

**National Oceanic and Atmospheric Administration
National Environmental Satellite, Data, and Information Service
Comprehensive Large Array-data Storage System (CLASS)
006-48-01-13-01-3205-00-108-023
Operational Analysis
2006**

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Executive Summary

The Comprehensive Large Array-data Storage System (CLASS) project supports the effort to understand climate variability and change to enhance society's ability to plan and respond through the application of modern, proven techniques and technology. By engineering a transition to an enterprise-capable data storage solution, CLASS will afford efficient management of high volumes (petabytes) of data critical to the United States Global Change Research Program and the scientific community. Management of these data requires a rapid expansion in storage capacity at the Data Centers and automation of data ingest, archive, quality control, and access. Significant increases in data volumes over the next 15 years and corresponding growth in the number and sophistication of system users necessitate this shift from the traditional archive paradigm to a fully operational and integrated system managed at the enterprise level. For example, data from the \$4.5 billion National Polar-Orbiting Environmental Satellite System (NPOESS) and the NPOESS Preparatory Project (NPP) programs will utilize CLASS in lieu of building standalone, dedicated data archival systems.

Large portions of the Nation's current archive of environmental data is stored and maintained by the NOAA National Data Centers. These data exist in disparate systems, with non-standard archive and

access capabilities. CLASS will provide a standard, integrated solution to data archive and access, resulting in numerous benefits: an easy-to-use access portal for the Nation to obtain environmental data; integration of data for the user (Search, Browse, Geospatial capabilities); higher quality and volume of environmental data which contributes to improvements in prediction capabilities; and decreased cost of redundant resources. To realize these benefits, the CLASS program has identified technologies and best practices to efficiently archive the vast quantities of NOAA satellite and in situ observational data; to safely and permanently preserve those valuable data for future generations to use; and to provide rapid data access in a cost-effective manner.

The CLASS Operational Analysis (OA) supports the operational components located in Suitland MD and Asheville NC. These operations primarily support data from 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 December 31, 2006, and is based on guidance developed by the Department of Commerce. The CLASS program directly facilitates the NOAA Strategic Goal to "Understand Climate Variability and Change to Enhance Society's Ability to Plan and Respond." The current program meets established cost, schedule and performance parameters.

1.0 Customer Results

The CLASS 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. CLASS archives and provides access to data used by the NOAA National Data Centers as well as an extensive user community. These data are used to support a broad array of products that impact nearly every economic sector of the nation. In addition, CLASS instrumental in the preserving of long-term data records of environmental conditions. The nation is a stakeholder; other customers include federal agencies, National Aeronautics and Space Administration (NASA), state and local governments, and students from all levels of academia.

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

1.1 Customer Requirements and Costs

The value of CLASS has been well documented in the CLASS Level 1 Requirement document and mandates a continued need for this investment. The cost to the customer is as low as it could be for the results delivered.

The current CLASS program supports the customer’s requirements. The cost to the customer is as low as it could be for the results delivered.

1.2 Performance Measures

CLASS mission is two fold: storage archival of valuable climate data and distribution of these data to a large user community to conduct to facilitate scientific research. CLASS performance measures address both components of the CLASS mission. By measuring that number of files cataloged we report the number of files that are being preserved by CLASS and that are readily available to the user community. By measuring the number of files delivered we are actually measuring CLASS usage by the user community. The number of files cataloged is provided in Section 2.5 Strategic and Business Results. Both performance measures are highly important and complementary. CLASS must strive to continue enhancing its data availability and at the same time continue its outreach and interface enhancement activities to make the data easily accessible by a wider user community.

Indicator	FY2006 Baseline	As of September 30, 2006	Comments
Data Delivery	Increase volume of environmental data delivered to customer by 10% (target = 4,482,781 files)	5,342,655	Files thru 4th quarter 2006 (119% of target)
Indicator	FY2007 Baseline	October 1 thru December 31, 2006	Comments
Data Delivery	Increase volume of environmental data delivered to customer by 10% (target = 5,876,920 files)	1,987,864	Files thru 1 st quarter 2007 (34% of target)

2.0 Strategic and Business Results

The CLASS 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 how well the CLASS program performs.

2.1 CLASS Helps to Achieve Strategic Goals

In line with the current NOAA Strategic Plan for FY2006-FY2011, the CLASS program directly supports the mission goal to “Understand Climate Variability and Change to Enhance Society's Ability to Plan and Respond.” Today there are significant demands on virtually all of NOAA's programs to provide information to the Nation and the World community on the health of the environment in real-time. CLASS provides 24x7 support for NOAA data.

