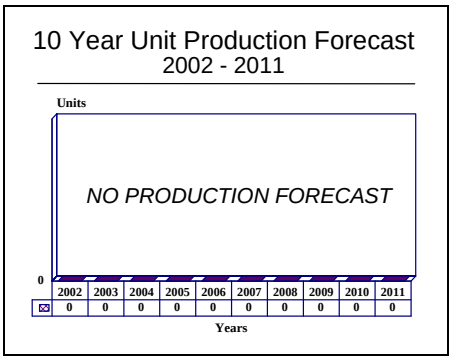
Defense Support Program (DSP) - Archived 08/2003

Outlook

- Forecast International projects the US Air Force to purchase no DSP satellites over the next decade
- Look for DSP-22 satellite to be launched sometime in the fall of 2002
- Expect Defense Support Program satellite 23 to lift off in August 2003



Orientation

Description. The Defense Support Program (DSP) is a United States Air Force endeavor. The DSP develops and deploys satellites that provide early detection and warning of missile launches and nuclear explosions.

Sponsor

US Air Force
The Space and Missile Systems Center
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USA
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US Air Force Space Command
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US Air Force Air Mobility Command
Scott AFB, Illinois (IL)
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US Air Force Materiel Command
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Tel: +1 937 257 3211
Web site: http://www.afmc.wpafb.af.mil

US Air Force Operational Test and Evaluation Center
Kirtland AFB, New Mexico (NM)
USA
Web site: http://www.afotec.af.mil

Prime Contractors

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TRW Inc. - Space & Electronics
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Web site: http://www.trw.com

Status. The Defense Support Program satellites are in operation. The Defense Support Program itself is continually conducting research and development.

Total Produced. Twenty-three DSP satellites have been produced.

Application. To provide early detection and warning of missile launches and nuclear explosions.

Price Range. The cost of one DSP satellite is approximately US$400 million. Price information obtained from the US Department of Defense.

Technical Data

DSP Satellites, Block 1 through 13. DSP satellites, Block 1 through 13, have a weight of about 2,535 pounds, a length of 22 feet, and a diameter of 9 feet, and are powered by four solar cell panels. These first- and second-generation DSP satellites have infrared (IR), ultraviolet, video, electromagnetic, and nuclear radiation sensors. Although second-generation DSP satellites were only designed for an on-orbit life span of three years, most DSP satellites have continued operating in geosynchronous orbit for five to seven years.

The primary sensor for the second-generation DSP satellite is a 12-foot Schmidt IR telescope. The telescope's line of sight is offset 7.5 degrees from the vertical axis of the satellite. This sensor is oriented toward Earth so that its 6,000 infrared detectors can sense the heat plume emitted by ballistic missiles in the first minutes after launch. It also provides a means to determine missile launch sites and the location of nuclear bursts on Earth. Data from the DSP satellites are relayed via the Defense Satellite Communications System to ground stations at Alice Springs, Australia, and Buckley Field, Colorado.

DSP Satellites, Block 14. Next-generation Block 14 satellites are larger and heavier than their predecessors. Block 14 satellites are designed to last about two years longer than their ancestors. The spacecraft is protected from attempts to blind the satellite's sensitive infrared detectors with ground-based lasers, and the vehicle's limited maneuverability enables it to evade anti-satellite weapons. Larger solar panels produce double the power of the second-generation DSPs.

Defense Support Program-Improvement Satellites: Block 14 Satellite Characteristics

Orbital Altitude	19,320 nautical miles (35,780 kilometers)
Powerplant	Solar arrays generate 1,485 watts of power (satellite uses 1,274 watts)
Height	32.8 feet (10 meters) on orbit; 28 feet (8.5 meters) at launch
Weight	5,250 pounds (2,386 kilograms)
Diameter	22 feet (6.7 meters) on orbit; 13.7 feet (4.2 meters) at launch

DSP Mobile Ground System. The Mobile Ground System (MGS) is designed to enhance DSP ground station survivability. The system, which processes data downlinked from DSP satellites and transmits reports to ground and airborne users, is composed of multiple sets of two prime elements: the Mobile Ground Terminal (MGT) and the Mobile Communications Terminal (MCT).

The MGTs and LCVs have been designed to look like standard commercial tractor-trailer rigs. They are capable of negotiating most primary and secondary roads. The MGTs and LCVs are transportable by C-5 aircraft, are capable of continuous operation, and can be rapidly reconfigured for road travel, moved to new locations, and quickly set up again.

