
SPACE

Progress in Space Acquisition

BACKGROUND

- In October 2001, the Secretary of Defense directed implementation of several actions in response to the Commission to Assess United States National Security Space Management and Organization, known as the "Space Commission." Since then, DoD has:
  - Designated the Air Force (AF) as the DoD Executive Agent for Space
  - Delegated Milestone Decision Authority (MDA) for DoD Space Systems to the Air Force
  - Assigned the Under Secretary of the Air Force as AF Acquisition Executive for Space
  - Established a "virtual" Space Major Force Program
  - Appointed the Under Secretary of the AF as Director, National Reconnaissance Office (NRO)
  - Established Air Force Space Command (AFSPC) as a separate four star Combatant Command
  - Reassigned the Space and Missile Systems Center (SMC) to Air Force Space Command
  - Designated the Commander, SMC as the Program Executive Officer for Space
  - Published National Security Space (NSS) Acquisition Policy 03-01 specifically tailored for acquisition of small quantity space systems
    - Establishes a consistent space system acquisition process between NRO and DoD
    - Reaffirms "mission success" as the over arching guiding principle
    - Reduces the acquisition decision cycle time by using an independent program assessment team of recognized experts to perform focused reviews and advise the MDA on program risks
    - Restructures Key Decision Points (KDPs), moving them earlier in the acquisition life-cycle to identify risks and potential problems
    - Establishes a Defense Space Acquisition Board to advise the MDA at KDP reviews
    - Establishes a world-class cost estimating capability led by OSD Cost Analysis Improvement Group and comprised of the broader military space community (NRO, OSD, USAir Force, US Navy, US Army, Intelligence Community)
  - Designated the Commander of Air Force Space Command as the Space Professional Functional Authority to develop the space cadre
    - NSS Institute activated 1 Oct 04 in Colorado Springs to train the space cadre
- In addition, SMC is undertaking multiple initiatives to enhance space acquisitions
  - Instituted the SMC Launch Verification Process
  - Developed robust Acquisition Center of Excellence
  - Growing and retaining technical expertise and revitalizing systems engineering

MAIN POINTS

- NSS Acquisition Policy 03-01 institutionalizing an improved acquisition process for DoD Space Systems based on NRO and DoD lessons learned

Advanced Extremely High Frequency (AEHF)

Acquisition Status

- **Program Status:** System Development and Demonstration (SDD)
  - Milestone B and approval to enter SDD in October 2001
  - SDD Contract: 16 November 2001; definitized 15 August 2002
- **Satellites on Orbit:**
  - First Launch April 2008
- **Satellites in Development:** 3
- **Contractors:**
  - System Definition: National Team: Lockheed Martin, Northrop Grumman, & Boeing
  - System Design & Development: Contractor Team: Lockheed Martin & Northrop Grumman
- **Future Upgrades:** Transformational Satellite (TSAT) System
- **Purchase Requirements:** Worldwide coverage requires a 4 satellite constellation; the first TSAT is planned to complete the AEHF constellation.

Capabilities/Profile

- **Key Performance Parameters:**
  - **Coverage:** Worldwide between 65 degrees north & south; 24 hours/day
  - **Capacity/Satellite:** Threshold: 500 Mbps Combined Major Theater War (CMTW) scenario (Objective: 1.2 Gbps) & 350 Mbps strategic scenario
  - **Anti-Jam Protection:** Support users exposed to fixed, transportable and mobile jammers
  - **Nuclear Protection:** Provide assured communications for networks supporting critical functions
  - **Access and Control:** Provide users ability to plan, control and reconfigure resources
  - **Interoperability:** Backwards compatible with Milstar; Support joint warfighter communications between EHF terminals

Functions/Performance Parameters

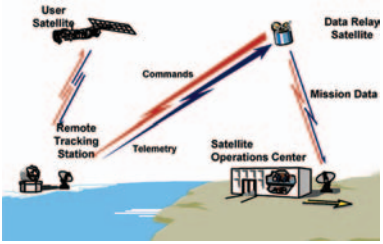
- **Mission:**
  - Replenishes capability currently provided by the Milstar system with additional capability
  - Provides more capacity than Milstar
  - Provides more coverage/ communications options than Milstar
  - Will launch on Evolved Expendable Launch Vehicle (EELV)
- **Performance Parameters:**
  - Low Probability of Intercept (LPI)
  - Low Probability of Detect (LPD)
  - Maximum Data Rate increases from Milstar rate of 1.5 Mbps to 8.2 Mbps
  - Throughput increases to ~12x Milstar capability in CMTW scenario

Air Force Satellite Control Network

Acquisition Status

- **Program Status:** Operational
- **Unit Assignment:** Air Force Space Command
- **Current Inventory:**
  - 8 Remote Tracking Stations (RTSs)
  - 22 Antennas: 15 at the RTSs, 4 Data Link Terminals, 1 Checkout Facility, 2 Transportables
  - 2 Operations Control Centers
  - Centralized Command and Control
- **Projected Inventory:**
  - 8 RTSs
  - 21-24 Antennas: 16 at the RTSs, 2-3 Data Link Terminals, 1 Checkout Facility, 2-4 Transportables
  - 2 Operations Control Centers
  - Distributed Command and Control
- **Contractors:**
  - Honeywell Technical Services, Colorado
- **Current Upgrades:**
  - Remote Tracking Station Block Change to replace unsustainable, aging antennas and 1960's electronics
  - Network Operations improvements-- scheduling and orbit analysis system upgrade; interoperability with commercial and civil networks
- **Future Upgrades:**

Automation, increased capacity, interoperability with other satellite networks, and improved reliability through modernization



