

**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 2007**

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## Executive Summary

The Satellite Operations Control Center/Command and Data Acquisition Stations (SOCC/CDAS) program encompasses all operations 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 and Fairbanks Command and Data Acquisition Stations (WCDAS and FCDAS), and the Satellite Operations Control Center (SOCC), and OSO Headquarters at the NOAA Satellite Operations facility (NSOF) in Suitland. 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). This OA is an annual, in-depth review of the program's performance based on the following:

- Customer Results
- Strategic and Business Results
- Financial Performance
- Innovation

This report focuses on the operational state of the program as of September 30, 2007, and is based on guidance developed by the Department of Commerce. The SOCC/CDAS program directly facilitates the NOAA Strategic Goal to "serve society's needs for weather and water information." The current program meets established cost, schedule and performance parameters.

### 1.0 Customer Results

The SOCC/CDAS program is fully meeting the customer's needs and the program is delivering the services that it is intended to deliver as outlined in the NOAA and NESDIS operational plans. 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. This document is available from the following website:

[http://www.economics.noaa.gov/library/documents/economic\\_statistics\\_and\\_methodology/NOAAEconomicStatistics-May2006.pdf](http://www.economics.noaa.gov/library/documents/economic_statistics_and_methodology/NOAAEconomicStatistics-May2006.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 is as low as it could be for the results delivered.

## 1.2 Performance Measures

There are 3 performance measures which specifically address the customer results for the SOCC/CDAS internal customers. These measures are:

Customer Results Measurement Area Metric	Current Performance Level	Threshold	Comments
Prevent any deterioration in data delivered meeting quality/timeliness requirements (including dropouts)	99.53%	98.5% of GOES data meeting quality/timeliness requirements per quarter	+1.03% over threshold as of December 31, 2007
Prevent any deterioration in DCS data that is successfully transmitted to users	100%	98.5% of DCS data that is successfully transmitted to users per quarter	+ 1.50% over threshold as of December 31, 2007
Prevent any deterioration in POES data delivered meeting quality requirements (total data recovered)	99.96%	98.5% of POES data delivered meeting quality requirements (total data recovered) per quarter	+1.46% over threshold as of December 31, 2007

**Table 1 Customer Results Quality/Timeliness Performance Measures**

## 2.0 Strategic and Business Results

The SOCC/CDAS program is meeting its own goals and objectives as well as those of the agency. 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.

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

In line with the current NOAA Strategic Plan for FY2006-FY2011, the SOCC/CDAS program directly supports the mission goal to serve society's needs for weather and water information. 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) theme 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 Technology Architecture Team (ITAT) and the NESDIS Chief Information Officer (CIO). A baseline of annual activity is contained in the matrix Annual Operating Plan (AOP) which is approved by NESDIS.

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, 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 reviews and 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 identification of new technologies on behalf of OSO. These technical changes can pose risks such as system incompatibility, to current operations in addition to the benefit of providing viable alternatives for improving systems and processes within OSO. The results of this analysis are the basis for OSO input to the Ground System Five Year Plan.

### **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 a monthly quad chart that summarizes 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

All SOCC/CDAS systems have been through a C&A Process and have been granted Full Authority to Operate. 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. C&A for four systems was completed in May, June, and September 2005 and one system in June 2006. Contingency plans for the five systems were tested from October 2006 through June 2007. Security control testing was completed in August 2007.

### 2.5 Performance Measures

The performance measures in the following table show the SOCC/CDAS program’s performance with respect to Strategic and Business

Measurement Area & Metric	Current Performance Level	Threshold	Comments
Processes and Activities - <u>Timeliness</u> Improve POES data delivered meeting timeliness requirements to above 95%	96.20%	95% of POES data delivered which meets timeliness requirements per quarter	+1.20% over threshold

<u>Mission and Business Results</u> Improve GOES data delivered within navigation specification to above 95%	99.89%	95% of GOES data delivered within navigation specification per quarter	+4.89% over threshold
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**Table 2 Strategic and Business Performance Measures**

**2.6 Other Alternatives.**

Currently, there are no other organizations capable of doing this work better, more efficiently, or at lower cost. Details can be found in the SOCC/CDAS OMB 300 Alternative Analysis section.

