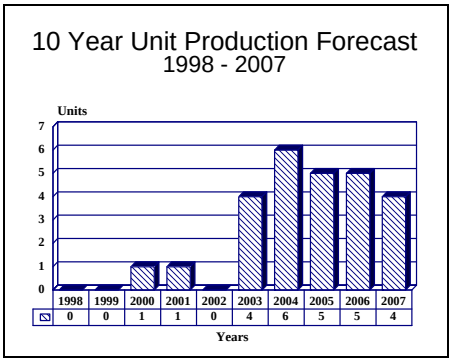
Space and Missile Tracking System (SMTS) - Archived 10/99

Outlook

- In-orbit testing of prototypes expected to start in 2000/01
- Initial Operational Capability (IOC) expected in FY06
- Small chance exists that IOC could be as early as 2002



Orientation

Description. The Space and Missile Tracking System (SMTS) is a program to deploy small space-based sensors, part of the Space-Based Infrared (SBIR) tracking system.

Sponsor. SMTS satellites are being developed for by the Air Force Space and Missile Systems Center, Los Angeles, CA.

Contractors

The two contractor teams that are developing the two initial SMTS prototype include:

Team One:

TRW Space and Electronics Group
One Space Park
Redondo Beach, California (CA) 90278-1001
USA
(Prime contractor producing SMTS prototype)

Raytheon
(formerly Hughes Electro-Optical Systems)
Box 902
El Segundo, California (CA) 90245
USA
(Subcontractor for SMTS prototype)

Team Two:

Boeing North American, Inc
(formerly Rockwell)
2201 Seal Beach Boulevard
Seal Beach, California (CA) 90740
USA
Tel: +1 562 797-5630

Lockheed Martin Missiles & Space
PO Box 3504
1111 Lockheed Way
Sunnyvale, California (CA) 94088-3504
USA
Tel: +1 408 742-7151

Status. Demonstration validation phase; in-orbit testing of SMTS prototypes is expected to begin in FY00. The Air Force is accelerating the SMTS schedule, with deployment beginning in FY04 instead of FY06, and an initial operational capability (IOC) moved from FY08 to FY06.

Total Produced. None.

Application. SMTS satellites are low-Earth orbiting spacecraft that will use passive sensors to detect and track objects – primarily hostile nuclear warheads, discriminate hostile re-entry vehicles from decoys, and provide targeting information to ground-based interceptors.

Price Range. No official price estimates for SMTS are available. However, given the nature of the instruments expected to be onboard, a reasonable guess would place the prototype unit cost at approximately US$150 million.

Technical Data

Design Features. Although the SMTS program is in its relative infancy, some basic design features have surfaced. SMTS satellites will be large, perhaps weighing between 545 and 680 kilograms. Sensors under consideration for the satellites include an on-axis Low Wave-length Infrared (LWIR) telescope, and visible/ Medium-Wavelength Infrared (MWIR)/Short-Wavelength Infrared (SWIR) off-axis telescope, all to provide detection of targets.

SMTS satellites will employ new cryocoolers for the infrared viewers. To date, the Air Force has completed prototype flight cryocooler final assembly of compressor and expansion engineering modules and demonstrated 10 Kelvin sorption cryocooler technology in laboratory tests. The results have exceeded all operational specifications, according to the Air Force. Future plans call for long-life testing of a 60 Kelvin standard spacecraft mechanical cryocooler and initiation of development on a 10 Kelvin sorption cryocooler components.

The Air Force Phillips Laboratory is working on ways to mass-produce LWIR sensors under its Hybrids With Advance Yield for Surveillance (HYWAYS) program. Cryocooler research is also being performed at NASA's Jet Propulsion Laboratory.

Variants/Upgrades

Proponents of SMTS have highlighted the sensors' usefulness, not only as a military system to track hostile weapons, but also as a remote sensing system to monitor Earth resources. Because SMTS would provide 24-hour global coverage, portions of the Earth's surface could be monitored on a continuous basis. SMTS spacecraft could be used for crop assessments, weather forecasting and environmental monitoring, among other uses.

Program Review

Background. SMTS (formerly Brilliant Eyes) is a spin-off of the Ballistic Missile Defense Organization's (BMDO) Brilliant Pebbles program, and involves space-based interceptors that would collide with a target to destroy it. The Brilliant Pebbles idea came from the Lawrence Livermore National Laboratory in Livermore, California, an Energy Department facility. In developing the Brilliant Eyes concept, Livermore dropped the rocket-propelled kinetic kill vehicle and added more sensors. Brilliant Eyes would spot targets and pass that information on to ground-based interceptors.