Capabilities/Profile

- Global system of control centers, remote tracking stations and communication links
- U.S.'s only high-power, 24/7, global network operating DoD, National, Civil, and Allied satellites in any orbit
  - Required for all DoD launch and early orbit operations
  - Telemetry, Tracking, and Commanding (TT&C)
  - Real-time low data rate mission data transfer for critical missions
  - US Government's best option for anomaly resolution and satellite emergencies
  - Critical for meeting war--fighter real-time and near real-time weather, missile warning, navigation, surveillance and communications requirements

Functions/Performance Parameters

- **Mission:** Deploy, checkout and fly operational USAF, National, Allied and R&D satellites.
  - Provide TT&C operations, relay mission data and communications, and end-of-life disposal support
  - Provide launch & early orbit tracking operations support for US and allied launches
  - Augment other satellite control networks with additional on-orbit operations reach
  - Provide accurate satellite positioning data for avoiding collisions and radio frequency interference
  - Resolve operating emergencies with high-power uplink-averages 1 satellite rescue month saving the US economy up to $2B per rescue
- **Performance Parameters:**
  - Over 150 satellites supported
  - Over 162,000 satellite contacts per year
  - 100% support of all major US (DoD and NASA) launches

Combat Survivor Evader Locator (CSEL)

Acquisition Status

• **Program Status:** System Development & Demonstration (SDD)-completed Block 1 development and testing
• **Production:** Full Rate Production begins in FY05
• **Current CSEL radio inventory:** 486 (AF)
• **Purchase Requirements:** 17,869 radios for the Air Force; 46,472 total for all services, four UHF Base Stations, and Joint Search and Rescue Center workstations
• **Contractors:** Boeing (Prime), Thales Communications, Interstate Electronics Corp.
• **Future Upgrades:**
  • Block 2: Adds Terminal Area Communications for 2-way secure line-of-sight data communications between the survivor and rescue forces
• **Fielding:** The Navy fielded CSEL on board the USS Stennis in May 04. There are plans to equip future battle groups with CSEL but a specific group has yet to be determined. The Army has begun fielding and training with the CSEL radio with the 3rd Infantry Division. The 82nd Airborne Division will deploy with CSEL later in FY05. Currently, the Air Force is scheduled to begin fielding the Combat Air Forces with CSEL in FY06

Capabilities/Profile

• Precision anti-spoofing military GPS positioning/navigation
  • Jam-resistant operations
• Over-the-horizon (OTH)
  • 2-way secure data transmission
• OTH Low Probability of Intercept/Low Probability of Detection
• Line-of-sight voice to rescue forces
• Global coverage
• Time from transmit to Joint Search & Rescue Center (JSRC) receipt: < 5 min
• **Battery lifetime:** 4-day threshold / 21-day objective requirement
• **Radio dimensions:**
  • 3 1/4 Inches (Width)
  • 8 Inches (Length)
  • 1 3/4 Inches (Depth)
• Weight: 30.7 ounces

Functions/Performance Parameters

• **Mission:** CSEL is an Air Force-led joint program to provide enhanced Combat Search and Rescue communication and location capabilities by replacing antiquated PRC-90/-112 survivor radios with a new over-the-horizon (OTH) end-to-end system. CSEL provides assured 24-hour, two-way, secure satellite communications along with military GPS that includes anti-jamming and anti-spoofing.
• **Performance Parameters:** CSEL uses precise GPS positioning and advanced anti-spoofing technologies to provide a reliable and accurate survivor location, an optimized waveform to reduce detectability, and increased probability of collection by national assets. In addition, CSEL utilizes the international search and rescue satellite system (SARSAT) for polar-area OTH data communications. With these new capabilities, CSEL will increase rescue force success rates in ongoing contingency operations, providing rapid and accurate location and authentication of survivor/evaders in minutes vice what could take days today.

Counterspace Systems

Acquisition Status

- **Program Status:**
  - **Counter Communications System (CCS):** Three systems delivered in FY04. Declared operational in Sep 2004. Systems will be upgraded in FY05-07. Definition and development of CCS Block 20 will begin in FY06
  - **Rapid Attack Identification Detection and Reporting System (RAIDRS):** Development contract awarded in Feb 05 for RAIDRS Spiral 1, which will provide ground-based capabilities to detect and geolocate interference to DoD owned and used satellite communications. IOC for RAIDRS Spiral 1 is anticipated in late FY07
- **Projected Inventory:**
  - **Counter Communications Systems:** 3 (initial capability), 1 (Block 20). Force structure studies indicate 10-14 will be ultimately required to meet warfighting needs
  - **Rapid Attack Identification and Detection System:** 36 interference detection systems, 8 geolocation systems
- **Contractors:**
  - Mission Area Primary Integrating Contractor: Northrop Grumman Mission Systems
  - CCS Developing Contract: Harris Corp
  - RAIDRS System Definition Contract: Northrop Grumman Mission Systems
  - RAIDRS Spiral 1 Development Contract: Integral Systems Inc

Capabilities/Profile

- Air Force's primary source for critical planning, technology maturation/insertion, and system acquisition in support of Air Force space control systems, both offensive and defensive counterspace systems, and associated command and control to meet current and future military space control needs.
- Offensive Counterspace Systems include the means to disrupt, deny, degrade, or destroy an adversary's space systems or the information they provide which may be used for purposes hostile to US National Security interests. Current program is (CCS)
- Defensive Counterspace Systems include both active and passive measures to protect U.S. space systems from natural threats and enemy attempts to negate or interfere with space operations. Current program is RAIDRS.

