

**National Oceanic and Atmospheric Administration (NOAA)
National Environmental Satellite, Data, and Information Service (NESDIS)
Office of Systems Development (OSD)
Polar-orbiting Operational Environmental Satellite Ground System (POES GS)
006-48-01-15-01-3208-00-104-010
Operational Analysis
FY 2007**

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Executive Summary

The National Oceanic and Atmospheric Administration (NOAA) entered into an agreement with the European Organization for the Exploitation of Meteorological satellites (EUMETSAT) for participation in the Initial Joint Polar-orbiting Operational Satellite System (IJPS) (hereinafter referred to as the “IJPS Agreement”). In the IJPS Agreement, NOAA and EUMETSAT agreed to procure and operate their Polar-orbiting satellites in a manner beneficial to both parties and the world’s meteorological community.

The IJPS consists of two independent, but fully coordinated, polar satellite systems: the NOAA Polar-orbiting Operational Environmental Satellite Ground Systems (POES GS) and the EUMETSAT Polar System (EPS). In support of the IJPS, NOAA satellites NOAA N and N’ will be flown consecutively (one replacing the other) in a polar orbit with an afternoon (P.M.) equatorial crossing time. NOAA N and N’ will be the IJPS POES satellites. NOAA N was launched in May, 2005. EUMETSAT, working together with the European Space Agency (ESA), will developed the Meteorological Operational Satellite (Metop) series to be flown

consecutively in a Polar orbit with a morning (A.M.) equatorial crossing time. The Metop satellites comprise the space segment of the EUMETSAT Polar System. Metop 1 was launched in October 2006 and Metop-2 (am) will be launched in June 2011. The morning and afternoon satellites have a set of jointly provided common instruments. In addition, instruments specific to each orbit were provided by NOAA and EUMETSAT for their respective satellites. The IJPS agreement also commits NOAA and EUMETSAT to provide support for each other's operational satellite through their respective ground segments for commanding, receiving telemetry and global data, as well as exchanging data between the two Polar satellite systems. IJPS began with the commissioning of the first Metop satellite to be launched. Hence, NOAA is now in the IJPS era.

The POES mission operates with a NOAA provided constellation in circular, near-polar, sun-synchronous orbits that provide scheduled down-loads of environmental data collected from space to the POES Ground System for satellite monitoring and control and mission processing, analysis, and distribution. The POES GS assures continuous data coverage to provide an uninterrupted flow of critical global information used for land, ocean, atmospheric, and space environment applications in support of the meteorological, hydrological, marine, agricultural, transportation, and energy user communities.

The POES GS technology is periodically refreshed as equipment becomes obsolete and is no longer supported. Old technology is replaced with new technology which sustains the capability of the POES GS. POES GS also takes on additional challenges and requirements to support new missions and new agreements. These activities are not part of the Operational Analysis discussion. However, once development on a new operational system component is complete, operational support for that component is provided through the POES Ground System until transferred to the appropriate NESDIS Office.

This operational analysis (OA) is an annual, in-depth review of the performance of the tasks needed to fulfill the requirements that are levied on the POES GS. These are 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 December 31, 2007, and is based on guidance developed by the Department of Commerce. The POES GS program directly facilitates NOAA's Strategic Goal to "Advance understanding and predict changes in the Earth's environment to meet America's economic, social and environmental needs." The current program meets established cost, schedule and performance parameters.

1.0 Customer Results

The POES GS program is fully meeting the customer's needs and the program is delivering the services that it is intended as outlined in the NOAA/NESDIS Satellite Ground System Five Year

Plan. The POES Ground Systems primary customers are the Satellite Operations Control Center (SOCC), the Command Data Acquisition Station (CDAS), and the Environmental Satellite Processing Center (ESPC). POES Ground System provides satellite monitoring and control and mission processing, analysis, and distribution services to ensure that the end-user systems receive the required data, timely and complete.

1.1 Customer Requirements

The customer's requirements are detailed in the NOAA/NESDIS Satellite Ground System Five Year Plan.

The customer's detailed technical requirements are discussed in Technical Interface Meetings (TIM), Preliminary Design Reviews (PDR), and Critical Design Reviews (CDR). These requirements are documented and referenced in all phases; and the requirements are traced to all tests which include unit tests, on-site tests, end-to end tests and system tests. All documents are Configuration Managed and archived in a library for customer use. For example, IJPS/CSU task documents are stored on a password protected website for the customers' review.

