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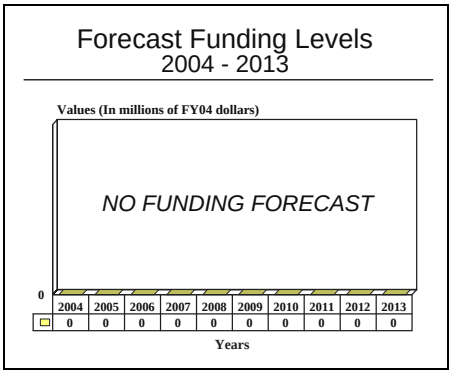
GEODSS - Archived 3/2005

Outlook

- Main sustainment program completed in FY2002
- Infra-red Cloud Imager integration completed December 2003
- Barring further activity, this report will be archived in March 2005



Orientation

Description. The Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) program is a U.S. Air Force-led effort that tracks and catalogs deep space (above 22,000 miles) objects, such as satellites and other man-made debris, and reports position information on U.S. and international satellites to the U.S. Air Force and U.S. Space Commands.

Sponsor

U.S. Air Force
Air Force Space Command
Peterson AFB, Colorado (CO)
USA

Status. Last known enhancements (Infra-red Cloud Imager) completed in year 2003.

Total Produced. Three GEODSS electro-optical telescope sites are operational.

Application. Space surveillance and tracking system.

Price Range. Indeterminate

Contractors

TRW Space & Electronics, http://www.trw.com, MS: E1/5061, One Space Park, Redondo Beach, CA 90278-1001 United States, Tel: 1 (310) 812-4321, Fax: 1 (310) 814-4507, Packager

MITRE Corp, http://www.mitre.org, 202 Burlington Road, Bedford, MA 01730 United States, Tel: 1 (781) 271-2000, Packager

Technical Data

Design Features. GEODSS provides a global network of ground sites using electro-optical telescopes, low-light-level television cameras, and computer networks to optically detect, track, and identify satellites in Earth orbit. GEODSS sensors are capable of searching up to 17,400 square degrees per hour, and can track objects that are between 3,000 and 22,000 nautical miles out in space. One important limitation of the network is that it can be used at night only during clear weather.

Each of the three operational sites has three EO telescopes, two main and one auxiliary, with the exception of Diego Garcia, which has three main telescopes. The main telescopes have a 40-inch aperture and a 2° field of view. The auxiliary telescopes

have a 15-inch aperture and a 6° field of view. An upgrade is under way to replace the auxiliary telescopes with main telescopes and refurbish all the GEODSS telescopes. The telescopes are able to see objects 10,000 times dimmer than can be seen by the human eye. The system operates only at night, and since it is an optical system, cloud cover and local weather conditions have a great deal of influence on its effectiveness.

GEODSS site in Socorro, New Mexico

Source: U.S. Air Force

Variants/Upgrades

Deep Stare. Upgrade effort to design, develop, and demonstrate new prototype sensors and cameras.

Program Review

Background. The GEODSS development and acquisition contract was awarded in FY78. The system critical design review was completed in FY79. During FY80 and FY81, charge-coupled devices were examined in an effort to improve system performance and long-term supportability. Negotiations between the United States and Portugal continued from FY88 to FY90 on the technical and facility agreement that allowed construction of a GEODSS facility. FY91 tasks included continuing caretaker-only status of the GEODSS test site (GTS) and initiating a system engineering effort to establish a Space Surveillance Network (SSN) technical baseline. The orbital debris measurement effort to characterize the space debris environment of selected U.S. Department of Defense (DoD) orbits was initiated. The Advanced Electro-Optical System (AEOS) program was initiated per congressional direction in FY91.

Project accomplishments in FY92 included the following: completion of a study to identify deep space surveillance alternatives to eliminate the GEODSS coverage gap and to improve the system's supportability; continued operation of the GEODSS Engineering Test Site used as a testbed for the GEODSS modifications and improvements; continued orbital debris research and measurement to characterize the space debris environment and develop models to predict the unmeasurable environment (i.e., debris too small to be tracked reliably); completion of a study to identify and correct sources of false errors for the Eglin radar; completion of a systems engineering effort to define required sensor improvement programs for FY93 implementation, including studies of alternatives to improve and optimize the existing near-Earth surveillance systems; and incorporation of a program to complete construction of the Haystack Auxiliary (HAX) radar that was originally funded by NASA. This adjunct radar provided the DoD with improved satellite imaging capability on a more timely basis.