Functions/Performance Parameters

- **Mission:** Perform engineering and manufacturing development, integrate and procure both offensive and defensive counterspace systems in support of the Space Control mission
- **Performance Parameters:**
  - CCS is a transportable system designed to disrupt satellite-based communications, using reversible, nondestructive means
  - RAIDRS will be a family of systems being designed to detect, report, identify, locate, and classify attacks against our military space assets. RAIDRS will include detection sensors, information processors, and a reporting architecture. The RAIDRS system will detect and report attacks on both ground and space-based elements of operational space systems. It will notify operators and users, and carry information to decision-makers

Defense Meteorological Satellite Program (DMSP)

Acquisition Status

- **Program Status:** Operational
- **Production:** FY83-FY99
- **Satellites on Orbit:** 2 primary, 3 residuals
- **Satellites to be launched:** 4
- **Contractors:**
  - Lockheed Martin (Prime-Spacecraft)
  - Northrop Grumman (Prime-Sensors)
- **Future Upgrades:** Mini-Inertial Measurement Units for DMSPs F-17 through F-20 provide required redundancy in attitude control system.
- **Purchase Requirements:** None
  - The DMSP program will cease operations near the middle of the next decade at the end of the final DMSP satellite's life. Thereafter, the joint DoD/DOC/NASA National Polar-orbiting Operational Environmental Satellite System (NPOESS) will fulfill DoD's requirements.

Functions/Performance Parameters

- **Mission:** The mission of DMSP is to provide an enduring and survivable capability, through all levels of conflict, to collect and disseminate global visible and infrared cloud data and other specialized meteorological, oceanographic and space environment data required to support worldwide DoD operations and high-priority national programs.
- **Performance Parameters:** DMSP utilizes sensors that measure surface and atmospheric radiation in the visible, infrared and microwave bands. In addition, DMSP flies sensors that measure space environmental parameters. Critical regional data is broadcast directly to user terminals in theater to support tactical missions. Global data is downloaded to processing centers to support both tactical and strategic missions.

Capabilities/Profile

KPPs	Threshold/ Baseline	Actual
Satellite Mean Mission Duration	30 mos	45 mos
Primary Sensor Global Resolution	1.5 km	1.5 km
Theater Resolution	0.3 km	0.3km

Defense Satellite Communications System (DSCS) III

Acquisition Status

- **Program Status:** Operational
- **Satellites on Orbit:** 5 primary, 6 residual
- **Satellites to be Launched:** 0
- **Contractors:** Lockheed Martin (Missile and Space), Sunnyvale, CA
- **Purchase Requirements:** 14 purchased; none remaining
- **Future Upgrades:**
  - Wideband Gapfiller System (WGS) and Transformational Satellite (TSAT) (Kaband capabilities)

Capabilities/Profile

- **Key Performance Parameters**
  - **Requirement:** 30 Channels on 5 primary satellites
  - **Actual:** 30 Channels on 5 primary satellites

Functions/Performance Parameters

- **Mission:**
  - Provides worldwide, responsive wideband communications with some anti-jam satellite capabilities supporting strategic and tactical Command, Control, Communications, & Intelligence (C3I) requirements.
- **Performance Parameters:**
  - Provide secure and high data rate Super High Frequency (SHF) communications.
  - Users include National and Senior Leadership, Defense Information System Network, Diplomatic Telecommunications Service, White House, Air Force Satellite Control Network, and Service ground mobile forces.

Defense Support Program (DSP)

Acquisition Status

- **Program Status:** Operational
- **Unit Assignment:** 2d Space Warning Squadron, Buckley AFB, CO
- **Current Inventory:** On-orbit inventory plus 1 satellite awaiting launch
  - DSP-23 scheduled for 1st Qtr 2006
- **Contractors:**
  - Northrop Grumman Space & Technology (Redondo Beach, CA)
  - Northrop Grumman Electronic Systems (Azusa, CA)
- **Current Upgrades:**
  - Under the Space Based Infrared System (SBIRS) program Increment 1, all DSP mission processing was consolidated at a single CONUS location; Initial Operational Capability (IOC) declared 18 December 2001, allowing the closure of overseas bases following a transition period.
  - Fielded Increment 1 Interim Mission Control Station Backup (IMCSB) in October 2002, allowing cessation of operations at the Attack Launch Early Reporting to Theater (ALERT) facility.
  - Fielded Increment 1 Integrated Training Suite September 2003, providing first-ever advanced crew training systems at Buckley AFB, CO and Vandenberg AFB, CA.
- **Future Upgrades:**
  - Transition to SBIRS space constellation begins in FY07.

Capabilities/Profile

- **Satellites:** Classified number of geosynchronous earth orbit satellites.
- **Dimensions:** The current DSP-1 satellite is 28 feet long stowed, 32 feet long with solar panels deployed; 13 feet in diameter stowed, 22 feet with solar panels deployed; and generates 1275 watts of solar power.
- **Weight:** 5250 lbs

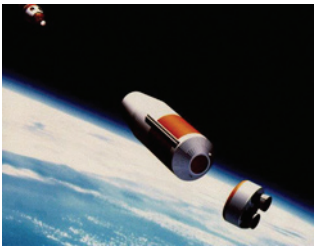
Functions/Performance Parameters

- **Mission:** The Defense Support Program is a space based infrared satellite system providing global coverage and warning of ballistic missile launches, nuclear detonations, and other events.
- **Performance Parameters:** DSP provides:
  - Near-real time detection and reporting of missile launches against US and/or Allied forces, interests, and assets worldwide.
  - Near-real time detection and reporting of endoatmospheric (0-50km), exoatmospheric (50-300km), and deep space (>300km) nuclear detonations worldwide.