The customer's business requirements are an input to the development of all technical requirements and ensure the overall operational performance of the POES GS system continues to meet the customer's business requirements.

1.2 Performance Measures

The POES GS is responsible for ensuring continuous data coverage to provide an uninterrupted flow of critical global information to its customers; used for land, ocean, atmospheric, and space environment applications in support of the meteorological, hydrological, marine, agricultural, transportation, and energy user communities. Timeliness and completeness of the data are the two key metrics by which customer results are judged in the POES GS environment. The Customer Results performance measurements provided in Table 1 focus on these metrics.

Table 1: Customer Results Performance Measurements

Metric	Current Performance Level	Threshold	Comments
Prevent any deterioration in POES data delivered meeting quality requirements (total data recovered)	99.94%	98.5% of POES data delivered meeting quality requirements (total data recovered) per quarter	+1.44% over threshold as of December 31, 2007
Improve POES data delivered meeting timeliness requirements to above 95%	96.39%	95% of POES data delivered which meets timeliness requirements per quarter	+1.39% over threshold as of December 31, 2007

2.0 Strategic and Business Results

The POES GS program is meeting its own goals and objectives as well as those of the agency. Program management and controls are in place to ensure the program continues to meet its goals and objectives and monitor the performance of POES GS.

2.1 POES GS Helps to Achieve Strategic Goals

The POES GS program directly facilitates the NOAA Strategic Goal to “serve society's needs for weather and water information.” To accomplish this goal requires sustained capability to monitor the health and safety of the POES satellites and ensure the timeliness of data to the Environmental Satellite Processing Center (ESPC).

2.1 Business Results

2.2.1 Program Management and Controls

The POES ground system support the POES satellite programs under the Office of System Development (OSD) management. All above tasks are assigned a Project Manager. This manager is directly responsible to coordinate and carry out the Technical Interface meetings, the Preliminary and Critical Design Reviews, coordination meetings, monthly program reports, and status meetings. The monthly reports are to include summaries of all accomplishments and status of all tasks, a financial status which is to include man-power utilization, schedules updated to reflect accurately the status, planned activities, and all issues and concerns which includes risk and mitigation strategies. These reports are provided to

Senior Management for review, risk areas are highlighted, and risks and associated mitigation activities are reviewed.

2.2.2 Monitoring Cost, Schedule and Performance

Cost – OSD conducts a variety of budget analyses throughout the fiscal year. Obligations and expenditures are tracked on a monthly basis. Variances to budget plans are analyzed monthly by OSD. Significant variances are reported to OSD 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 OSD management

Schedule – The matrix annual operating plan is used to track key milestones. The final matrix annual operating plan for OSD includes the significant POES Ground System milestones. Program activities are within the performance thresholds for reporting with the annual operating plan. These tasks are tracked through Microsoft Project and Excel.

Performance – Contract performance, when applicable, is monitored to support both budget and performance measurements. The majority of expenses incurred by the POES Ground System are hardware purchases. Typically, the integration of new hardware is conducted by either government or contract staff. As required, support can be secured through existing Operations & Maintenance contracts or through the vendors. Hardware maintenance contracts are reviewed on a semi-annual basis for technology advances impacting system maintainability, reliability, and interoperability.

Through the POES GS, OSD provides NESDIS-wide support for various tasking, including IT Security, Program Management, Business Continuity Planning, Systems Engineering and Budgeting. These contracts are Time and Materials. For these contracts, OSD receives monthly status reports and meets at least quarterly with contract management 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 identify milestones for the next contract year.

2.3 Reviews

As part of the NOAA program structure, the POES GS projects are reviewed on a monthly basis by NESDIS management. The POES GS also completed the Commerce Information Technology Review Board (CITRB) review in September 2006.

The POES Ground System project fully continues to meet the customer's needs and the program is delivering the services that it is intended to deliver. All program metrics are at or above expectations. The program continues to effectively and efficiently support NOAA's Strategic Goal to "serve society's needs for weather and water information."

