the labor cost to four staff members and allow for greater flexibility in exercising all aspects of the backup and restoration process.

##### Maximizing the Capabilities of Newly Launched Environmental Satellites:

In FY09, both GOES-14 and NOAA-19 were successfully launched. NOAA-19 was successfully transitioned to become the primary polar satellite in the PM orbit. This maximizes use of the most current technology. GOES-11 and GOES-13 east-west maneuvers were successfully tested in the first quarter of FY09. During FY09 SOCC-CDA has developed a plan for major changes to the configuration of GOES operational satellites in order to maximize data production. These changes to be implemented in FY10 include deorbiting GOES-10, using GOES-12 for South America coverage, and activating GOES-13 as the GOES-East replacement.

##### FCDAS:

Improvements in satellite operations technology are included in the new Fairbanks Satellite Operations Facility (FSOF) that is currently being constructed.

##### WCDAS:

The WCDAS Administrative LAN received C&A certification in FY09.

##### Commonly Shared Dual Factor Authentication Method:

Dual factor authentication is the combination of a user selected password or user name, and a password generated by a specific device such as an USB flash drive or Smart Card mobile card. OSO was informed by the CIO's office that

dual factor authentication will be required for all newly certified systems, and retro fitting of older certified systems is a requirement that is in the near future. Taking into account OSO current enterprise solution, a streamlined architecture can be developed that would allow for a commonly shared dual factor authentication method, sharing several mission needs to one common system. In FY09 a SOCC-CDA Dual Factor Authentication Study Team was established and they are actively coordinating with the NESDIS Information Resources Management Team (IRMT).

#### DCS and DADDS:

The DCS (Data Collection System) and its subsystem DCS Alternate Data Distribution System (DADDS) is a replacement of the existing DCS Automated Processor System (DAPS). This system receives and processes data messages sent from remote environmental sensors transmitted through the GOES satellites. This system processes over 300,000 messages a day and is vital to the DCS user community. The existing DAPS is antiquated and needs a suitable backup. The DADDS receives and distributes data to the following existing interfaces: Domestic Satellite (DOMSAT), National Weather Service Telecommunications Gateway (NWSSTG) and the Local Readout Ground System (LRGS). The DADDS will provide a Graphical User Interface (GUI) for operator monitor and control along with the tools to troubleshoot and validate performance.

FY09 DCS activities include:

- DADDS and DAPS were running in parallel operations in early FY09.
- Full DCS capabilities including the database and the web interface were included in DADDS, installed, and tested.

FY10 DCS activities include:

- The parallel operations of DADDS and DAPS were discontinued and the turnover to the new DCS system is planned to be completed in early FY10.
- DCS' Authority to Operate (ATO) is planned for July 2010.

#### **4.2.2 Meeting Customer Needs.**

##### Alaska Region Collaboration – NOAA OSO Prompt Response to Volcanic Activity

In response to a USGS request for an early start date due to Mt. Redoubt volcanic activity, the Landsat-5 Alaska summer imaging campaign began in March 2009 with two supports per day.

##### FCDAS and WCDAS Stations supporting FORMOSAT-3/COSMIC missions:

Commencing in April 2008, the Fairbanks and Wallops CDA Stations provide Telemetry, Command and Stored mission data recovery for the FORMOSAT-3/Constellation Observing System for Meteorology, Ionosphere and Climate (COSMIC) mission. This research mission is a joint United States and Taiwan venture whose goal is to gain inexpensive profiles of temperature and moisture across the globe by intercepting GPS signals using a constellation of satellite-based receivers. The COSMIC space segment consists of six satellites. Each satellite contains three instruments; the primary instrument is an advanced GPS receiver, which can autonomously track all GPS satellites in view simultaneously. The GPS receiver reports phase changes within the frequencies of the carrier with sub millimeter accuracy for high resolution profiling. The two additional instruments are an ionospheric photometer and a tri-band beacon.

In FY08 and FY09, both Wallops and Fairbanks CDAS made changes for COSMIC. At Wallops, the existing 14.2 meter antenna and 13 meter A and B antennas were modified to support COSMIC data. At Fairbanks, two 5 meter antennas were installed to help support COSMIC satellite data. The 5 meter Low Earth Orbit – Terminal (LEO-T) antenna built by Datron (also known as (AKA) 5m-A) was installed at Fairbanks and tested by OSD. In FY09 OSO formally accepted this antenna into operations. The 5 meter antenna built by Malibu Research Inc. (AKA 5m-B) was installed and acceptance tested at Fairbanks in FY08 and formally accepted in FY09. The Malibu antenna does the back-up to the LEO-T antenna. All crews were trained and the systems have been declared to be operational.

### Support to JASON-2:

Jason-2 was successfully transitioned to operations in the first quarter of FY09. SOCC-CDA is responsible for operation and maintenance of the Jason-2 spacecraft. SOCC-CDA and OSD GSD POES GS support the Jason-2 ground system. In FY09 the Jason-2 system received C&A certification. Formal handover to OSO operations is scheduled for November 2009.

## **4.3 Better Use of Technology for Networking Demands**

### Transition to NETWORKX:

Transition from GSA FTS2001 to NETWORKX is a government wide transition to a new 10 year telecommunications agreement with GSA. The transition is progressing slowly, and at this point, OSO is not feeling any financial impact. Future financial impact is expected to be minimal.

### FY09 Planning for New Projects to be Completed in FY10:

During FY09 the initial plans were made and resources committed for the following projects that will be completed in FY10:

- Compunetix voice conference system upgrade
- NSOF chiller replacement
- DMSP F18 launch on October 18, 2009, post launch testing, and transition to operations
- Jason-2 formal transition to operations
- GOES-P launch and transition to operations
- GOES satellite maneuvers to de-orbit GOES-10, use GOES-12 to support South American operations, and GOES-13 becomes operational as the GOES-East satellite.
- Upgrade the FCDAS power plant and security system
- C&A certification for POES, DCS, SRAS, Satellite Antenna System (SAS), and COSMIC.

## **4.4 Funding Levels**

Recent trends in government spending indicate that agencies should not expect significant increases in their budgets. This, coupled with the requirement to accommodate more users and incorporate evolving technology, will force the program to find efficiencies and do more with the same amount of resources. SOCC-CDA will use the new technology available from instruments on recently launched satellites to maximize data recovered and transmitted to particularly support data needs to respond to weather emergencies and climate analysis of global trends.