Evolved Expendable Launch Vehicle (EELV)

Acquisition Status

- **Program Status:**
  - Two $500M Other Transaction Agreements for development to Boeing and Lockheed Martin (LMA)
  - Two Firm Fixed Price contracts for Initial Launch Services (ILS) FY02-06 for 26 launches
    - Reallocation of 7 Buy I launches from Boeing to LMA and rescission of Boeing west coast exclusivity clause allowing LMA to build a west coast launch facility
    - Buy I allocation post-PIA allocation - Boeing 12 launches and LMA 14 launches (FY03-10)
    - Buy II NRO west coast FY05-08- 3 Launches to LMA and 1 Launch to Boeing



  - Current Manifest:
    - 14 launches assigned to Boeing (includes Heavy Lift Vehicle Demo)
    - 18 launches to LMA
- **Program Events:**
  - First commercial Atlas V launched August 2002; first commercial Delta IV launched November 2002
  - First Government Delta IV (Defense Satellite Communications System) March 2003
  - First heavy launch on Delta IV (Demo) December 2004

Capabilities/Profile

	Threshold	Objective
• Standardization • Launch Pad	Single Pad	Single Pad
• Payload interface	Std by Class	Std for all
• Mass to Orbit • Semi-Sync	2,500-4,725	+15%
• GTO	6,100-8,500	+15%
• Polar-LEO	41,000	+5%
• GEO	13,500	+5%
• Reliability	98%	>98%

Both EELV variants meet or exceed Operational Requirements Document (ORD) requirements

Functions/Performance Parameters

- **Mission:** Partner with industry to develop a national launch capability that satisfies medium and heavy lift requirements for DoD, National and civil users.
  - Replaces current Delta, Atlas and Titan space launch vehicles (FY02-20)
  - Expected savings of more than 25% is consistent with 25% - 50% ORD goal
  - Purchasing firm fixed priced commercial launch services (CLS)
  - Competition for life of program
  - Enhances U.S. industrial base, poises two competitive launch vehicle families to capture increased domestic and international commercial market share
- **Launch performance:**
  - Delta IV: 3 successful launches in 3 attempts (DoD is 2 for 2) = 100%
  - Atlas V: 3 successful launches in 3 attempts (DoD has yet to launch an Atlas V mission) = 100%

Falcon

Acquisition Status

• **Program Status:** New Start in FY04; Joint Air Force/DARPA program; ORS/CAV objectives combined in the joint program called Falcon
  • Operationally Responsive Spacelift Mission Need Statement (MNS) approved by Joint Requirements Oversight Council (JROC): April 2002
• **Contractors:**
  • Falcon Small Launch Vehicle - Phase IIA (System Design & Development):
    • Air Launch LLC, Reno, Nevada
    • Lockheed Martin Corp., Space Systems Co., Michoud Operations, New Orleans, La. Microcosm Inc., El Segundo, Calif.
    • Space Exploration Technologies, El Segundo, Calif.
    • Falcon Hypersonic Technologies Vehicle - Phase II (System Design & Development)):
    • Lockheed Martin Corp., Lockheed Martin Aeronautics Co., Palmdale, Calif.
• **Schedule:**
  • Falcon Phase II (System Definition) was completed May 04
  • Falcon Phase II (Design & Development) began 4Q FY04
  • Falcon Phase III (System Demonstration) scheduled to begin by FY07

Capabilities/Profile

• **Approach:** Falcon is a demonstration program designed to develop technologies using an evolutionary approach to enable a prompt global reach capability and demonstrating responsive, affordable small satellite spacelift
• **Elements:**
  • Operationally Responsive Spacelift (ORS) will develop a small launch vehicle to provide a low-cost, responsive launch capability capable of placing a small satellite into a low Earth orbit
  • Hypersonic Technology Vehicles 1, 2, & 3 will provide an affordable and low risk building block demonstration approach to validate key enabling Hypersonic Cruise Vehicle technologies. Hypersonic Cruise Vehicle technical tasks will enable an autonomous aircraft capable of taking off from a conventional military runway and capable of flying 9,000 NM in less than two hours in the 2025 timeframe.

Functions/Performance Parameters

• **Mission:** Falcon will develop and validate, in-flight, technologies to enable time-critical, prompt global reach missions while at the same time, demonstrating affordable and responsive spacelift.
• **Performance Parameters:**
  • The initial ORS demonstration, small launch vehicle, has a goal of 1,000 pounds into low Earth orbit for less than $5M recurring (excluding payload and payload integration costs).
  • Hypersonic Technology Vehicle will be designed to carry approximately 1,000 lbs of payload with a range of approximately 9,000 NM and cross range of 3,000 NM
  • DARPA's Hypersonic Cruise Vehicle is a reusable aircraft-like system that will strike targets at 9,000 nautical miles in less than 2 hours. Its payload capability is 12,000lbs.

Global Broadcast Service (GBS)

Acquisition Status

- **Program Status:**
  - GBS Phase 2 passed Milestone II in November 1997
  - Program re-baselined to establish:
    - Spiral development
    - 3 incremental Initial Operational Capabilities (IOCs) (versus single IOC)
    - IOC 1 achieved 10 December 2003
- **Payloads on Orbit:** 3 GBS Phase 2 payloads on UHF Follow-on (UFO) satellites
- **Contractor:** Raytheon
- **Future Upgrades:**
  - Equivalent Phase 2 capability being designed into Wideband Gapfiller System (WGS)
  - Transitioning to Internet Protocol (IP) technology for greater flexibility and capability expansion, and supportability

- **Purchase Requirements (Phase 2):**
  - 3 primary injection facilities to upload data to satellites
  - 96 receive terminals (initial buy for joint users)
  - Services will purchase additional receive terminals (1085 units currently planned)