2.4 Security

The POES Ground System is supported by federal and contractor staff, government-owned equipment, and resides in a government facility. The nature of contracted IT services is primarily for systems

engineering support. Any system development activities included in the POES Ground System include security planning requirements. In accordance with Commerce Procurement Memorandum 2003-09 issued November 17, 2003, Commerce Acquisition Regulation (CAR) 1352.239.73 - Security Requirements for Information Technology Resources has been incorporated into all IT services contracts. In addition, Commerce Acquisition Manual (CAM) 1337.70 - Security Processing Requirements for On-Site Service Contracts is implemented for personnel security. Security is incorporated into the investment's system life cycle in accordance with DOC IT Security Program Policy and the recommendations of NIST SP 800-64 - Security Considerations in the Information System Development Life Cycle. Contractor performance of required IT security management, operational, and technical controls is assessed in accordance with draft NIST SP 800-26 Revision 1, Security Self-Assessment Guide for Information Technology Systems, as part of the annual FISMA self-assessment of control effectiveness.

This POES Ground System OA report, reports only Steady State (SS) activities, development, modernization and enhancement (DME) activities are tracked through separate reports. However, once development is completed, the POES Ground System provides IT security contractor support for at least twelve months after the system has transitioned to operational status.

The contractors help maintain system operations. The required security clauses have been inserted in the two IT services contracts by the Contracting Officer and independently verified by the Information Technology Security Officer (ITSO). Upon contract award, contractor employees required to access this system are approved for a NOAA badge and undergo the appropriate background check to ensure employee trustworthiness. The Contractor Officer's Technical Representative (COTR) verifies the identity of each contractor employee and submits appropriate forms to the NOAA Security Office for a background check and employee badge. A personnel security professional within the NOAA Security Office ensures that all information provided by the COTR is correct and initiates a security background check for the contractor employee through the Office of Personnel Management (OPM).

After OPM performs the contractor employee's background check, the NOAA Security Office is notified and a personnel security specialist reviews the results of the background check and subsequently approves issuance of a NOAA badge. The expiration date of a NOAA badge worn by a contractor employee must coincide with the contract's end date. This process is repeated for each new contractor employee. Contractors supporting this investment do not store, process or transmit data/information with any of the government system(s) that contain personal or IT security sensitive information. . As a result, contractors are not required to undergo certification and accreditation activities for their information systems and are not required to submit a C&A package to the Contracting Officer and Information Technology Security Officer for these systems.

2.5 Performance Measures

The performance measures in Table 2 shows the actual POES GS program's performance with respect to Strategic and Business Results at the end of year 2007.

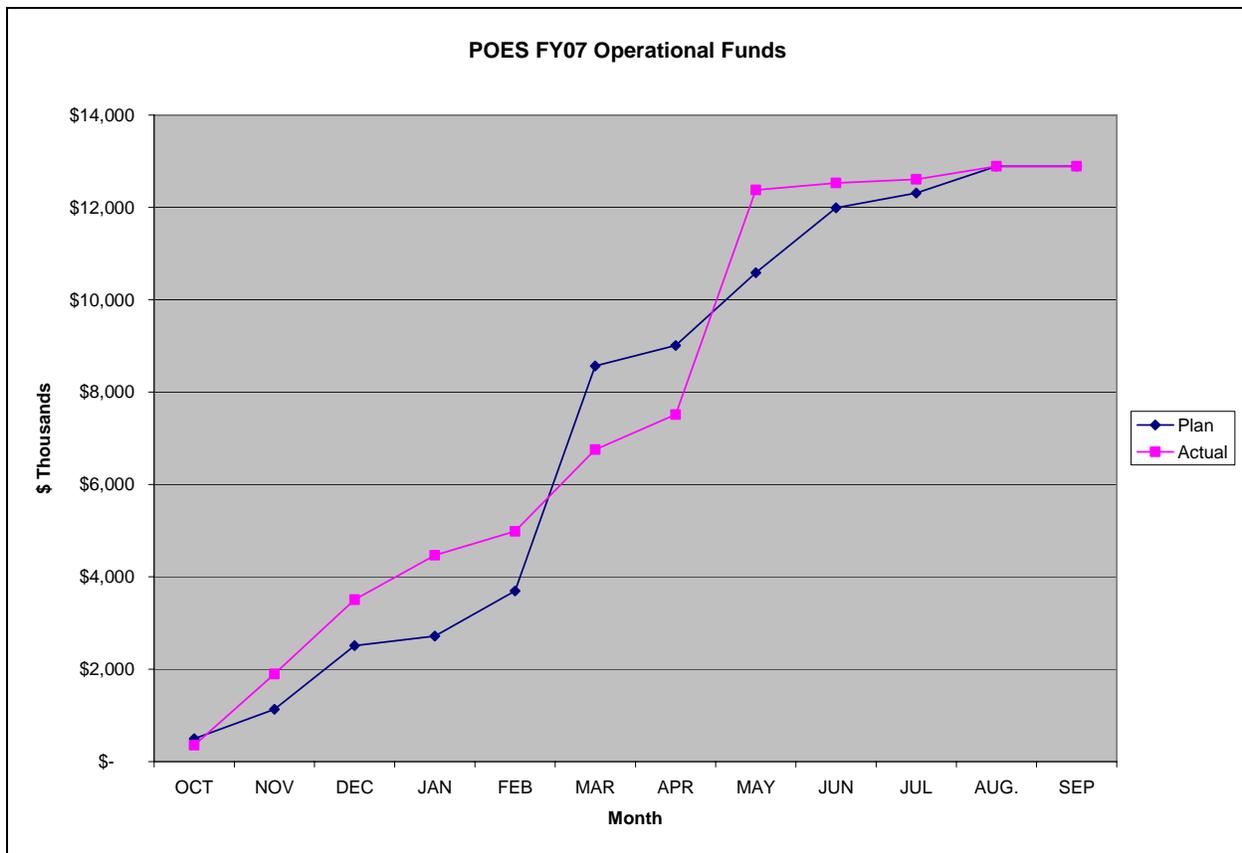
Table 2: Business Results Performance Measure

