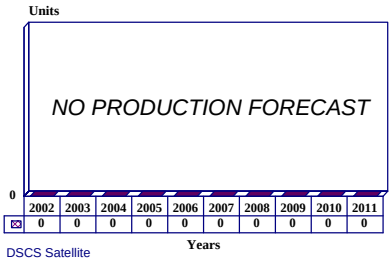
Defense Satellite Communications System - Archived 03/2003

Outlook

- Forecast International expects the US Department of Defense to provide funds for operation and maintenance of the Defense Satellite Communications System over the next decade
- Look for a DSCS III satellite to be launched in May 2002
- Anticipate the DSCS III A3 satellite to be launched sometime in 2003

10 Year Unit Production Forecast
2002 - 2011



Orientation

Description. The Defense Satellite Communications System (DSCS) is a United States Department of Defense program. The DSCS provides US military commanders with worldwide, secure communications.

Sponsor

Defense Communications Agency
Washington, DC
USA
(Overall DSCS program management, system engineering, and satellite operational direction)

US Air Force
Space Systems Division
Los Angeles, California (CA)
USA
(Space segment of DSCS)

US Army
Army Communications-Electronics Command
Fort Monmouth, New Jersey (NJ)
USA
(Major ground control elements of DSCS)

US Navy
Space & Naval Warfare Systems Command
(SPA-WAR)
Washington, DC
USA
(Shipborne terminals)

Prime Contractor

Lockheed Martin Corporation
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Fax: +1 301 897 6406
Web: http://www.lockheedmartin.com

Contractors

Femme Comp Incorporated
22876 Shaw Road
Sterling, Virginia (VA) 20166-9463
USA
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ITT Industries Incorporated
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Tel: +1 914 641 2000
Fax: +1 914 696 2960
Web: http://www.itt.com

Status. The Defense Satellite Communications System is fully operational. All satellites have been acquired. Two satellite launches remain.

Total Produced. Through 2001, a total of 51 initial defense communications satellite program (IDCSP) and DSCS II/III satellites (including one EMD prototype for testing and development) have been produced.

Application. The DSCS is used for high-priority communications, such as the exchange of wartime information between deployed military units, battlefield commanders, and defense officials. The US military also uses the DSCS to transmit data on space operations.

Price Range. The average unit cost of a DSCS III satellite is approximately US$134 million (in FY94 dollars).

Technical Data

	Metric	US
Characteristics		
DSCS III		
Length:	2 m	6.8 ft
Width:	1.9 m	6.4 ft
Depth (to antenna tips):	1.9 m	6.4 ft
Solar Array (length with yoke):	4.8 m	15.9 ft
Soar Array (length fully extended):	11.6 m	38.1 ft
Mass in Orbit:	1,125 kg	2,480 lb
Electrical Power		
At Launch:	1,240 watts	
Array Power (10 years):	980 watts	
Frequencies		
Receive:	7.9 to 8.4 GHz	
Transmit:	7.25 to 7.75 GHz	
Telemetry Tracking Command:	S-Band and SHF	
Channels Available:	6	
Stabilization:	Three-axis	
Design Life:	10 years	
Launch Vehicle:	Atlas II and Evolved Expendable Launch Vehicle (EELV)	

DSCS III Design Features. The current DSCS III satellites are comprised of five principal components: a 273-kg-capacity propulsion system, a 1,240-watt solar array, a modular structure, a housekeeping panel, and a transponder panel. The satellite's antennas include four Earth coverage horns (two receive and two transmit); a 61-beam MBA waveguide lens receive antenna to provide selective coverage and jamming protection; two 19-beam waveguide lens transmit MBAs with beam-forming networks to rapidly produce selected antenna patterns that fit the network of ground receivers; a high-gain gimbaled dish antenna for spot beam transmissions; and two single-channel transponder UHF antennas. With these antennas, DSCS communications can be distributed over large areas or concentrated to specific terminals.

The satellite contains a six-channel communications transponder, with each channel operating through its own radio frequency (RF) amplifier (two 40-watt and four 10-watt amplifiers). Telemetry capacity includes 490 bi-level channels, 320 analog channels, and 18 serial digital inputs.

DSCS III satellites are protected against the effects of nuclear radiation and provide improved protection from jamming. Should on-board sensors detect jamming, ground controllers can use the satellite's steerable beam antennas to counter any jammer interference.