Functions/Performance Parameters

- **Mission:**
  - **GBS Phase 2:** Provide efficient high data rate broadcast capability between many distributed information sources simultaneously to warfighters using small, inexpensive terminals.
- **Performance Parameters -- GBS Phase 2 satellites provide:**
  - 96 Mbps capacity (max)
  - 4 channels (max of 24 Mbps each)
  - 2 spot beams and 1 wide area beam
  - 1.25 Terabytes/day of critical data provided to the warfighters in Operations Enduring Freedom and Iraqi Freedom

Capabilities/Profile

- **GBS Phase 2 Key Performance Parameters Include:**

Requirement	Threshold	Objective
Coverage	65S - 65N	6S - 65N
Spot Beams (per Sat.)	2 500NM; 1 2000NM	2 500NM; 1 2000NM
Simultaneous Uplinks	1 PIP; 1 TIP	1 PIP; 3 TIP
Security	unclas - TS/SCI	unclas - TS/SCI
Terminal Ops	F/T GRT; SRT & SSRT	F/T GRT; SRT & SSRT

Definitions

F/T GRT - Ground Receive Terminal
SRT - Ship Receive Terminal
SSRT - Submersible Ship Receive Terminal
PIP - Primary Injection Point
TIP - Theatre Injection Point

Global Positioning System (GPS)

Acquisition Status

- **Program Status:** Operational
  - IIR-13 Launch: last planned IIR; successfully launched 6 November 2004
  - First IIR-M Launch: FY05
  - First IIF Launch: FY07
  - First GPS III Launch: FY13
- **Unit Assignment:** 2nd Space Operations Squadron (2SOPS), Schriever AFB, CO
- **Production:** Ongoing
- **Current Inventory:** 29 operational satellites; 24 required
- **Contractors:**
  - Block II/IIA: Boeing
  - Block IIR/IIR-M: Lockheed Martin Missiles and Space (LMMS)
  - Block IIF: Boeing
  - Block III: Not awarded
- **Future Upgrades:** Control and Space Segment Modernization, New Military and Civil Signals, User equipment upgrades, Navigation Warfare (Navwar); Block III addressing system-wide architectural concepts; Flexible Power on Blocks IIR-M & IIF will deliver higher power and anti-jam to the warfighter

Capabilities/Profile

- **24 Satellite constellation**
- **6 Orbital Planes**
  - Altitude: ~20,180 km (~12,540 miles)
  - ~12 Hour Orbit
- **3 Segments:**
  - Space
  - Control
  - User
- **Secondary Mission**
  - US Nuclear Detonation (NUDET) Detection System (USNDS)

Functions/Performance Parameters

- **Mission:** Provides highly accurate time and three-dimensional position and velocity information to an unlimited number of users anywhere on or above the surface of the earth, in any weather.
- **Performance Parameters:**
  - Constellation Sustainment: 24 satellites
- **Accuracy**
  - Standard Positioning Service (SPS): ≤ 36 meters (Horizontal), ≤ 77 meters (Vertical)
  - Precise Positioning Service (PPS): ≤ 6.3 meters (Horizontal), ≤ 13.6 meters (Vertical)
  - Timing: ≤ 40 nanoseconds
  - User accuracy is dependent on receiver type and the number, location and performance of the satellites acquired

Joint Warfighting Space

BACKGROUND

● To ensure United States dominance in space and provide critical support to the terrestrial warfighter, the Air Force is intensifying its focus on operationally responsive space--the ability to rapidly employ responsive spacelift vehicles and satellites; service, repair or recover on-orbit satellites; and deliver space-based capabilities wherever and whenever the warfighter requests them.

● The first step in achieving a global Operationally Responsive Space (ORS) capability is in the theater through the Joint Warfighting Space (JWS) concept. JWS will provide dedicated, responsive space capabilities and effects to the Joint Force Commander (JFC) in support of national security objectives.

● The concept seeks immediate and near-term initial operating capabilities to meet pressing Joint Force Commander (JFC) needs, and a Full Operational Capability (FOC) beyond 2010. Additionally, the Air Force envisions that JWS system capabilities will evolve as technology advances and the needs of the theater commander change.

DISCUSSION

● In the near-term, JWS will exploit existing off-the-shelf technologies from each Service.

● JWS will enhance and incorporate space capabilities in joint training and exercises, increase space integration in the Air Expeditionary Force (AEF) and allow the JFC to take advantage of the many synergies provided by multi-Service space professionals.

● As technologies mature, JWS will bring to the JFC enhanced, dedicated capabilities that eliminate gaps in present-day space capabilities such as communications, surveillance and strike.

● The far term envisions a fully capable expeditionary force, ready and responsive to theater warfighters' needs, bringing the impact of the full spectrum of space capabilities and effects to the operational and tactical levels of war.

● When fully operational, the JWS capability will deliver responsive near space (i.e., area above the earth from ~ 65,000 to 325,000 feet altitude) and on-orbit capabilities to directly support the JFC in a theater of conflict, with emphasis at operational and tactical warfighting levels.

MAIN POINTS

● JWS will involve:
  - Exploiting existing global National Security Space capabilities more effectively via net worked space systems
  - Rapidly employing dedicated, tailored space capabilities and expeditionary warrior space forces under the control of the JFC
  - Implementing unambiguous command and control (C2) and operational processes/procedures to quickly provide warfighters with integrated space capabilities in a repeatable and affordable manner

● The ORS-supported Joint Warfighting Space program will redefine how future conflicts are fought and won.