Due to FY93 congressional reductions, upgrades to reduce the false uncorrelated error rates of various sensors were descoped to upgrades for the Eglin radar only. The congressional reduction delayed upgrades to the SSN communications/datalinks by one year, delayed completion of astrodynamic standards implementation by one year, and delayed completion of the star catalog upgrade by two years.

GEODSS upgrading continued in FY94 with hardware procurement. Other efforts focused on initiating

upgrades to the communications/datalinks of the SSN, as these upgrades would provide dedicated secure voice links and datalinks between SSN elements and the Space Surveillance Center in Cheyenne Mountain (and its alternate), as well as improve overall data flow capacity.

GEODSS modifications proceeded through FY95 and FY96. Also during this time, optimization of the communications and datalinks of the SSN was slated to be completed. Other work included continuing the systems engineering effort to define and support required sensor investment. Efforts included alternatives to improve and optimize existing near-Earth surveillance, as well as modification of the Eglin radar deep space range transmitter. In FY97, these sustainment efforts were transferred and continued in the Operation and Maintenance Appropriation.

Project 674791 GEODSS Sustainment. This GEODSS project started in FY00 as a sustainment effort to develop and field 10 charge-coupled device (CCD) cameras for the GEODSS system located at Socorro, New Mexico; Diego Garcia, Indian Ocean; and Maui, Hawaii. It also funds the purchase and integration of 10 Modular Precision Angular Control Systems (MPACS) and funds associated logistics requirements, technical data, and training. The effort develops the first components and installs them at the test unit at Site One in Socorro, New Mexico. Follow-on CCD cameras and MPACS are being produced and installed using Space Track Modification funds. This project, with the recently completed GEODSS Modification Program, results in more than double the throughput and search rate of the legacy system. Without the CCD camera replacement, the entire GEODSS system would have been unusable by FY02, as mission-critical Ebsicon tubes are no longer manufactured or supported by the vendor and the supply of spares had run out by the end of 2001.

FY00 efforts focused on beginning CCD, camera, and MPACS designs, as well as developing a testbed at Site One in Socorro, New Mexico. Plans for FY01 called for beginning operational use of Site One, completing the CCD and camera designs, and following up with a test of the prototype camera and MPACS.

The main sustainment project finished in FY02 with contingency and closeout efforts for the development contractor, completing the prototype camera and testing, and acquiring any initial spares. In December 2003, one of the final upgrades, the integration of the Infra-red Cloud Imager, was successfully completed. The imager allows GEODSS to operated more effectively during extreme cloud cover.

Funding

All enhancement and sustainment efforts appeared to have been completed in year 2002. No additional funding is expected at this time.

Recent Contracts

Contractor	Award (US$ millions)	Date/Description
TRW	5.0	Mar 2000 – Initial US$5 million award, with potential for US$20 million in options over four years, to design and upgrade EO telescope sensors and cameras.
Northrop Grumman	6.8	Oct 2002 – Fixed-price incentive with award-fee contract modification to provide for operations, maintenance, and logistics support of GEODSS at Socorro, NM; Diego Garcia; and Maui, Hawaii. The contract award number is F05604-96-C-9005, P00057.

Timetable

Year	Major Development
FY78	GEODSS development and acquisition contract
FY00	GEODSS Sustainment Project start
FY01	Prototype camera Mod Kit Test
FY02	Main sustainment program complete
FY03	Operational acceptance at Site 1 (Socorro, New Mexico)

Year	Major Development
2003	Integration of Infra-red Cloud Imager complete

Worldwide Distribution

GEODSS is a **U.S. Air Force** program with sites located at the Optical Command, Control, and Communications Facility at Edwards AFB, California, which serves as a collection point for information. The EO telescopes are located at Socorro (White Sands Missile Range), New Mexico; Diego Garcia, British Indian Ocean Territory; and Maui, Hawaii. Other auxiliary sites have been reported at Cho San Jong, South Korea, and a fifth site is in Portugal.

Forecast Rationale

With the addition of an Infra-red Cloud Imager in December 2003 that is able to better see through extreme cloud covering, the U.S. Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) program is now fully operational. No further upgrades are scheduled at this time. Any minor enhancements will likely be funded by particular projects using the GEODSS facility at that time.

Ten-Year Outlook

Upgrade efforts completed at the end of year 2003; the forecast chart has therefore been omitted. Barring a sudden surge of activity, this report will be archived in March 2005.

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