2.2 Business Results

2.2.1 Program Management and Controls

The CLASS program is managed using 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.

CLASS Management performs extensive, continuous OA on the performance of its 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.

CLASS conducts an objective measurement of resource and performance metrics through the CLASS Project Management Team (CPMT). This team is a formal review board and discussion vehicle for problem identification, mitigation development, and resolution action. The CPMT meets weekly and includes the various team leads, contractor management, and project management. In addition to the performance metrics noted in Section 1.2 and Section 2.5, internal project milestones such as software release dates (which often include changes to the operational environment) or Boulder site development activities are looked at as part of this review process.

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 are gathered at the functional level and reported on a weekly basis. CLASS management reports to NESDIS Ground System management on a monthly basis. In addition, CLASS reports to NESDIS OCIO as requested. Performance deficiencies in the CLASS operational system resulting from hardware failures are referred to the maintenance contractor for remediation. Performance deficiencies for IT systems resulting from software problems are also handled by the maintenance contractor. Key performance issues and risks are identified through these reviews and tracked by CLASS management.

Given that the CLASS operational environment includes a large IT component, CLASS must keep abreast of changes in technology that would impact operations. These changes identify risks, such as compatibility issues between current and future system components, to current operations in addition to identifying viable alternatives for improving systems and processes within CLASS. The results of this analysis are the basis for CLASS input to the Ground System Five Year Plan as well as the CLASS Ten Year Plan.

2.2.2 Monitoring Cost, Schedule and Performance

Cost – CLASS 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 Office of Systems Development (OSD) 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 CLASS management.

Schedule – Weekly CLASS Project Management Team (CPMT) meetings allow the project 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. CLASS operations are conducted utilizing contractors. For these contracts, CLASS management 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 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 Ground System management via a monthly project report summarizing cost, schedule, and performance.

2.3 Reviews

As part of the NOAA program structure, the CLASS 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 unacceptable deviations, i.e. cost or performance outside the 10% threshold, along with explanations and a plan to correct.

The CLASS project underwent a programmatic review at NOAA and DOC as part of its acquisition activities in January 2006.

2.4 Security

The CLASS system has been through the C&A Process and has been granted Full Authority to Operate. CLASS has an approved System Security Plan, Risk Assessment, and Contingency Plan in place. Management, operational and technical security controls are in place to ensure the confidentiality, integrity, and availability of information.

2.5 Performance Measures

The performance measures in the following table show the CLASS program’s performance with respect to Strategic and Business Results.

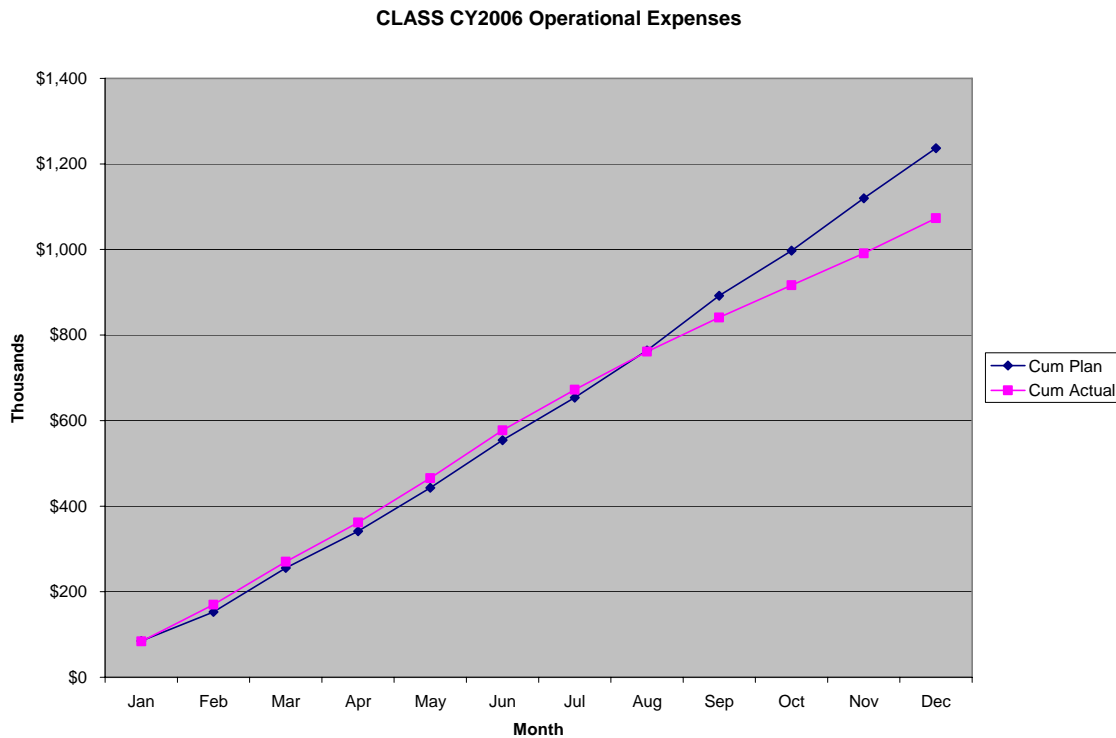
Indicator	FY2006 Baseline	As of September 30, 2006	Comments
Ingest (cataloged files)	Increase environmental data availability by 15% (target = 9,582,226)	10,247,082	Files thru 4th quarter 2006 (107% of target)
Indicator	FY2007 Baseline	October 1 thru December 31, 2006	Comments
Ingest (cataloged files)	Increase environmental data availability by 15% (target = 11,784,144)	10,540,445	Files thru 1 st quarter 2007 (89% of target)