The DSCS III satellite also carries an Air Force Satellite Communications Systems (AFSATCOM) UHF/SHF single-channel transponder for retransmission of

emergency-action messages (EAMs) to strategic nuclear forces.

The DSCS satellite features a hydrazine-propulsion system with 273 kg fuel capacity and with redundant thrusters and tanks. The thrusters provide 1.3 n to 4.4 n (0.3 lb to 1 lb) of thrust. The satellite is 3-axis stabilized.

DSCS III satellites feature an Integrated Apogee Boost Subsystem (IABS) developed by General Electric. Prior to FY92, DSCS satellites used the Inertial Upper Stage to reach geosynchronous transfer orbit, but when flown aboard the Atlas 2 medium-launch vehicle, the satellites require the IABS. The IABS weighs 240 kg and carries 1,170 kg of monomethyl-hydrazine fuel and nitrogen-tetroxide oxidizer. A flat cylinder 76 cm high and 280 cm in diameter, the IABS is covered with solar cells that augment the DSCS satellite's battery power during launch.

Technical Changes. The US Air Force has installed Beam Forming Network enhancements on the last four DSCS IIIB satellites. With this modification, four transmit and four receive beams will provide better anti-jam characteristics and improved performance for smaller tactical terminals. Additional changes include replacing 40-watt traveling wave tube amplifiers in Channels 1 and 2 with 40-watt solid-state amplifiers, and replacement of two inboard solar panels with high-efficiency material.

Variants/Upgrades

IDCSP. IDCSP was the initial military Communications Satellite (COMSAT), weighing about 45 kg, measuring 92 cm in diameter, and containing a single omnidirectional antenna. The IDCSP series began in 1966, and 24 were produced by Ford Aerospace & Communications. Each satellite relayed voice, imagery, computerized digital data, and teletype transmissions.

DSCS II. DSCS II is the four-channel IDCSP follow-on. First produced in 1971, a total of 16 were produced by TRW. The DSCS IIs weigh 545 kg, are spin-stabilized, and provide a substantial increase in communications load and transmission strength. Each spacecraft includes two horn antennas and two parabolic dish antennas to provide a communications capacity of 1,300 duplex voice channels or 100 megabits per second of data. The dish antennas are steerable by ground command, providing controllers with the ability to concentrate the satellite's beams on small areas of the Earth's surface. The satellites also come with propulsion systems for orbit repositioning if necessary.

DSCS III. Follow-on to DSCS II; first launched in 1982; 14 produced or in production.

DSCS Replenishment. The DSCS Replenishment satellites will represent the fourth-generation for DSCS. A key engineering feature will be significantly increased jam resistance, as well as a satellite-to-satellite link, probably based on laser communication technology. The satellite is also expected to have an EHF capability.

An EHF addition would provide an increased frequency capacity, a better bandwidth for increased information transmittal (thus allowing for more DSCS users), and more resistance to jamming. Finally, antenna size can be reduced from about 60 ft in height to about 20 ft in size. Also under consideration is the development of a universal DSCS bus that would allow separate DSCS satellites to be somewhat differently configured as requirements change.

Program Review

PE#0303110F, Project 672638: DSCS Satellites

IDSCP. The Defense Satellite Communications System (DSCS) provides numerous United States government agencies with worldwide, secure communications. The system began in 1966 with the Initial Defense Satellite Communications Program (IDSCP). From June 1966 to June 1968, 28 Ford Aerospace & Communications IDSCP spacecraft were placed in orbit.

DSCS II. The IDCSP follow-on was the DSCS II. Under DSCS II, 15 satellites were launched from 1971 to 1982 and positioned in geosynchronous orbits of 37,000 km. The satellites had an original design life of four years. This was later adjusted to 10 years.

DSCS III. DSCS III represents the third generation of DSCS satellites. Production of DSCS III satellites commenced in January of 1982 (General Electric was awarded a contract to produce two satellites).

The first DSCS III satellite was launched in October 1982 on a Titan 34D/IUS expendable launch vehicle. Three years later (October 1985) two DSCS IIIs were launched from the Space Shuttle Atlantis. In the wake of the 1986 Challenger accident, additional launches

were delayed. Since the Challenger incident, the US Air Force has launched the satellites using a dedicated booster designated the Medium Launch Vehicle II (MLV II).

In early 1990, GE Astro-Space was awarded a contract to upgrade three DSCS III satellites then in storage. The upgrade allows each of the satellites to handle up to 150 percent more communications traffic.

