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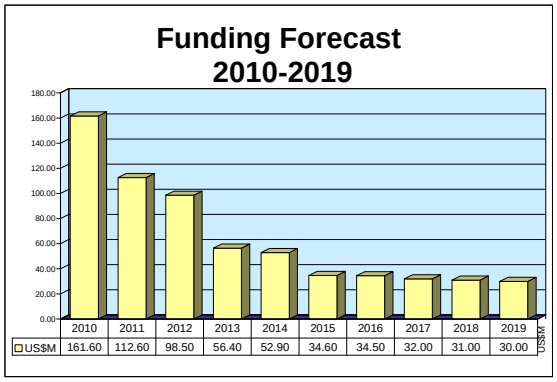
STSS (Space Tracking and Surveillance System)

Outlook

- Block 2006 satellites (SV-1 and SV-2) launched in September 2009
- In the Fiscal Year 2011 budget request, the MDA requested funding for a new program, dubbed the Precision Tracking Space System (PTSS)
- This report coverage will be transferred to Forecast International's Space Systems Forecast - Satellites & Spacecraft service in 2011



Orientation

Description. The Space Tracking and Surveillance System (STSS) is a satellite system being developed to replace the satellites of the Defense Support Program (DSP). It is part of the Ballistic Missile Defense Sensors (BMDS) program element and was originally part of the SBIRS Low program that was canceled in 2002.

Sponsor

Missile Defense Agency (MDA)
The Pentagon
Washington, DC 20301-7100
USA
Tel: + 1 (703) 697-8855
Web site: http://www.mda.mil/

Status. Development and production in progress. Two satellites launched in September 2009.

Application. SBIRS/STSS is part of an overall early warning system to detect, identify, and track intercontinental ballistic missiles, sea-launched ballistic missiles, and tactical surface-to-surface missiles during their initial stages of flight.

Contractors

Prime

Aerospace Corp	http://www.aero.org, 2350 E El Segundo Blvd, El Segundo, CA 90245-4691 United States, Tel: + 1 (310) 336-5000, Fax: + 1 (310) 336-8249, RDT+E (Systems Engineering and Integration)
General Dynamics C4 Systems	http://www.gdc4s.com, 8201 E McDowell Rd, Scottsdale, AZ 85252-3812 United States,

STSS (Space Tracking and Surveillance System)

	Tel: + 1 (877) 449-0600, Fax: + 1 (877) 449-0599, Email: info@gdc4s.com, RDT+E (Risk Reduction and Definition Studies)
Northrop Grumman Space Technology	http://www.as.northropgrumman.com, 1 Space Park, Redondo Beach, CA 90278 United States, Tel: + 1 (310) 812-4321, Fax: + 1 (310) 813-7548, Prime
Raytheon Space & Airborne Systems	http://www.raytheon.com/businesses/rsas, 2000 E El Segundo Blvd, El Segundo, CA 90245 United States, Tel: + 1 (310) 647-1000, Fax: + 1 (310) 647-0734, Email: SAS_Comms_PA@raytheon.com, Second Prime

Comprehensive information on Contractors can be found in Forecast International's "International Contractors" series. For a detailed description, go to www.forecastinternational.com (see Products & Samples/Governments & Industries) or call + 1 (203) 426-0800.

Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

Technical Data

Acquisition Sensor. The acquisition sensor provides high-resolution horizon-to-horizon coverage for detecting and tracking missiles in the boost phase. It has a wide field-of-view, scanning refractive telescope with only one moving element. The shortwave infrared focal plane array is cooled by a passive cryoradiator/ heatpipe system.

Track Sensor. After receiving a hand-over signal from the acquisition sensor or external cueing from other assets, the tracking sensor continues tracking a missile through the midcourse phase, including hit assessment. The tracking sensor features a narrow field of view and agile telescope, providing coverage below and above the horizon. The sensor is cooled to cryogenic temperatures so that it can detect dim objects in space, such as missiles after burnout and post-boost vehicles. These features are critical for detecting lethal objects.