Variants/Upgrades

Defense Support Program-Improvement Satellites. In June 1989, the US Air Force launched a Defense Support Program-Improvement (DSP-I) Block 14 satellite on a Titan IV booster from Cape Canaveral, Florida. This third-generation DSP satellite provides the United States with enhanced missile detection and warning capabilities. The DSP-I satellite possesses greater advanced potential threat survival capabilities than its predecessors.

The primary telescope aboard the DSP-I Block 14 contains a dual-wavelength focal plane. This focal plane provides enhanced protection against laser attack and better discrimination of missile launches. Other enhancements found in DSP-I satellites include a mission data message rebroadcast capability, a

classified capability to maneuver away from Russian anti-satellite (ASAT) interceptors, and advanced nuclear detection sensors.

Program Review

Background. In December 1966, TRW and Aerojet General were named associate prime contractors for the DSP Satellite. The firms were awarded a contract totaling US$50 million for satellite development.

After the completion of a Critical Design Review (CDR) in June 1978, a new sensor providing more data was retrofitted on Satellites 5R and 6R. In February 1980, the US Department of Defense (DoD) decided to increase the survivability of the current DSP system. Contracts were awarded in August and October 1981 for satellites, Block 14 through 17 sensors, and spacecraft full-scale engineering development.

Mobile Ground Terminals (MGTs) design was completed in 1982, and six were procured through 1985. Spacecraft design for DSP Block 14 through 17 was completed at the conclusion of the last CDR in May 1983. DSP Block 14 and 15 were procured on a fully funded basis in 1983, with long-lead procurement initiated in 1982. Procurement of DSP Block 16 and 17 occurred in 1984.

Initial Operational Test and Evaluation (IOT&E) was completed on the Mobile Ground System (MGS) in 1986. Upgrades of the ground support elements continued in 1987. In 1988, efforts continued on the upgrade of the MGS to make processing and communications hardware compatible with DSP-I.

During 1990, the European Ground Station (EGS) became operational, replacing the insupportable and less capable Simplified Processing Station. Efforts in 1991 and 1992 brought successful launches of DSP-15 on a Titan IV and DSP-16 from the Space Shuttle.

In 1993, System 1 software was terminated when the contractor-estimated cost to completion jumped from US$129 million to US$202 million, along with a one-year delay in the development schedule. During 1995, program activity centered on completing integration of the DSP MGT and the MILSTAR Mobile Communications Vehicle. During 1996 and 1997, DSP work focused on software development and ground station facility support. In 1997, DSP-18 was launched from a Titan IV. On August 19, 1998, DSP Sensor 23 (the final sensor) was delivered to the US Air Force.

On April 9, 1999, DSP-19 was launched from a Titan IVB rocket at the US Air Force's Cape Canaveral Air Station. Soon after the launch, Air Force officials noticed that the satellite was spinning abnormally. Instead of spinning in the desired circular orbit, the satellite was spinning in an elliptical orbit. This irregular course resulted in the loss of DSP-19. A subsequent investigation showed that the mislaunch was caused by a malfunction of the Titan IVB's Inertial Upper Stage.

On May 8, 2000, the US Air Force launched DSP-20 from Cape Canaveral. Approximately seven hours after liftoff, the inertial upper stage booster of the Titan IVB rocket successfully delivered the satellite into geosynchronous orbit above the equator.

Latest Information. On August 6, 2001, a Boeing inertial upper stage (IUS) payload delivery vehicle successfully deployed Defense Support Program satellite 21. The launch took place from space launch complex 40 at Cape Canaveral Air Force Station, Florida.

Following separation from the Titan IVB, the Boeing IUS fired its two stages to propel the spacecraft toward its geosynchronous orbit. The IUS performed roll maneuvers to protect the DSP spacecraft from extreme heat and cold temperatures prior to spacecraft separation. Once the IUS reached its intended orbit, the IUS successfully deployed the 5,200-pound TRW-built defense satellite. Acquisition of the DSP spacecraft from Air Force ground tracking stations confirmed that the satellite was operating normally.

Forecast International expects the DSP-22 satellite to be launched sometime in the fall of 2002. Additionally, Forecast International projects DSP-23 to lift off in August 2003. Look for DSP-23 to be launched aboard a Delta IV Heavy booster rocket.

The follow-on program to DSP is the Space-Based Infrared System (SBIRS). SBIRS High satellites are being built to replace the TRW Defense Support Program satellites now in operation. SBIRS High will consist of four satellites in geosynchronous Earth orbit, and two sensors in highly elliptical orbit. The SBIRS satellites will provide better coverage than DSP satellites.

Forecast International expects SBIRS High satellites, which are being produced by Lockheed Martin, to be launched sometime between 2005 and 2006.