Launch & Test Range System (LTRS)

Acquisition Status

• **Program Status:** A family of projects to modernize and sustain the LTRS to keep it operationally effective and supportable.
• **Production:** Ongoing modernization/sustainment
• **Current Inventory:** Eastern and Western Launch & Test Ranges, and associated downrange assets
• **Contractors:** Lockheed Martin, Santa Maria, CA; ITT Industries, Cape Canaveral, FL
• **Future Upgrades:** Planning & Scheduling; Communications; Weather; Metric Tracking (Radar and Telemetry); Command Destruct; Flight Safety

Capabilities/Profile

• Launch & Test Range System (LTRS), also known as Spacelift Range System, comprised of:
  • Western Range (WR) at Vandenberg AFB, CA
  • Eastern Range (ER) at Cape Canaveral AFS/Patrick AFB, FL
• Some of the current LTRS assets still employ 1950s/1960s technology
  • Outdated, unreliable, limited responsiveness, and increasingly unsupportable equipment
  • Costly to operate and maintain, with manpower intensive architecture
• Launch and Test Range modernization program upgrades multiple operational capabilities
• Improves responsiveness, reliability and supportability

Functions/Performance Parameters

• **Mission:** Provide responsive, reliable and cost effective launch scheduling, communications, tracking, telemetry, flight analysis and emergency termination for DoD, civil, and commercial space launches, ballistic missile tests, guided weapons and aeronautical tests; also supports space surveillance mission as a secondary mission.
• **Functions (LTRS Operational Capabilities):**
  • Metric Tracking (Global Positioning System, Radar, and Telemetry)
  • Command Destruct
  • Flight Safety
  • Communications
  • Weather
  • Surveillance
  • Planning and Scheduling
  • Centralized Control and Automation
• **Performance Parameters:**
  • Ensure acceptable risk to public safety
  • Provide trajectory coverage for current and forecasted launches: ER: Launch trajectories from 34^{o} to 112^{o}; WR: Launch trajectories from 153.6^{o} to 281^{o}
  • Support launches with 24 hours between the close of the first launch window and the opening of the second

Medium Launch Vehicles (MLV)

Acquisition Status

- **Program Status:** Active
- **Production:** Complete -- last launch scheduled for FY07
- **Inventory:**
  - One Atlas IIIB medium launch vehicle mission remains with flyout planned for late CY05 (National Reconnaissance Office satellite).
  - 9 Delta II medium launch vehicle missions remain with flyout planned for FY07 (Seven planned [GPS] satellites, one NRO, and one planned DARPA/Navy Research Lab/Air Force satellite).
- **Contractors:**
  - Atlas IIIB: Lockheed Martin, Denver, CO
  - Delta II: Boeing, Huntington Beach, CA
- **Future Upgrades:** None planned
- **Purchase Requirements:**

All launch vehicles have been manufactured and are either in storage or are being processed for launch.

Need funding for Global Positioning System (GPS) IIRM-8 launch vehicle needed to support 2QTR FY07 launch

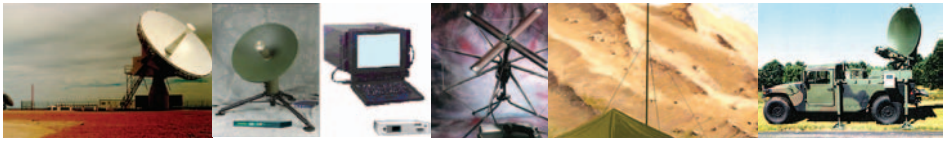
Capabilities/Profile

- **Lift capability:**
  - Atlas IIIB: capable of lifting 9,900 lbs to geosynchronous transfer orbit
  - Delta II: capable of lifting 4,000 lbs to geosynchronous transfer orbit
- **Launch Sites:**
  - Atlas IIIB: Launch Complex 36B Cape Canaveral, FL
  - Delta II: Launch Complex 17 A/B, Cape Canaveral, FL

Functions/Performance Parameters

- **Mission:**
  - The Atlas IIIB launch vehicle provides medium lift orbital insertion for the National Reconnaissance Office.
  - Delta II launch vehicles provide medium lift orbital insertion for GPS and other satellites.
- **Launch performance (DoD launches only)**:
  - Delta II: 46/47 successful launches = 98%
  - Atlas II: 14/14 successful launches = 100%

Military Satellite Communication (MILSATCOM) Terminals



DSCS GPS recieve suite Spitfire GMT SMART-T

Acquisition Status

• **Program Status:** Development, procurement, upgrade and sustainment efforts:
  • Develop, produce & field Ground Multi-band Terminals (GMT)
  • Develop, produce & field Family of Advanced Beyond Line-of-Sight Terminal (FAB-T) including High Data Rate (HDR) airborne increment to support Transformational Communications for the Airborne Intelligence, Surveillance, Reconnaissance (ISR) community
  • Develop, produce & field Laser Communications Terminal
  • Develop, produce & field High Data Rate (HDR) ground terminals
  • Field and sustain UHF Demand Assigned Multiple Access (DAMA) Airborne Integraed Terminal (AIT)
  • Sustain Single-Channel Anti-Jam Man Portable (SCAMP) and Air Force Command Post Terminals
  • Sustain Secure Mobile Anti-Jam Reliable Tactical - Terminal (SMART-T)
  • Sustain UHF Demand Assigned Multiple Access (DAMA) ground terminals (Multi-Band Multi-Mode Radio [MBMMR] and Spitfires)
  • Upgrade/Modify Defense Satellite Communications System (DSCS) Terminals
• **Current AF Inventory (within Program Element 0303601F):** Includes ground, fixed, transporable and airborne:
  • Narrowband/UHF (AIT, MBMMR, Spitfire): 1246 total
  • Wideband/SHF (DSCS, GBS): 136 total
  • Protected/EHF (SCAMP, SMART-T): 96 total
• **Contractors:** Multiple Primes
  • Boeing (CA)
  • Raytheon (MA, FL, IN, VA)
  • Harris (FL)
  • Rockwell (IA)
  • BAE (NH)
  • Lockheed Martin (CA)
  • Northrop Grumman (CA)