Signal and Data Processing. The signal and data processor system has demonstrated the ability to receive and filter an impressive 2.1 gigabits of data per second – equivalent to reading an entire set of encyclopedias six times in one second. This processing rate is accomplished in a processor that is 10 times smaller than processors with similar capability, and it requires only 175 watts of power – a 10-fold decrease in power requirement. The processor and software will simultaneously detect and track more than 100 objects in real time, detecting potential missile and warhead targets against vast amounts of infrared clutter and noise.

Program Review

The U.S. Air Force has relied on Defense Support Program (DSP) satellites for over two decades to alert strategic forces of ICBM launches in the former Soviet Union and China. DSP satellites were designed to detect the infrared signature of a rocket launch. When the first DSP satellite was launched in 1970, the main threat against the United States was nuclear attack from the Soviet Union.

During the Iraq-Iran conflict in the 1980s, the satellites proved that they could detect smaller rockets. Satellites monitored the launches of Soviet-made Scud surface-to-surface missiles from Iran. During the Persian Gulf War, the system played an important role in detecting Scuds launched from Iraq, and warning Israel and Saudi Arabia of impending attacks.

Although the satellites have performed adequately in their two decades of service, the pace and character of modern warfare are overtaking the ability to provide timely and accurate information of tactical missile launches. The system is too dependent on labor-intensive ground stations.

STSS – Result of Decades of Research

Throughout the 1980s and 1990s, the U.S. military researched ways to replace the DSP with newer, more modern and capable systems. In 2001, responsibility for the program transferred from the Air Force to the Ballistic Missile Defense Organization (now the Missile Defense Agency). By the next year, the program, dubbed SBIRS Low, was seen as costing too much and was canceled. It was at this time that the current STSS program was created. Through FY05, the STSS program was funded under the Ballistic Missile Defense Sensors (PE#0603884C) program. However, in FY06, Congress moved the program to its own program element – PE#0603893C, Space Tracking and Surveillance Systems.

STSS (Space Tracking and Surveillance System)

In March 2006, Raytheon delivered the first sensor payload for the STSS satellite.

MDA Block Structure Revised

The program was previously divided into three blocks: Block 2006, Block 2008, and Block 2012. However, in accordance with revised Missile Defense Agency block structure, the program has been unified into a single project, known as WX12 – Capability Development.

Under the old block system, Block 2006 (Project 0812) funded the development of two space-based sensors and a ground station processing capability. Ground and software upgrades were the major focus of Block 2008 (Project 0912). Block 2008 also funded further automation of the Ground Mission Data Processing and Mission Management software. Block 2012 (Project R112) represented the next spiral of STSS. This effort would have funded increased global coverage, improved system performance, and near real-time capability. Block 2012 satellites would replace Block 2006 satellites.

In June 2008, Raytheon completed a satellite payload trade study with Northrop Grumman. The results of the study will be used to enhance the performance of follow-on satellites. In August 2008, the STSS program successfully completed acoustic testing.