**3.0 Financial Performance**

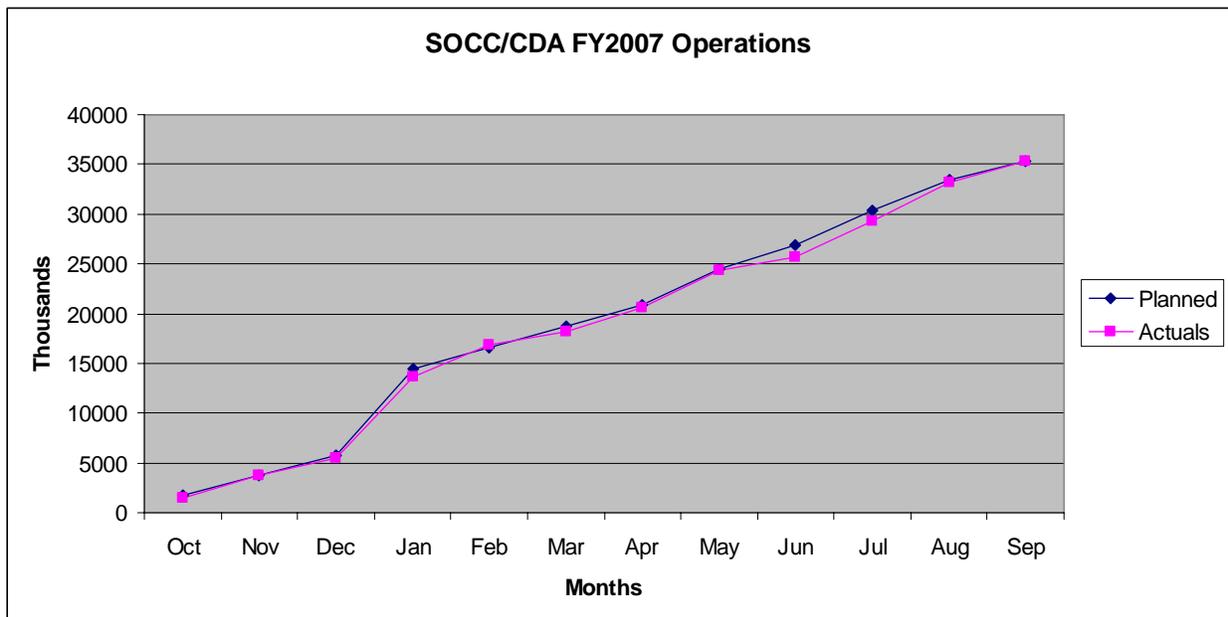
**3.1 Current Performance vs. Baseline**

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 FY2007.

The SOCC/CDAS program planned costs vs. actual costs are shown in Figure 1. Program costs consist of contract staff dedicated to SOCC/CDAS activities. In addition, these funds 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 2007. The total Steady State IT planned expenditures for FY2007 were \$35,295,000; actual FY2007 expenditures were \$35,287,000.

Note that the SOCC/CDAS is a steady state, operations and maintenance system. Government FTE labor costs are over 60% of total annual costs. Because the Government FTE labor costs in the OBM 300 are estimated by the OMB eCPIC software based on number of FTEs in 5 functional areas not job categories and GS-levels, they will not exactly match the SOCC/CDA planned costs that are based on historical actual costs.



**Figure 2: Budget and Actual Costs**

### 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 FY2007 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 two NOAA documents that are available at the following websites:

- Economic Statistics for NOAA 5<sup>th</sup> Edition at [http://www.economics.noaa.gov/library/documents/economic\\_statistics\\_and\\_methodology/NOAAEconomicStatistics-May2006.pdf](http://www.economics.noaa.gov/library/documents/economic_statistics_and_methodology/NOAAEconomicStatistics-May2006.pdf)
- Economics of Global Earth Observation at [www.pco.noaa.gov/documents/economics\\_ofEarthObs.doc](http://www.pco.noaa.gov/documents/economics_ofEarthObs.doc)

### **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**

The following projects/initiatives have been implemented in FY2007, 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 2007 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.

### **4.1 Better Use of Technology**

In CY06, the SOCC/CDAS performed a gap 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, three future projects have been identified.

#### Enterprise backup solution:

Identification of, and planning for, an Enterprise backup solution began in FY2006 and continues today. 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. The CY07 planning activities created the basis for the SOCC/CDAS FY09 Ground System budget request.

#### Centralized Intrusion Detection System:

The NIST 800-53 requires that all mission critical systems have some form of Intrusion Detection System. An Intrusion Detection System (IDS) monitors any network traffic and logs/notifications providing instant status of any possible malicious activity. Unlike a standard Firewall, IDS can differentiate between friendly and unfriendly activity. OSO is currently running IDS for each and every critical system and the 2006 study confirmed that a significant cost saving would be realized by implementing one centralized IDS for all missions. The 2007 planning activities created the basis for the SOCC/CDAS FY09 Ground System budget request.

#### 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. Planning activities in 2007 identified a two stage approach which will be included in the SOCC/CDAS Ground System budget request as required to meet the CIO outlined implementation schedule.

#### GOES IFDS:

The Wallops Intermediate Frequency Distribution System (IFDS) routes all uplink/downlink signals between the antenna systems and associated transmit/ receive equipment in the Operations building for all GOES spacecraft. This system is currently being replaced by a new system that includes new switching hardware, design reviews, in-plant and on-site testing, transition test plans, integration and testing of the hardware into the Wallops facility, documentation for the delivered system and operator training. WCDAS personnel will provide final connectivity to the required ground equipment. The upgrade includes a system software control package that will provide a Graphical User Interface (GUI) for operators at the Station.