Capabilities/Profile

• Satellite communications terminals for:
  • UHF DAMA air & ground
    • Airborne Integrated Terminal; Multi-Band Multi-Mission Radio; Spitfire
  • Wideband SHF Connectivity
    • Global Broadcast Service (GBS) Receive Suites (RS) and Theater Injection Points (TIP); Ground Multi-band Terminal (GMT); Defense Satellite Comm System (DSCS)
  • Protected EHF (and AEHF) Connectivity
    • Family of Advanced Beyond line-of-sight Terminals (FAB-T)
    • Army developed Secure Mobile Anti-jam Reliable Tactical Terminal (SMART-T)
  • Transformational Communications (will support both Wideband and Protected)
    • Laser Communication Terminal (Lasercom)
    • High Data Rate (HDR) terminal modifications--derivatives of FAB-T and ground terminals to support Intelligence, Surveillance, and Reconnaissance (ISR) community

Functions/Performance Parameters

- **Mission:** Develop, procure, deploy and sustain multi-band SATCOM terminals utilized by Air and Space Expeditionary Forces (AEF), SIOP, combatant commanders, and other users to communicate over current and emerging military and commercial satellite systems.
  - Terminals will support the Transformational Communications Architecture
- **Performance Parameters:** Communications connectivity in bands:
  - Narrowband/UHF: Secure, mobile, DAMA
  - Wideband/SHF: Secure, long-haul, tactical and strategic
  - Protected/EHF: Secure, nuclear hardened, Anti-Jam/ Anti-Scintillation, Low Probability of Intercept, tactical and strategic

Military Strategic and Tactical Relay (Milstar)

Acquisition Status

- **Program Status:** Operational
- **Satellites on Orbit:** 5
  - 2 Block I satellites with Low Data Rate (LDR), 3 Block II satellites with both Low and Medium Data Rate (LDR/MDR)
- **Satellites to be Launched:** 0
- **Contractors:**
  - Lockheed Martin, Missiles & Space (Prime)
  - Boeing & Northrop Grumman (Major Subcontractors)
- **Future Upgrades:** Advanced EHF (AEHF) communications satellites will replenish Milstar satellites. Transformational Satellite (TSAT) will follow AEHF.
- **Purchase Requirements:** None remaining

Capabilities/Profile

- **System Capabilities and Characteristics Include:**
  - **Connectivity – Coverage:** Worldwide between 65 degrees north & south; 24 hours/day
  - **Connectivity – Data Rates and Capacity/Satellite:**
    - Low Data Rate (LDR): 75 to 2400bps data rates available; 0.4 Mbps theoretical total throughput
    - Medium Data Rate (MDR): 4.8 to 1,544 Kbps data rates available; 40 Mbps theoretical total throughput
    - Bands: UHF and EHF/SHF with crossbanding; crosslink between satellites
  - **Protection:** Anti-jam, anti-scintillation, anti-intercept/detection, and satellite hardening to provide assured communications for networks supporting critical functions
  - **Access and Control:** Provide users ability to plan, control and reconfigure resources.
  - **Interoperability:** Per appropriate MIL-STDs

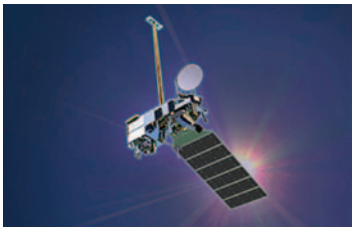
Functions/Performance Parameters

- **Program will specifically:**
  - Maintain operations support for satellites 1, 2, 4, 5 & 6 (#3 did not achieve useful orbit)
  - Complete upgrade of mission control facilities to support medium data rate operations
- **Performance Parameters:** Low Probability of Intercept/ Detection (LPI/D), Anti-Jam (AJ), and Anti-Scintillation (AS) protected communications at low and medium data rates (LDR and MDR), Crosslinks

National Polar-orbiting Operational Environmental Satellite System (NPOESS)

Acquisition Status

- **Program Status:** Acquisition & Operations phase
- **Production:** FY02-FY16
  - RDT&E funds NPOESS C1 and C2: FY02-FY11
  - Procurement funds NPOESS C3 through C6: FY08-FY16
- **Current Inventory:** None
- **Projected Inventory:** 6
- **Contractors:**
  - Northrop Grumman Space Technology (Prime)
  - Raytheon, Boeing Satellite Systems, Ball Aerospace, and ITT (Instruments)
- **Future Upgrades:** TBD



Capabilities/Profile

KPPs	Threshold
Vertical Moisture	Surface to 600mb: > of 20% or 0.2g/kg (clear/cloudy)
Temperature Profile	Surface to 300mb: +/- 1.6K/km (clear)
	Surface to 700mb: +/-2.5K/km (cloudy)
Imagery refresh*	≤ 4 hrs avg; ≤ 6hrs max; at least 75% of revisit times ≤ 4hrs at any location
Sea Surface Temp	Measurement Uncertainty - clear; +/- 0.5 deg C
	Horiz. Cell Size - Nadir, clear; 1km
Sea Surface Winds	Measurement Accuracy, Speed; > of 2m/s or 10%
Soil Moisture	Sensing Depth: Surface (Skin Layer: -0.1cm
Data Access	Capable of selective denial (except ARGOS and SARSAT)
Interoperability	100% of top-level IERs designated critical

Schedule

Milestone I: Mar 97
Key Decision Point (KDP) C: Aug 02

Functions/Performance Parameters

- **Mission:** NPOESS is a tri-agency program (DoD, DOC, and NASA) that will provide military commanders and civilian leaders assured timely, high quality environmental information to effectively employ weapon systems and protect national resources (safety, life, and property). The converged program will be the nation's primary source of global weather and environmental data for operational military and civil use for a period of at least 10 years.
- **Performance Parameters:** NPOESS will fly a suite of instruments that will provide visible and infrared cloud-cover imagery and other atmospheric, oceanographic, terrestrial, and space environmental information. In all, NPOESS will measure 54 distinct environmental parameters such as soil moisture, cloud levels, sea ice, ozone, ionospheric scintillation, and more.