The SMTS program traces its roots to the SDI's space-based sensors program, which, since the SDI program officially began in 1984, has undergone a number of changes. At one time the Strategic Defense Initiative Organization (SDIO) was moving toward development of the Space Surveillance and Tracking System (SSTS), a constellation of large, complex (and very expensive) spacecraft to provide midcourse tracking of ballistic missiles. In late 1990, however, the Pentagon reconsidered the SSTS scheme as part of an overall shift toward the Global Protection Against Limited Strikes (GPALS) concept. GPALS would forgo the use of SSTS spacecraft in favor of fewer than 100 Brilliant Eyes satellites. There were a number of advantages to this approach.

Brilliant Eyes would be positioned in low-Earth orbit compared to the higher orbits for SSTS spacecraft. As a result, their sensors could be made smaller, less complicated and less expensive than their SSTS counterparts. The relatively few SSTS spacecraft in orbit (18) could become targets for (then) Soviet anti-satellite weapons, but the nearly 100 Brilliant Eyes might prove more difficult to disable. Their small size would also allow a greater number to be launched at a time, saving on deployment costs.

Brilliant Eyes Announcement. The Air Force Space Systems Division (now called the Space and Missiles Systems Center), which was given charge of Brilliant Eyes by the SDIO, released an announcement in

December 1990 concerning proposals for Brilliant Eyes development. The announcement included options for the program's demonstration/validation (Dem/Val) phase and full-scale engineering development (FSED). The Dem/Val phase includes a flight test experiment to verify functionality of key technologies. The emphasis during the FSED will be manufacturing and producibility, the Air Force said.

Brilliant Eyes Contracts. On June 6, 1991, the Air Force Space Systems Division awarded four, one-year contracts worth about US$5.2 million each for Brilliant Eyes concept design and test requirements. Receiving the awards were Lockheed Missiles & Space Co, Sunnyvale, CA; Martin Marietta Defense Space and Communications Co, Littleton, CO; Rockwell Strategic Defense Center, Seal Beach, CA; and TRW Inc, Redondo Beach, CA.

The Space Systems Division released an RFP for the Dem/Val phase of the Brilliant Eyes program in April 1992. This phase includes the Brilliant Eyes system design and ground demonstration of key development technologies, Brilliant Eyes flight demonstration planning, Brilliant Eyes flight demonstrations, and ground system design and development.

The Air Force Space and Missile Systems Center awarded Rockwell International and TRW Inc two major development contracts in December 1992 for the Brilliant Eyes space-based sensor program. Rockwell International won a US$265 million contract, and TRW received a US$223.5 million award.

Brilliant Eyes Forms Part of SBIR. Then Deputy Defense Secretary John Deutch approved in November 1994 a new multi-layer satellite system to replace Defense Support Program satellites in the role of detecting missile launches. Called the Space-Based Infrared system, it would consist of four satellites in geosynchronous orbit, two satellites in highly elliptical orbits, and multiple SMTS satellites orbiting closer to Earth. SBIR is a reshaped version of the Alert, Locate and Report Missiles (ALARM) program, itself a follow-on to the former FEWS program.

TRW Selected as Brilliant Eyes Contractor. Coming on the heels of an Air Force decision to proceed with the SMTS program using only one contractor, TRW was selected in May 1995 to proceed with the design of the SMTS satellite. The design work continued into 1996 and brought the value of the original contract to US$249 million. The Air Force in March 1996 increased the contract's value by US$214.1 million.

In an abrupt turnaround, the Air Force in September 1996 awarded a Rockwell (now Boeing North America)-Lockheed Martin team a US$179 million, 27-month contract to build one test satellite to compete with the TRW-Hughes SMTS prototype. Lockheed will supply its lightweight LM700 bus and a launch vehicle, while Boeing North America will develop the satellite sensors and oversee systems engineering and flight operations. The Air Force will award a single contract in 1999 to build the SMTS system.

In 1997 the DoD came under Congressional pressure to accelerate the SMTS and SBIRS programs. While the DoD has moved up the initial launch date from 2006 to 2004, it presented Congress with an accelerated schedule that could see the first launch occurring in 2002. The DoD also noted that a launch in 2002/03 would carry a high risk factor as testing would be inadequate, resulting in the possibility of even more serious setbacks to the program.

