Space Radar

Outlook

- Congressional Budget Office (CBO) report indicates that total cost of Space Radar development, deployment, and maintenance could be anywhere between $26 billion and $94 billion
- Lockheed Martin and Northrop Grumman – prime contractors on the Space Radar program – confirmed in April 2008 that the Space Radar program was canceled, due to high costs of level of technology
- Program could be revitalized at a later date with reduced capabilities or more cost sharing

Orientation

Description. This effort funded the development of a space-based sensor that would provide radar-based synthetic aperture radar imaging, ground moving target indication, and digital terrain and elevation data.

Sponsor

U.S. Air Force
Space and Missiles System Center
SMSC/PAM
2400 East Segundo Boulevard
Los Angeles AFB, CA 90009-2960
USA
Tel: + 1 (213) 643-0030
Web site: http://www.losangeles.af.mil/

National Reconnaissance Office
14675 Lee Rd
Chantilly, VA 20151-1715
USA
Tel: + 1 (703) 808-1198
Web site: http://www.nro.gov

Status. The Space Radar program has been canceled. It was in the concept development phase prior to cancellation.

Application. Multi-theater surveillance, identification, tracking, and targeting.

Contractors

Prime

Lockheed Martin Space Systems Co, Division HQ	http://www.lockheedmartin.com/ssc, 12257 S Wadsworth Blvd, Littleton, CO 80125-8500 United States, Tel: + 1 (303) 977-3000, Prime
Northrop Grumman Space Technology	http://www.st.northropgrumman.com, One Space Park, Redondo Beach, CA 90278 United States, Tel: + 1 (310) 812-4321, Fax: + 1 (310) 813-7548, Prime
NOTE(S): Each company will generate a Space Radar Concept for evaluation and eventual down-select to (probably) a single developer. Separate actions are supporting various Electronic Scanned Array technologies for use in the production system.	

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

Design Features. The Space Radar faces severe weight and power restrictions. Because prime power is limited, but volume is not, radar designs favor high-gain, low-power antennas and extremely low-power-drain front ends. One approach being investigated, according to a paper presented at the Institute of Electrical and Electronics Engineers 2004 Radar Conference, features a unique active lens antenna instead of the active modules becoming commonplace in terrestrial radars. Air Force officials specified an active antenna for the Space Radar.

A triangular truss structure would feature one side as the lens, with solar cells mounted on the other and the third side functioning as a thermal radiator. The lens would be fed from a long, narrow array positioned inside the truss. Beam steering would be through a combination of mechanical rotation (roll) of the entire lens along its long axis and/or electronic steering with phase and time-delay steering.

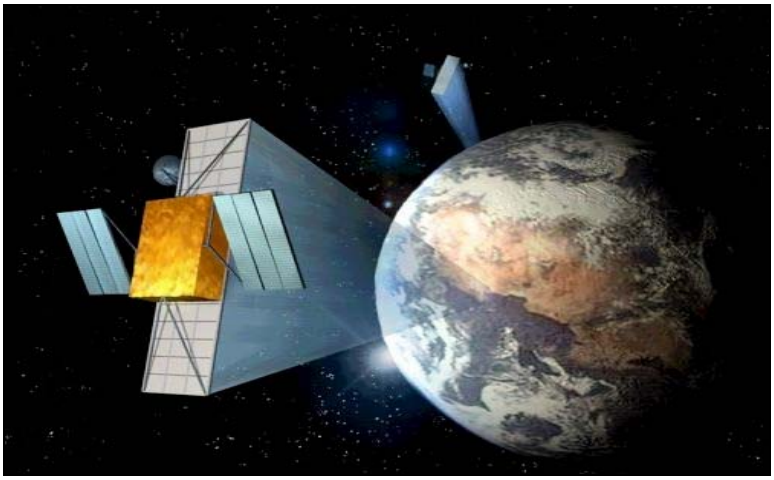
An active lens has an advantage over fully active arrays: signal distribution is achieved via mass-less space feed, a simpler and more efficient way of converting prime power to radiated power. It also has a better noise figure. This is thought to offer the lowest cost-per-array element while supporting demanding space-based GMTI goals.