Funding

US RDT&E FUNDING

	FY01		FY02		FY03			
	QTY	AMT	QTY	AMT	QTY	AMT		
RDT&E (USAF)								
PE#0305911F	-	12.8	-	6.1	-	2.1		
	FY04		FY05		FY06		FY07	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (USAF)								
PE#0305911F	-	0.0	-	0.0	-	0.0	-	0.0

All US$ are in millions.

Source: US Air Force FY 2002 RDT&E Descriptive Summary

US PROCUREMENT FUNDING

	FY01		FY02		FY03			
	QTY	AMT	QTY	AMT	QTY	AMT		
DSP	-	102.0	-	109.0	-	114.4		
	FY04		FY05		FY06		FY07	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
DSP	-	117.4	-	35.2	-	33.4	-	34.1

All US$ are in millions.

Source: US Air Force FY 2002 Procurement Program

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Aerojet	49.2	Sep 2001 – Aerojet awarded a contract modification to provide for fiscal year 2002 postproduction support for the sensors on the Defense Support Program spacecraft. Work to be completed September 2002. Space and Missile Systems Center, Los Angeles, California, is the contracting authority. (F04701-96-C-0031, P00072)
TRW Incorporated	42.2	Sep 2001 – TRW Incorporated awarded a contract modification to provide for fiscal year 2002 postproduction support for the Defense Support Program satellite system. Work to be completed September 2002. Space and Missile Systems Center, Los Angeles, California, is the contracting authority. (F04701-96-C-0030, P00065)
Aerojet	5.8	Dec 2001 – Aerojet awarded a contract modification to provide for Period 5 (fiscal year 2001) earned award fee for performance of the Defense Support Program Sensor Post-Production and Constellation Support effort. Space and Missile Systems Center, Los Angeles Air Force Base, California, is the contracting authority. (F04701-96-C-0031, P00078)

Timetable

Month	Year	Major Development

Month	Year	Major Development
	1960s	Predefinition and definition studies; prime contractors selected
	1970s	First launch of a DSP satellite; Block 10-11 retrofit completed
Aug	1980	Delivery of DSP-12
Jul	1981	Delivery of DSP-13
Aug	1984	First Mobile Ground Terminal delivered
Nov	1987	DSP-13 launched on Titan 34D
	1988	Delivery of DSP-14
Jun	1989	DSP-14 launched on Titan IV
Nov	1990	DSP-15 launched on Titan IV
Dec	1991	DSP-16 launched from Space Shuttle Atlantis
Dec	1992	System 1 software segment terminated
	1994	Satellite Readout Station upgrade completed; DSP-17 launched
	1995	Ground Computer Changeout completed
Feb	1997	DSP-18 launched on Titan IV
Aug	1998	Sensor 23 delivered
Apr	1999	DSP-19 launched – mission failed when satellite did not reach its intended orbit
May	2000	DSP-20 launched on Titan IVB
Aug	2001	DSP-21 launched
Fall	2002	DSP-22 to be launched
Fall	2003	DSP-23 to be launched
	2005-2006	SBIRS satellite constellation scheduled for launch (replacement for DSP satellites)

Worldwide Distribution

The Defense Support Program is a **US Department of Defense** program. That said, DSP was used extensively by the coalition forces in Operation Desert Storm to detect Iraqi Scud missile launches.

Forecast Rationale

The Defense Support Program, or DSP, is a United States Air Force endeavor. The DSP develops and deploys satellites that provide early detection and warning of missile launches and nuclear explosions.

As indicated by the **Ten-Year Outlook** chart, Forecast International projects the US Air Force to purchase no DSP satellites over the next decade. This projection indicates that the Defense Support Program is coming to a close.

Defense Support Program satellites are a key part of North America's early warning system, capable of detecting missile launches, space launches, and nuclear detonations. Warning data are fed to NORAD and US Space Command early warning centers at Cheyenne Mountain AFS, Colorado.

Since their first launch, DSP satellites have provided an uninterrupted early warning capability to the United States. Though not designed to spot and track smaller missiles, the system's capability was demonstrated during the Persian Gulf War: the satellites provided warnings of Iraqi Scud attacks.

The follow-on program to the US Air Force's DSP is the Space-Based Infrared System (SBIRS). The SBIRS satellites will provide better coverage than the Defense Support Program satellites. Forecast International expects SBIRS satellites to be launched sometime between 2005 and 2006.

DSP operation and maintenance funding will continue until the SBIRS program officially replaces the DSP. Forecast International will continue to analyze Defense Support Program developments as they occur.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

			High Confidence Level				Good Confidence Level			Speculative			
Designation	**Application**	**Thru 01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**	**11**	**Total 02-11**
DEFENSE SUPPORT PROGRAM	Prior Prod'n:	23	0	0	0	0	0	0	0	0	0	0	0