Measurement Task Area	Indicator	2007 Initial Baseline	2007 Result	Comments
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Measurement Task Area	Indicator	2007 Initial Baseline	2007 Result	Comments
IJPS/CSU	Transition the POES GS from testing environment to an operational environment	Transition from testing environment using operational schedules	System has been transitioned to operations.	The IJPS era started officially after a 30 day durability test, November 1 st , 2007.
PACS Refresh	Telemetry and Command System Replacement Prototype on Itanium	Completed TCS port to 64 bit operating system	Critical Design Review (CDR) completed.	All systems will be implemented in as per budget plan.
PACS Refresh	LEO-T and FEP replacement	Complete Integration Phase	Integrated at all CDA sites.	Documentation Clean up process
Replacement Receiver Refresh	Replace obsolete L and S band receivers at both CDA sites	Release RFP Package	RFP released and completed evaluation	Task completion in 2009, per current budget plan
Replace Intelligent Multiplexer (IMUX)	Drop in replacement with the same operational capabilities as already exists	Define requirements	Prototype and Critical Design Review (CDR)	Integration and testing at both CDAs in 2008.

3.0 Financial Performance

3.1 Current Performance vs. Baseline



The POES GS program plans and executes budget based upon a fiscal year calendar. A calendar year view comprises a snapshot of the program, and is likely to depict variance due to factors unrelated to performance. In this chart, actual POES GS expenditures outpace budget in the early part of Fiscal Year 2007 due to past delays in completing contractually required purchase documentation. To ensure the FY07 work plan remained on schedule, some funds were obligated according to plan early enough to allow the work to proceed as scheduled.

3.2 Performance Measures

The current POES Ground System financial performance is based on a pre-established cost baseline (e.g., annual spend plan) program costs primarily consist of hardware, software, and contracts. During 2007, the POES Ground System expenditures stayed within the relevant thresholds of the Fiscal Year budget.

3.3 Cost Benefit Analysis

For the Polar Ground Systems, the incremental technology refresh strategy is intended to maintain the current POES ground system and make changes as required and as resources are available to sustain system performance throughout the satellite program lifecycles in accordance with the NESDIS strategic mission. The cost benefit analysis is documented in the POES Ground System OMB 300.