Operational Characteristics. The planned Space Radar satellites are to provide the intelligence agencies and battlefield commanders with what is being called "universal situational awareness." The concept does not mean the ability to continuously observe everything, but rather to track enough objects to provide relevant and timely data. It will detect moving targets on land and sea, take images of designated areas, and gather terrain elevation data for 3-D planning maps.

Electronically scanned arrays will be able to cover broad swaths of the Earth's surface and accommodate last-minute requests for surveillance. Control will be primarily by intelligence planners. Control by battle-field commanders is uncertain.

The Space Radar program has been designated the Single Common Space radar for all agencies, and both the military and intelligence community.

Stated goals of the system are to provide reliable strategic warning, support a strategy of deterrence, support deployed forces, and ensure that knowledgeable adversaries do not compromise the capabilities of the deployed forces.



Space Radar Concept

Source: Discoverer II Program

Program Review

Beginning in 1999, the U.S. Air Force, along with the National Reconnaissance Office, DARPA, and the National Geospatial-Intelligence Agency (NGA), began an effort to develop a space radar system. The system would be able to provide detailed information to the Department of Defense and intelligence agencies with minimal risk to U.S. forces. Two companies, Lockheed Martin and Northrop Grumman, were chosen to compete for the contract to develop and manufacture the constellation of satellites.

Cost Overruns Cause Congressional Concern

During budget deliberations in late 1999, Congress threatened budget cuts due to cost concerns. Public statements by Secretary of Defense William Cohen saved the program's funding for that year. In a mid-2000 announcement on the program, the launch date was slipped to 2010.

In FY01, the House and Senate appropriations conference removed all Discoverer II funds from the bill. Capitol Hill continued to feel that support from Air Force and intelligence officials was lukewarm. There was also significant worry about the maturity of the technology available, and the requirements called for in the system.

Risk Reduction Begun in FY02

In FY02, the Air Force spent $12.34 million to begin Technology Risk Reduction and continue a classified electronically scanned array effort. Designers started onboard processing system development efforts while providing support to the BMC^3 (Battle Management Command, Control, and Communications) effort; $8.5 million was used to begin Requirements Development and Operational Requirements Definitions for the SBR system; and $2.3 million went to Program Support (concept evaluation, schedule management, independent cost analysis, technical evaluation, source selection).

In FY03, planners budgeted $11.16 million for technology risk reduction activities. A total of $11.02 million was programmed for the Requirements Development and Operational Requirements Definition project, $19.101 million was budgeted to begin Concept Definition for a candidate operational system; and $5.870 million went to program support.

In FY04, the original budget request programmed $133 million to continue technology risk-reduction activities, adding end-to-end payload prototype development and development of alternative signal processing algorithms. The BMC^3 effort was expanded to include interface identification, and definition and provision of Advanced Concept Technology Demonstration (ACTD) support. A total of $119.104 million was planned to complete concept definition. Additional efforts were to include, but not be limited to, development of precise costing methodologies and the modeling and simulation of system performance and utility analyses.

Congress cut the original request by $100 million in the FY04 Defense Appropriation, citing program affordability concerns. The appropriators put no other restrictions on how the remaining funds could be spent within the planned program.

Lockheed and Northrop Chosen to Compete

On April 16, 2004, the Air Force awarded SBR concept development contracts to Lockheed Martin, Littleton, Colorado, and Northrop Grumman Space Systems, Redondo Beach, California. The $220 million cost-plus-fixed-fee concept development effort called for each contractor to develop multiple candidate architectures for an SBR system. These would be reviewed at an Alternate System Review, after which each contractor would select a single solution for further development into a SBR system design.