The DoD further stated that to launch in 2002, an additional US$2.1 billion would need to be allocated between FY97 and 2002. This increased funding has apparently caused some hesitation within Congress and the White House. The administration has announced that it will wait until 2000 to assess whether a current threat environment exists that would warrant such an investment, and to take stock of how the technology has progressed.

The FY98/99 program of the SBIRS system continues to focus primarily on the testing of ground station equipment as well as SBIRS Low Flight Demonstration System equipment. Remaining funds are going to a multitude of programs, including simulations, low-altitude demonstrations, and program office activities.

In FY98 the engineering and manufacturing development (EMD) program of the SBIR Low SMTS system was transferred into its own Program Element Description (PED). Funding for the EMD program becomes available in FY99. The goals for that year include SBIRS Low Program Definition activities for Cost as an Independent Variable (CAIV), risk assessment, and EMD planning.

Funding

Brilliant Eyes funding is provided through two SBIR program elements: 0603441F – Space-based IR Architecture (Dem/Val); and 0604441F – Space-based IR Architecture (EMD).

US FUNDING

	FY97 AMT	FY98 AMT	FY99(Req) AMT	FY00(Req) AMT
US Air Force				
PE#0603441F – Project 0007 (R&D) SBIRS Low	241.5	199.7	160.3	154.1
PE#0604442F – Project 4598 (EMD)[a] SBIRS Low	0.0	0.0	33.3	79.1

	FY01(Req) AMT	FY02(Req) AMT	FY03(Req) AMT	FY04(Req) AMT
Project 0007 (R&D) SBIRS Low	115.5	94.4	0.0	0.0
Project 4598 (EMD) SBIRS Low	148.7	420.2	823.9	N/A

All $ are in US millions.

Source: Biennial RDT&E Descriptive Summary 1998/1999.

[a]This project was transferred from PE#0604441F to its own PED in FY98.

Timetable

Month	Year	Major Development
Jan	1984	SDI Organization formed
	1987	Brilliant Pebbles idea formulated
	1990	Brilliant Eyes idea formulated
Apr	1991	USAF releases Brilliant Eyes RFP
Jun	1991	Four contractors picked for Brilliant Eyes concept design
Jun	1992	Completion of concept design contracts
Dec	1992	TRW and Rockwell selected to build four prototypes
May	1995	TRW selected to develop SMTS prototype
Sep	1996	Boeing North America selected to develop SMTS prototype
	FY99	SMTS flight tests to begin
	FY04	First SMTS launch
	FY06	SMTS IOC

Forecast Rationale

The Space Missile and Tracking System (SMTS) is being touted as a system that will be able to detect and track inbound ballistic missile threats. It will also have the ability to discriminate between live warheads and decoys, thereby ensuring any defensive response will not be wasted on a decoy. The SMTS is the main component of the Space-Based Infrared Tracking System (SBIRS) which evolved from the Reagan administration "Star Wars" Brilliant Pebbles program.

In recent years, Congress has pushed the DoD to field the SBIRS system earlier than its 2008 Initial Operational Capability (IOC) date. Due to a significant increase in funding the DoD has pushed the IOC date up to 2006, with initial launches of the satellites to occur in 2004. Initial orbital testing of test units is currently scheduled for 2001 and 2002 using two test satellites.

Even this has not halted the Congressional cry to field the system even sooner. The DoD in 1997 presented a plan that could field the first operational units in 2002, but would require an additional US$2.1 billion in funding between FY97 and 2002. In addition, testing

would be compressed to the point that more expensive operational units would serve as a test bed. If a major error or setback occurred, this could easily force the SBIRS IOC back to the original 2008 date. These two reasons have given both Congress and the White House pause on this matter. Instead, the program will be reviewed in 2000 to determine if the program needs to be stepped up.

The ten-year forecast is based on the operational deployment of 24 satellites (plus test units) with an IOC of 2006. The satellites have been given a one-year lead time from the actual launch year of any particular system.

Due to the intense interest shown by the US government in this program the entire forecast should be considered "good." Funding will remain high with an estimated US$7.4 billion in R&D and EMD funding being slated through at least 2008. The one thing that could radically alter both this funding and the IOC of the system would be if the US does decide to accelerate the program in order to achieve IOC by 2004. As this decision is not due until 2000 the forecast will hold until that time.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level			Good Confidence Level				Speculative			
Designation	**Application**	**thru 97**	**98**	**99**	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**Total 98-07**
SMTS/BRILLIANT EYES	BALLISTIC MISSILE DEFENSE (USAF)	0	0	0	1	1	0	4	6	5	5	4	26