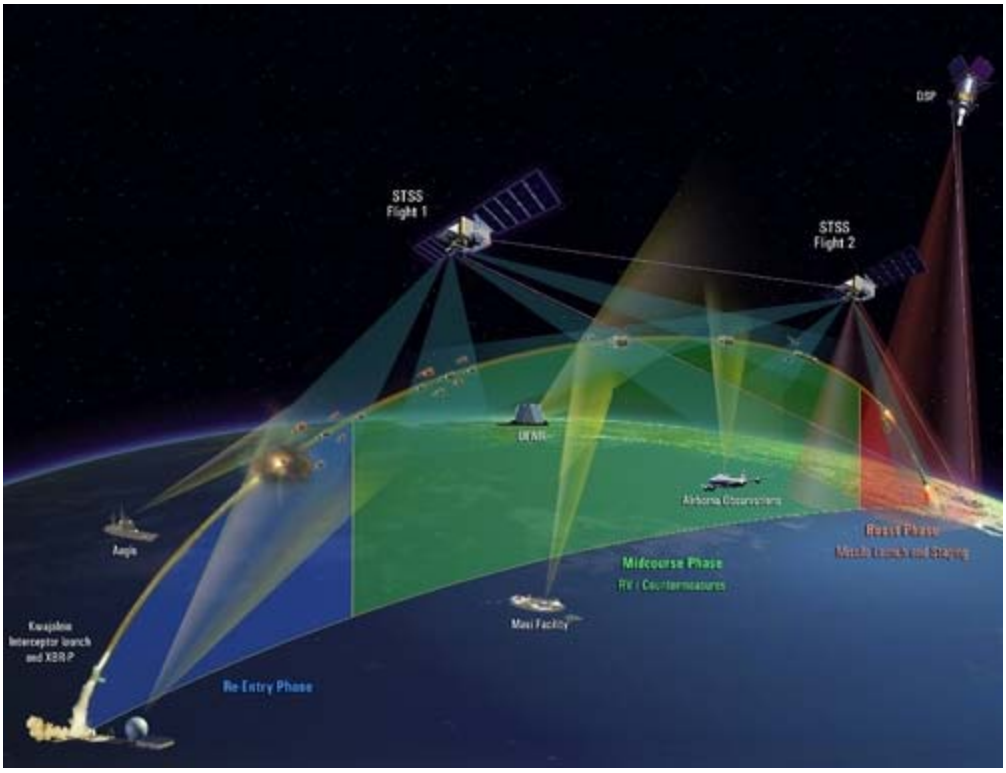
The MDA launched the Space Tracking and Surveillance System (STSS) Advanced Technology Risk Reduction (ATRR) satellite from Vandenberg Air Force Base, California, aboard a Delta II launch vehicle in early May 2009. STSS ATRR is a small, experimental satellite that serves as a pathfinder for next-generation sensor technology for future MDA space missions. The program takes multiple approaches to reduce overall risk to the layered Ballistic Missile Defense System (BMDS) through sensor testing, launch and space vehicle integration, resource protection and security planning, and launch site processing.

The first STSS Demonstrator (Block 2006) satellite was delivered to Cape Canaveral for launch in June 2009, with the second satellite delivered a month later. The two satellites were launched on board a Delta II from Cape Canaveral on September 25, 2009.

The satellites experienced some in-orbit issues, such as problems with the attitude control software. However, those problems are fixed. No live tests were conducted in 2009 because of a lack of funding.

In the Fiscal Year 2011 budget request, the MDA requested funding for a new program, dubbed the Precision Tracking Space System (PTSS). The new program will use knowledge gained from the STSS demonstrator satellites currently in orbit to develop a missile warning and tracking satellite system. The goal of the program is to demonstrate a prototype satellite by FY14. Funds will be used to cover trade studies, alternative analysis, and concept review; define and document the internal and external interfaces; conduct software-in-the-loop testing; and completion of systems requirement reviews, System Design Reviews, and Preliminary Design Reviews.

STSS (Space Tracking and Surveillance System)



Planned Use of the STSS

Source: Northrop Grumman

STSS is a constellation of satellites in low-Earth orbit, each having a very capable set of infrared and visible sensors for detecting and tracking ballistic missiles launched from anywhere, to anywhere, at any time.

Source: Northrop Grumman

STSS (Space Tracking and Surveillance System)

STSS Satellite under Construction

Source: Northrop Grumman

Funding

U.S. FUNDING

	FY09 QTY	FY09 AMT	FY10 QTY	FY10 AMT	FY11 QTY	FY11 AMT	FY12 QTY	FY12 AMT
RDT&E (U.S. MDA)								
PE#0603893C STSS	-	209.8	-	161.6	-	112.6	-	98.5

	FY13 QTY	FY13 AMT	FY14 QTY	FY14 AMT	FY15 QTY	FY15 AMT	FY16 QTY	FY16 AMT
RDT&E (U.S. MDA)								
PE#0603893C STSS	-	56.4	-	52.9	-	31.6	-	N/A

All $ are in millions.