This design and development work would culminate in a review of both designs, which would be followed by a source selection for a follow-on contract to design, develop, test, produce, and deploy Increment One of the SBR system. This work was expected to be completed by April 2006.

In FY04, the Air Force spent $66.12 million on risk-reduction activities on the electronically scanned array and onboard processing, including end-to-end payload testbeds and alternative signal processing algorithms. Designers expanded the Battle Management Command, Control, Communications effort, including interface identification and definition, and provided ACTD support.

Also in FY04, the program allocated $85 million for continued concept definition and the award of two Phase A concept development contracts.

Congress, in the FY05 Defense Appropriations bill, made significant cuts to the Space-Based Radar program. The Air Force requested $327 million. In their individual versions of the appropriations bill, the Senate recommended a cut of $100 million, while the House called for a $252.73 million cut, with significant concerns expressed and restrictions imposed. The FY05 conference committee accepted the House position,

appropriating $75 million for the program and directing that SBR be taken off the acquisition track.

Innovation and Affordability Emphasized

To address congressional concerns and to arrive at a technically feasible solution, the Air Force placed increased emphasis on innovation and affordability in terms of SR concept exploration efforts. This resulted in significant changes to the SR program. While continuing to be dual-use to meet Department of Defense needs, the designers and planners began to focus on smaller constellations of high-performance, more-affordable satellites.

The move to smaller, more-affordable constellations was driven by the realization that developing a single system to provide a global continuous target tracking capability would not be affordable. The more-affordable system concepts that resulted would be more effective by leveraging advanced technologies and increased levels of horizontal integration with other ISR platforms, national infrastructure, and DoD weapon systems.

Air Force and OSD leadership plan to further address congressional concerns through an on-orbit demonstration that will validate Space Radar costs and technology maturity. The program will also shift focus toward payload maturation, a robust technology risk-reduction and system-of-systems engineering program, and a structured revalidation of requirements. In addition, leadership commissioned an independent technology assessment to look at alternative technologies to reduce cost and improve utility.

Additional near-term efforts include technology risk-reduction demonstrations, as well as system-of-systems engineering activities, war-games and experiments, and modeling and simulation efforts, among other activities.

These efforts were budgeted at $66.376 million in FY05, $210.782 million in FY06, and $320.560 million in FY07, with the remainder of the budget for each year to go toward various program support activities.

The 2006 program focused on overall program affordability by stressing innovation through program risk reduction and technology maturation. The program leveraged National Reconnaissance Office (NRO), National Geospatial-Intelligence Agency (NGA), Defense Advanced Research Projects Agency (DARPA), and Air Force Research Laboratory (AFRL) activities to ensure both DoD and Intelligence Community requirements were satisfied in the baseline SR effort.

Contracts Awarded in 2006

In December 2006, contracts were awarded to Northrop Grumman and Lockheed Martin, each worth about $49 million. The contracts covered modeling and simulation, risk reduction, and technology demonstrations for the Space Radar. The contract established each company as a candidate for the final development contract.

A Congressional Budget Office (CBO) report issued in January 2007 indicated that the total cost of Space Radar development, deployment, and maintenance was estimated to cost anywhere between $26 billion and $94 billion. One of the largest cost variables discussed in the report was the number of satellites the DoD could purchase, with numbers ranging anywhere between 5 and 21 satellites.

Beginning in FY08, the Space Radar program was classified as a secret program. Funding also shifted from the Air Force to the National Reconnaissance Office (NRO). However, Congress shifted funding back to the Air Force, making it once again public, to ensure that the program was more visible.

Related News

Space Radar Canceled – Prime contractors on the Space Radar program, Lockheed Martin and Northrop Grumman, confirmed in April 2008 that the Space Radar program was canceled. High costs and technological feasibility were the prime reasons given for the cancellation. In order to include the level of technology needed to meet the capabilities set out by the Air Force, costs would have been at least $35 billion to $50 billion for a nine-satellite system. (*Aviation Week*, 4/08)

Funding

In FY08, funding for Space Radar was moved from PE#0603858F to PE#0305159F (Defense Reconnaissance Support Activities) and the program was made proprietary. Funding was canceled in FY09.