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's 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

In 2007, work was performed on the following major tasks:

- Initial Joint Polar Satellite (IJPS) /Command Data Acquisition (CDA) and Satellite Operations Control Center (SOCC) Upgrades transitions from testing environment to the operational environment.
- Polar Acquisition and Commanding System (PACS) Refresh
 - Low Earth Orbit Terminal Upgrade and Front End Processor replacement
 - Replace Telemetry and Command System with new technology
- Replacement Receiver refresh
- IMUX replacement

Minor tasks performed include:

- Replacement Command Generator
- Replacement of Frame Synchronizer Operating System

The IJPS/CSU Upgrade has completed the transition from end-to-end testing with EUMETSAT and has been declared operational. Development activities were completed when the system was accepted by the Office of Satellite Operations (OSO) on November 1, 2007. At that time, the project moved into the Post-Installation Engineering Support (PIES) phase. Testing with the Metop spacecraft is in progress. The successful launch of the Metop Spacecraft was October 19, 2006. The spacecraft is to be declared operational in April 2007. During FY07, PIES activities will be provided by the contractor and will include continued technical support and solving issues discovered during operational testing with EUMETSAT. Documentation has been Configured and delivered to the library. All support training for the POES GS Crews has been completed.

The Polar Acquisition and Commanding System (PACS) task completed Phase I in 2006. This refresh consists of replacing the existing NOAA Polar Acquisition System (NPAS) Low Earth Orbit Terminal (LEO-T) Integral Systems Inc.'s EPOCH™ systems. The new EPOCH LEO-T equipment and the operating system (OS) on the workstation and Front End Processor (FEP) were tested in parallel operations for one of the antennas at the Wallops CDA. Integration of LEO-T was successfully completed at both CDAs in 2007. The second part of the PACS refresh is to port the existing PACS Telemetry and Command code from the existing outdated hardware, VAX 4000, to the Itanium. To prove the concept of a direct port of the existing software with minimum code changes, a prototype was built. The prototype of the Telemetry and Command Subsystem (TCS) on an Itanium System was demonstrated to NOAA in 2007. There was also a Critical Design Review of

the PACS TCS Upgrade successfully completed in 2007. This task is scheduled for completion as per the budget plan.

The refresh program established by the POES Ground System provides opportunities to implement innovative solutions that will allow sustainment of the existing system. For example, the refresh of the telemetry receiver will be accomplished utilizing new technology drop-in functionally equivalent units. The current hardware is no longer in production and maintenance support for existing equipment is uncertain. The uncertainty of this outdated equipment triggered these replacement activities. The new equipment will have a longer life cycle and a maintenance component which will lower operations costs and ensure that the equipment can support the POES mission through its end of life. The Replacement Receiver (RR) refresh task is in the procurement process and is scheduled for completion in 2009. The RR effort will utilize new technology to ensure that support to the current POES and the IJPS Metop missions will remain successful. In addition, these replacement components are being evaluated for their ability to support future missions such as the upcoming Ocean Surface Topography Mission (OSTM) Jason-2 program which provides a cost saving to NESDIS.

Another major POES ground system technology up-grade is the Replacement IMUX. The existing NOAA CDA systems contain aging data multiplexers and recorder known as IMUX. These multiplexers are integral to the day-to-day CDA polar mission support. Because of the recent failures and intermittent problems with the IMUX, a COTS solution, a drop-in replacement, including upgraded capabilities that increase efficiency and add scalability for future support requirements was procured. Prototype testing and a CDR were accomplished in 2007. In-plant testing and on-site testing will be accomplished in early 2008. Task completion is scheduled for 2008.

Two minor technology refresh tasks were also started in 2007, the Command Generator (CG) replacement and the frame synchronizer operating system replacement. The CG is a customized unit which is specifically designed for POES S-Band commanding system. The CG receives the satellite commands from POES Acquisition and Commanding System (PACS) Communication Controller and outputs a modulated signal to the CDA's up-converter. The new CG was designed as a drop-in replacement with the same operational capabilities, and will provide a continued service life of 10 plus years with high reliability and modularized for ease of maintenance. The prototype CG was successfully tested against a POES spacecraft in 2007. The procurement effort to provide deliverable CGs to NOAA is in process. The completion of this task is scheduled for the end of 2008.

The second minor technology task started in 2007 was the POES Frame Synchronizer Operating System (OS) replacement. The existing frame sync OS is Windows NT, which is no longer supported by Microsoft, will be ported to a QNX OS. The upgrade also includes a solid state disk drive to increase reliability. The procurement package was submitted to contracts in late 2007. The task is scheduled to be awarded in 2008 and completed in 2009.