N/A = Not Available.

Source: FY2011 U.S. Budget Documents, Exhibit R-2, RDT&E Budget Item Justification: PB 2011 Missile Defense Agency

STSS (Space Tracking and Surveillance System)

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
Northrop Grumman	25.2	Aug 2005 – CPAF mod to re-baseline the STSS for FY05 through FY08 in response to funding reductions. Fiscal-year funding constraints required work to be re-prioritized. In order for the contractor to remain on schedule, contractor costs increased (i.e., double/triple shifts, additional personnel). Also, additional tasks were performed, including space vehicle thermal vacuum testing, enhanced training and rehearsal, and anomaly resolution. Completed Jun 2008. (F04701-02-C-0009, P00070)
Northrop Grumman	126.2	Nov 2005 – CPAF mod to re-baseline the STSS for FY05 through FY08 due to funding restriction. Fiscal-year funding constraints required work content to be prioritized and time phased differently from the current Block 6 performance baseline. In order for the contractor to remain on schedule, the contractor's costs increased (i.e., double/triple shifts, additional personnel). The contractor also performed additional government-directed testing to improve mission assurance. No funds obligated at this time. Contract completed Jun 2008. Headquarters Space and Missile Systems Center, Los Angeles Air Force Base, CA, was the contracting activity. (F04701-02-C-0009/P00106)

Timetable

Month	Year	Major Development
Jan	1984	SDIO formed
	1984	Space Surveillance and Tracking System (SSTS) plan formulated
	1987	Brilliant Pebbles plan formulated
	1990	Brilliant Eyes idea formulated
Jun	1992	Rockwell and TRW complete Brilliant Eyes concept designs
	1994	Brilliant Eyes canceled in favor of SBIRS Low
May	1995	TRW selected to develop two Flight Demonstration SBIRS Low spacecraft
Sep	1996	Boeing selected to develop competing LADS SBIRS Low prototype
Feb	1999	USAF cancels LADS and FDS efforts
Aug	1999	TRW and Spectrum Astro teams selected for SBIRS Low PDRR
Oct	2001	SBIRS Low program transferred to the Missile Defense Agency
Apr	2002	SBIRS Low program restructured; TRW selected as prime contractor
Aug	2002	SBIRS Low canceled in favor of STSS
Aug	2002	Northrop Grumman awarded STSS contract to supply two satellites and a ground station
May	2009	STSS ATRR (Block 2010) satellite launched on Delta II launch vehicle
Sep	2009	Launch of two Block 2006 (STSS Demonstrator) satellites on a Delta II launch vehicle

Worldwide Distribution/Inventories

This is a **U.S. Department of Defense** effort under the management of the **U.S. Missile Defense Agency**.

Forecast Rationale

The U.S. Missile Defense Agency Space Tracking and Surveillance System (STSS) is considered an important part of the planned Ballistic Missile Defense System (BMDS). Originally titled SBIR Low, STSS, along with SBIRS High, will provide early warning of missile launches from enemy nations.

With a shift in political administration from right to left, the support for ballistic missile defense overall has also shifted. STSS has come under scrutiny, along with the rest of the ballistic missile defense program. While funding will be reduced, STSS program funding will not be cut entirely.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions $)												
Designation or Program		**High Confidence**				**Good Confidence**			**Speculative**			
	Thru 2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Total**
Northrop Grumman Space Technology (Prime)												
Space Tracking & Surveillance System (STSS) **<> United States <> Missile Defense Agency**												
	1,795.78	161.60	112.60	98.50	56.40	52.90	34.60	34.50	32.00	31.00	30.00	644.10
Total	1,795.78	161.60	112.60	98.50	56.40	52.90	34.60	34.50	32.00	31.00	30.00	644.10