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 CLASS OMB 300 Alternative Analysis section.

3.0 Financial Performance

3.1 Current Performance vs. Baseline

The current CLASS 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 the 1st quarter of FY2007 (which ended December 31, 2006). The CLASS program plans and executes budget based upon a fiscal year calendar. A calendar year view comprises a snapshot of the program. As shown in the chart below, beginning in September and continuing through December, actual operations costs are running below planned costs. This under-run is the result of the delay in getting the Boulder operational site up and running. This has delayed anticipated staff additions that were part of the original baseline and schedule. Although this change has created a spending under-run, it has not impacted performance. It is anticipated that the project will be re-baselined in the near future to account for this delay and thus this variance will be remediated for the remainder of the fiscal year.



3.2 Performance Measures

The current CLASS financial performance is based on a pre-established cost baseline (e.g., annual spend plan). Program operational costs consist of contractor labor dedicated to CLASS, travel,

communications and corporate overhead. During 2006 the CLASS program consistently stayed within a ten percent variance.

3.3 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 Representatives (CORs) 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 have been implemented in FY2006 or in 1st quarter FY2007. The CLASS project is a mixed lifecycle project and CLASS operations is only a small component of the overall CLASS project. The CLASS operational environment often benefits from the development that is on-going and the development activities are often the vehicle for implementing change in the operational system. However, a few small innovations have been made directly to the operational system during the past year. These changes will help to address future challenges, better meet customer needs, make better use of technology, and lower operating costs.

4.1 Improve Data acquisition

CLASS implemented operational support for data collected by the Metop-A satellite. This mission, developed in partnership between NOAA and EUMETSAT, will serve the scientific community for years to come. By providing a single point of access for all Metop data, CLASS facilitates future search and ensures preservation of this very valuable data. CLASS is developing an Initial Operational Capability for migrating selected data from the National Oceanic Data Center (NODC) into CLASS, this Initial Operational Capability will later be expanded for supporting all of NODC data and will be used as a blueprint for migrating data stored in other data centers.

CLASS continued migrating to a new hardware and network architecture that provides much more redundancy and significant performance improvements. This new architecture will have two fully operational nodes: One at the National Climatic Data Center (NDCD) and one at the National Geophysical Data Center (NGDC) and one Point of Presence at the NOAA Satellite Operations Facility (NSOF).

4.2 Improve Data Distribution

CLASS enhanced its web interface to enable subscribers to manage their own subscriptions. This allows subscribers to more efficiently and effectively manage the data that is received via subscription services

CLASS implemented support for the Open-source Project for a Network Data Access Protocol (OPeNDAP) for a selected group of data. This protocol makes data more accessible to the user community familiar with its functionality to access data from CLASS without using the CLASS web site.

CLASS embarked on a project to implement Application Program Interfaces (APIs) to allow the user community to access and retrieve data from CLASS without using the CLASS web site.

Once developed, APIs will allow the Data Centers to support users who require highly specialized interfaces.