The first DSCS III satellite with Integrated Apogee Boost System (IABS) modification was launched in February 1992 (on an Atlas II booster). Facility modification for the DSCS Processing Facility at Cape Canaveral, Florida, was completed in FY93.

In FY94, engineering change proposals were incorporated on DSCS III satellites. The DSCS III Telemetry Gathering and Archiving System was also upgraded. In 1995, the Beam Forming Network Modification development effort to DSCS III satellites was initiated.

The main efforts conducted in FY96 focused on starting the Service Life Enhancement Program (SLEP) and developing the low-noise amplifier upgrade. Alternative methods to improve jammer location electronics performance and reliability were also investigated. Much of the agenda for FY97 called for continuing work already in progress from prior years.

The final two DSCS III satellites will launch on the Evolved Expendable Launch Vehicle (EELV). This requires DSCS launch vehicle interface modifications. To make the necessary alterations, integration-kit development began in 1998.

In 1999, work continued on integration-kit development Work also continued on the Service Life Enhancement Program.

Navy Urges DSCS III Changes. To satisfy fleet tactical needs, the US Navy requested that the US Air Force modify the last four DSCS III satellites. The US Navy does not have the space aboard ship for DSCS III antennas. To address this problem, the US Navy (joined by the US Army) requested the US Air Force to equip the final four DSCS III satellites with a second movable antenna and new solid-state electronics. The work included replacing the single Beam Forming Network (BFN) per MBA with lightweight multiple BFNs that will improve uplink and down link gains.

DSCS Satellites: New Developments & Projections. Like everyone else, the DSCS program administrators were gearing up for the new millennium. They saw some interesting events take place in the year 2000 both scientifically and politically.

On January 20 a DSCS III B8 satellite was launched successfully aboard an Atlas IIA rocket. The satellite performed two-months of on-orbit tests consisting of real-time demonstrations of the satellite's communications capabilities. Test operations focused on the 50-watt wave-tube amplifier. Test results showed a 200-percent increase in the tactical communications capability of the satellite.

In March, Lockheed Martin received a US$6.7 million contract to develop battery replacements and battery telemetry modifications supporting the DSCS III program.

Summers are notoriously hot in Washington, DC, and the summer of 2000 was "heated" in more ways than one. The US House of Representatives cut the fiscal year 2001 EELV budget by US$12 million. The Department of Defense immediately submitted an appeal stating "... [the cut] would require the Air Force to cancel one of the three [satellite] launches scheduled in FY03." This would put a DSCS satellite at risk of not being launched.

Science once again ruled in the fall of 2000. On October 19, a new US$200 million US Air Force/ Lockheed Martin DSCS III Defense Satellite Communications Spacecraft was launched successfully. The spacecraft replaced an earlier DSCS launched in 1985 that exceeded its 10-year design life by five years. The 5,936 lb Spacecraft provided military communications services to US forces in the Middle East and Europe. The new DSCS is the second satellite to be modified under the SLEP. The modifications enable the satellite to be used by ground forces with smaller receiver dishes. Look for two more of the enhanced DSCS satellites to be launched in the near future.

PE#0303142A, Project D253: DSCS Ground Terminals

Ground Terminals. Most of the DSCS ground terminal development comes under PE#0303142A (Satellite Command Ground Environment), Project D253 (Defense Satellite Communications Systems-Defense Communications Systems or DSCS-DCS Phase II). This project develops strategic and tactical ground subsystem equipment to support Joint Chiefs of Staff validated C^{3}I for the worldwide SHF DSCS program.

Development of the Universal Modem in FY92 was the program's principal accomplishment. Other efforts included support and upgrades of the Integrated Research Facility (IRF) and System Engineering Technical Assistance (SETA) efforts. EMD contracts were awarded in FY93 for the DSCS Training Devices program and for the AN/USC-28 Conferencing Modification. Support and upgrades of the IRF and SETA efforts also continued.

Development, review, and testing for DSCS Training Devices continued during FY94. Work also focused on replacing the AN/USC-28 Forward Error Correction Encoder/Decoder and developing the test bed for the Replacement Satellite Configuration Control Element (RESCUE).

As a result of funding "adjustments" in FY94, only one Generic Principles Trainer (GPT) was allocated to the DSCS Training Devices program. In FY95, engineering for the USC-28 embedded computer was completed.