#### DADDS:

The DCS (Data Collection System) Alternate Data Distribution System (DADDS) is a backup to 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 (NWSTG) 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.

## **4.2 Meeting A Challenge: Centralized LAN Hosting FIPS and NIST Required Documents**

Hardware has been implemented in FY07 to support a centralized server along with a backup server that will house all required NIST and FIPS security documentation. Through better use of technology, this effort will reduce the cost of multiple site document storage while providing a redundant centralized point to fulfill security requirements. An additional cost savings will be generated from centralized organizational approach.

## **4.3 Meeting Customer Needs.**

#### FCDAS and NWS Alaska Region Collaboration:

In FY08, the FCDASS plans to expand its support to the NWS Alaska Region by supplying real-time DMSP data received by the FCDASS to the NWS Weather Forecast Office (WFO) Fairbanks Advanced Weather Interactive Processing System (AWIPS) system. The data transfer will use an existing circuit interface to NWS WFO Fairbanks to supply these additional data sets acquired by the FCDAS for forecast use within the State of Alaska. In late 2006, the FCDASS began increasing the volume of POES HRPT data sets being acquired over the high latitude Barrow ground station to assist NWS forecasters in Alaska with acquiring additional polar spacecraft data over Barrow, which

is needed for forecast use due to the high latitude location of Alaska's North Slope which limits the use of GOES data.

FCDAS and University of Alaska Geographic Information Network for Alaska:

Through a lessons learned analysis, a new technique was identified in which the FCDASS will supply satellite data from the Moderate Resolution Imaging Spectroradiometer (MODIS) instrument on the NASA Earth Observing Satellite. These data sets are not currently available to the University of Alaska at Fairbanks (UAF) or the Bureau of Land Management Alaska Fire Service and State emergency management offices. The existing 13-meter systems will be used to "strip" the real-time MODIS data from the X-band high data rate composite playback stream and will transfer the data in real-time using an existing OC-3 circuit.

In collaboration with the United States Geological Survey and the UAF Geographic Information Network of Alaska (GINA) Program, FCDASS will continue to support the *Landsat-5 for Alaska Program* and is a follow on to successful campaigns during the summer of 2005, 2006 and 2007 which contributed 10,885 scenes acquired over Alaska, eastern Siberia, and western Canada to the National Satellite Land Remote Sensing Data Archive.

The FCDASS provides all POES HRPT data collected over Fairbanks and Barrow Stations to the University of Alaska GINA program for use by Alaska Fire Service, Alaska Volcano Observatory (AVO), Alaska Ocean Observing System (AOOS), and International Arctic Research Center (IARC).

FCDAS and WCDAS Stations providing FORMOSAT-3/COSMIC missions support:

Commencing in April 2008, the Fairbanks and Wallops CDAS Stations will begin providing Telemetry, Command and Stored mission data recovery for the FORMOSAT-3/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 launched on a common launch vehicle on April 14, 2006. Each satellite contains three instruments; the primary instrument is an advanced GPS receiver, which can autonomously track all GPS satellites in view simultaneously. The 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 tri-band beacon.

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

POES DOMSAT link upgrade:

POES currently uses 1.33Mbps Domestic Satellite (DOMSAT) links in order to transmit data between the CDASs and users, including the SOCC. On average, POES operations performs approximately 54 supports per day. Currently it takes approximately 14 hours per day to transfer this data from the CDASs back to the SOCC. In 2006, a usage and future requirements analysis was completed which identified opportunities to better use this service. The decision was made to increase the bandwidth to 2.66 Mbps. The increase in DOMSAT bandwidth would reduce the man-hours needed to monitor data transfers between the CDASs and SOCC by 50% and get the data to users faster. OSO is working with WCDAS remote site in testing of the new uplink and downlink of the 2.66Mbps data rates. Testing was started in January 2008, and will need to continue testing and

troubleshooting in order to get successful frame sync lock on the 2.66 downlink data at Suitland. Testing and conversion to the new rate at FCDAS remote site will be implemented in FY08.

WAN upgrade:

The WAN between the SOCC and CDASs currently consists of T1 lines, routers and multiplexers. Currently, if prime & backup T1 lines are brought up and the same time a “bridge loop” will be created in the WAN and the operational network will get flooded with messages. In 2006, OSO developed a plan to upgrade the WAN to allow both prime and backup lines up simultaneously between the SOCC and CDASs, along with a more automated failover to the backup T1 should the prime T1 have experience problems. This project was presented to OSD during Summer 2006 and funding was approved for FY07. Currently hardware is installed at all sites which includes Suitland, Wallops, and Fairbanks. Current emphasis is on progressing with cabling, testing, and development of the transition plans.

Transition to NETWORKX:

Transition from 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. For planning purposes, one extra month of the usual monthly telecom billing is put into the yearly budget to compensate for any additional telecommunications transition costs should they occur.