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
Lockheed Martin	30.5	Apr 2004 – CPFF contract to provide for Space-Based Radar concept development efforts. Each contractor would develop multiple candidate architectures for an SBR system, which would be reviewed by the government at an Alternate System Review. After ASR, each contractor would select a single solution for further development into an SBR design. This design/development work would culminate in a System Design Review of both designs, to be followed by a source selection for a follow-on contract to design, develop, test, produce, and deploy Increment One of the SBR System. Completed Apr 2006. (FA8820-04-C-0001)
Northrop Grumman	30.0	Apr 2004 – CPFF contract to provide for Space-Based Radar concept development efforts. Each contractor would develop multiple candidate architectures for an SBR system, to be reviewed by the government at an Alternate System Review. After ASR, each contractor would select a single solution for further development into an SBR design, which would culminate in a System Design Review of both designs. SDR will be followed by a source selection for a follow-on contract to design, develop, test, produce, and deploy Increment One of the SBR System. Completed Apr 2006. (FA8820-04-C-0002)
Lockheed Martin	48.67	Dec 2006 – CPFF to develop Space Radar. It will cover modeling and simulation, risk reduction, and technology demonstrations. Work will be completed in Apr 2009. (FA8820-04-C-0002/P00022)
Northrop Grumman	48.99	Dec 2006 – CPFF to develop Space Radar. It will cover modeling and simulation, risk reduction, and technology demonstrations. Work will be completed in Apr 2009. (FA8820-04-C-0001/P00021)

Timetable

Month	Year	Major Development
2Q	FY02	AoA started; requirements development; technology risk reduction
1Q	FY03	Concept definition
2Q	FY03	Initial CONOPS completed
3Q	FY03	Key Decision Point A
1Q	FY04	AoA completed
2Q	FY04	Phase A concept development contracts awarded
1Q-4Q	FY05-07	Prime Contractors Program Management Reviews (PMRs)
1Q	FY06	Government Reference Architecture (GRA) update, Program Office Estimate (POE) update
2Q	FY06	JROC MRB approves revised ICD; ACTD Military Utility Assessment
4Q	FY06	CONOPS Revision B
3Q	FY07	System Requirements Review
4Q	FY07	Cost Analysis Requirement Description (and POE update)
Apr	2008	Prime contractors confirm that Space Radar program canceled

Space Radar

Worldwide Distribution/Inventories

This is a **U.S.**-only program.

Forecast Rationale

Space Radar Canceled

The Space Radar program was canceled due to the high cost involved in developing a level of technology that could provide the Air Force and intelligence community with the capabilities needed. It was realized that developing a single system to provide a global continuous target tracking capability was not affordable. The most recent estimates place the cost of the system at anywhere between $30 billion and $50 billion.

Although high costs ended the Space Radar program, the need for persistent surveillance capabilities from space still exists. The program would have provided synthetic aperture radar, moving targeting indication, and topographic data to the military and intelligence community. Many even believe that the technology would have revolutionized the commercial market, much in the same way GPS already has.

With this in mind, it is possible that the program will be revitalized, but with modifications. Designing a less capable, and therefore less expensive, system would be one solution to the high-cost problem. Another solution that has been suggested would be to form partnerships between various governments and companies to pay for a system that could have value for many sections of society.

At this time, there are no indications that the Air Force or intelligence community wants to pursue either solution. The program will be tracked closely, and Forecast International will report any changes should they arise. However, since funding has ended, Forecast International plans to archive this report in 2009 barring any further developments.

Ten-Year Outlook

Barring any further developments of the Space Radar program, this report will be archived in 2009.

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