Efforts throughout FY96 concentrated on continuing development work from prior years. Development of the Replacement BATSON and the AN/GSC-52 Modification were initiated by year-end 1997.

DSCS Ground Terminals: New Developments & Projections. Major milestones were achieved in 1999. Apparently, developing software technology was the DSCS ground terminal theme that year.

The DSCS Integrated Management System (DIMS) Interface Software program completed testing its DIMS Version 2.0 software application in the first quarter of 1999. DIMS develops software that electronically disseminates network plans to monitoring and controlling subsystems and to retrieve and display subsystem monitoring data.

In the third quarter of 1999 the Common Network Planning Software (CNPS) program was initiated. The CNPS program develops strategic and Ground Mobile Forces (GMF) satellite communications networks for DSCS satellites.

Latest Defense Satellite Communications System Information. A flurry of DSCS activity took place in 2001. In March, Lockheed Martin Corporation was awarded a contract to provide for the reactivation and related support activities of DSCS III Satellite B6. In the same month, the Boeing Company announced was on track to launch the next DSCS III satellite for the US Air Force in May of 2002. In June, Boeing revealed that the US Air Force had assigned a second launch of a DSCS satellite aboard a Boeing Delta IV rocket. The satellite, the DSCS III A3, is slated to be launched by a Boeing Delta IV Medium Vehicle sometime in the second quarter of 2003 from Cape Canaveral Air Force Station, Florida.

In October 2001, Lockheed Martin Corporation received a second DSCS contract. Under the contract, Lockheed Martin will be responsible for the reactivation and related support activities of DSCS III Satellite A3. Forecast International expects Lockheed Martin to complete this work by November of 2002.

In December of 2001, ITT Industries Incorporated was awarded a contract to provide site operations and maintenance in support of US government personnel who plan, monitor, and control access to the DSCS satellites. Under the agreement, ITT will provide onsite support at sites located in the US, Germany, and Japan. Forecast International anticipates ITT to complete this work by December of 2006.

Funding

US FUNDING

	FY00		FY01		FY02(Req)		FY03(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Air Force)								
PE#0303110F Defense Satellite Communications System								
Project 2638	-	3.5	-	7.3	-	3.9	-	2.1
RDT&E (US Army)								
PE#0303142A SATCOM Ground Envir.								
Project 253	-	8.7	-	9.8	-	13.2	-	0.0
Total	-	12.2	-	17.1	-	17.1	-	2.1

	FY04(Req)		FY05(Req)		FY06(Req)		FY07(Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
RDT&E (US Air Force)								
PE#0303110F Defense Satellite Communications System								
Project 2638	-	1.2	-	1.3	-	0.0	-	0.0
RDT&E (US Army)								
PE#0303142A SATCOM Ground Envir.								
Project 253	-	0.0	-	0.0	-	0.0	-	0.0
Total	-	1.2	-	1.3	-	0.0	-	0.0

All US dollars are in millions.

Source: US Department of Defense FY 2002 RDT&E Descriptive Summaries.

NOTE: The Bush administration has not addressed FY 2003-2007 PE#0303110F Project 2638 funding requirements. All FY 2003-2007 RDT&E budget estimates are notional only and subject to change.

NOTE: The Bush administration has not addressed FY 2003-2007 PE#0303142A Project 253 funding requirements. All FY 2003-2007 RDT&E budget estimates are notional only and subject to change.

Recent Contracts

Contractor	Award ($ millions)	Date/Description
Femme Comp Incorporated	Unknown	May 1998 – An increment (appropriation number/dollar value issued with each delivery order) as part of a US$13,923,659 (base year total) cost-plus-fixed-fee, cost-plus-award-fee, indefinite delivery/indefinite quantity, task order arrangement contract, with a cumulative total of US$97,333,898 if all options are exercised. Contract calls for analytical, technical, operational, and programmatic support of the definition, planning, development, and execution of US DoD satellite communications missions. Contract scheduled for completion in September 2004. (DASG62-98-D-0004)
ITT Industries Incorporated	63.0	June 2000 – ITT Industries was awarded a contract to modernize the ground control segment of the DSCS program. Under the 10-year agreement, ITT will design, develop, and install network control terminals for the DSCS satellite ground environment. Look for the work to be completed by July 31, 2010.
Lockheed Martin Corporation	8.5	March 2001 – Lockheed Martin Corporation received a contract for the reactivation and related support activities of DSCS III Satellite B6. The Space and Missile Systems Center, Los Angeles Air Force Base, California, is the contracting activity. (F04701-96-C-0023-P00084)
Lockheed Martin Corporation	6.4	October 2001 – Lockheed Martin Corporation received a contract to provide for the reactivation and related support activities of DSCS III Satellite A3. This work is expected to be completed by November 2002. The Space and Missile Systems Center, Los Angeles Air Force Base, California, is the contracting activity. (F04701-96-C-0023-P00098)

Contractor	Award ($ millions)	Date/Description
ITT Industries Incorporated	125.0	December 2001 – ITT Industries Incorporated received a five-year contract from the United States Army Space Command to provide operations and maintenance support to the US Army Space Command's DSCS Operations Control System Site Support and Services (DOCS4).

Timetable

Month	Year	Major Development
Oct	1964	First Initial DSCS (IDSCP) satellite contract awarded to Ford
Jun	1966	First launch of seven IDSCP satellites on a Titan IIIC
Jun	1968	26th and final IDSCP satellite launched
Nov	1971	First two DSCS II satellites launched on Titan IIIC
Feb	1977	GE awarded contract for a qualification model and 2 flight model DSCS IIIs
Jan	1979	DSCS II system achieved full operational constellation
Dec	1981	GE awarded production contract for DSCS III satellites
Oct	1982	16th and final DSCS II launched along with first DSCS III
Nov	1984	Multi-year contract for second group of seven DSCS III awarded to GE
Sep	1989	Titan 34D launched two DSCS III satellites
FY	1991	Last DSCS III delivered; Universal Modem development begun
FY	1992	Two DSCS IIIs launched aboard Atlas IIs
FY	1993	Contract awarded for DSCS training devices EMD
FY	1994	Incorporation of engineering change proposals on DSCS III satellites achieved; Upgrading the DSCS III Telemetry Gathering and Archiving System achieved
FY	1995	DSCS Generic Principles Trainer reached IOC
FY	1996	Service Life Enhancement Program (SLEP) initiated
FY	1997	DSCS III procurement ended; DSCS-R program begun
FY	1998	Initial deliveries of DSCS Replenishment satellites
FY	1999	Launched first of last four DSCS III satellites
FY	2000	Successful launch of DSCS III B8 satellite; Successful launch of US Air Force/ Lockheed Martin DSCS III Defense Satellite Communications Spacecraft
FY	2002	May launch scheduled for the DSCS B6/IABS 7 satellite
FY	2003	Second quarter launch scheduled for the DSCS A3/IABS 10 satellite
Dec	2006	ITT expected to complete its contract work to provide site operations and maintenance in support of US government personnel who plan, monitor, and control access to the DSCS satellites

Worldwide Distribution

This is a **US Department of Defense** program only.

Forecast Rationale

The Defense Satellite Communications System (DSCS) is a United States Department of Defense program. The DSCS provides US military commanders with world-wide, secure communications. The DSCS is used for high-priority communications, such as the exchange of wartime information between deployed military units, battlefield commanders, and defense officials. The US military also uses the DSCS to transmit data on space operations.

As indicated by the **Ten-Year Outlook** chart, all 51 DSCS satellites have been purchased. *No additional satellite procurements are forecast.* That said, Forecast International projects the US Department of Defense to

continue to finance the DSCS program from 2002 to 2011.

In December 2001, ITT Industries landed a five-year deal to provide site operations and maintenance in support of US government staff planning, monitoring, and controlling access to the DSCS satellites. Forecast International anticipates ITT to complete work under this contract by December 2006. Eighteen months earlier (June 2000), ITT Industries had received a 10-year contract to modernize the ground-control segment of the DSCS program. ITT's work under the agreement is expected to be finished in the summer of 2010.

A next-generation satellite communications system, the Advanced Wideband System, is expected to replace the DSCS. This military satellite communications system is currently in development and will not be in production for some time.

To fill the gap between the DSCS and the anticipated Advanced Wideband System, a project named "Wide-band Gapfiller" is underway. The Wideband Gapfiller system will be a constellation of three satellites augmenting the current constellation of DSCS satellites orbiting Earth. As a result, Forecast International expects the US Department of Defense to continue to provide funds for operation and maintenance of the Defense Satellite Communications System over the next decade.

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**
DSCS	Prior Prod'n:	51	0	0	0	0	0	0	0	0	0	0	0