Polar Military Satellite Communications (MILSATCOM)

Acquisition Status

• **Program Status:** The Polar MILSATCOM program consists of 3 Interim Poar (IP) Low Data Rate (LDR) EHF communications packages hosted on 3 classified satellites. The program is in the System Development and Design phase to design, test, and launch the last two packages. The first IP package was a late add-on to a classified host satellite that was made available in FY98. Packages 2 and 3 will be available in FY04 and FY06, respectively
• **Satellites on Orbit:** 1 IP package
• **Satellites in Development:** 2 IP packages
• **Contractors:** Classified
• **Future Upgrades:** The next generation Enhanced Polar (EP) capability will consist of extended Data Rate (XDR) packages compatible with the Advanced Extremely High Frequency (AEHF) system on a classified host (circa 2013)

Capabilities/Profile

• **Coverage:** North polar region - 24 hours/day required
• **Compatibility:** IP is compatible with Milstar Low Data Rate (LDR) service and the (AEHF) system in Milstar backwards compatibility mode. EP will be fully AEHF compatible.

Functions/Performance Parameters

• **Mission:** Provides protected communications supporting peacetime, contingency, and wartime operations in the north polar region. IP supports limited Independent Submarine Operations & Maritime Task Force Operations and Intelligence Collection/Dissemination Activities. The EP system will provide increased capabilities to the same activities and extend support to Strategic Forces and Special Operations Forces
• **Performance Parameters:** IP has no crosslinks and provides the same data rates as Milstar LDR: 75-2400 bps with Low Probability of Intercept/Detection (LPI/D), Anti-Jam (AJ), and Anti-Scintillation (AS) protection; and the EP system is expected to provide the full AEHF capability

Rocket Systems Launch Program (RSLP)

Acquisition Status

- **Inventory:** Over 1,250 stored motors
- **Contractors:**
  - **Orbital/Suborbital (Long-range):**
  - Orbital Sciences (Phoenix, AZ)
  - **Sounding Rocket:**
  - Coleman Research (Orlando, FL)
  - Lockheed Martin (Denver, CO)
  - Orbital Sciences (Phoenix, AZ)
  - Space Vector (Chatsworth, CA)
- **Advisory & Assistance:**
  - Northrop Grumman (Albuquerque, NM)

Capabilities/Profile

- **Store Deactivated ICBM Motors:**
  - $3 Billion ($FY02) in Launch Assets
  - Perform Aging Surveillance on stored motors
- **Provide Cost Reimbursable Launch Services for DoD Flight Tests:**
  - Provide Payload Integration Services
  - Refurbish and Transport Motors/Boosters
  - Conduct Launch

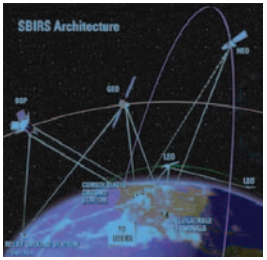
Functions/Performance Parameters

- **Mission:** RSLP will maintain active control and management of Air Force excess ballistic missile assets and will provide, on a cost reimbursable basis, flight test support and operations for national R&D requirements.
- **Performance Parameters:**
  - Single DoD agency providing launch vehicle support for the three services on cost reimbursable basis
  - Over 650 launches since 1962
  - Does $75 Million ($FY02) in reimbursable launch business per year - represents about $40 million in launch cost-avoidance for our customers

Space Based Infrared System High (SBIRS High)

Acquisition Status

- **Program Status:** SBIRS High is in System Development and Demonstration (SDD). Increment 1 ground segments at Mission Control Station (MCS) and Interim MCS Backup (IMCSB) are operational.
- **Unit Assignment:** 2d Space Warning Squadron, Buckley AFB, CO
- **Projected Inventory:**
  - SBIRS High consists of:
    - 4 Geosynchronous Earth Orbit (GEO) satellites plus a fifth (spare) GEO satellite
    - 2 Sensors in Highly Elliptical Orbit (HEO)
    - Increment 2 MCS
    - MCS Backup
    - 9 GEO-compatible Multi Mission Mobile Processors (M3Ps)
    - 5 Relay Ground Stations (RGS)
- **Contractors:**
  - Lockheed Martin Space Systems (Sunnyvale, CA) (prime)
  - Northrop Grumman Electronic Systems (Azusa, CA) (subcontractor)
- **Current Upgrades:**
  - Develop Increment 1-compatible M3Ps to replace Defense Satellite Program legacy Mobile Ground Terminals (MGTs)



- Develop advanced Increment 2 ground software to be fielded in all SBIRS High ground systems
- Develop permanent, fully-capable Increment 1 MCS Backup
- Develop next-generation space sensors to provide replacements to aging DSP fleet and provide enhanced mission capabilities
- Upgrade RGS compatible with SBIRS HEO and GEO space systems

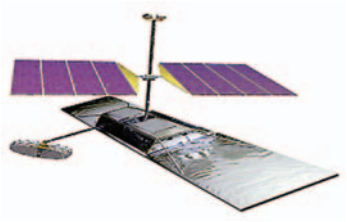
Functions/Performance Parameters

- **Mission:** SBIRS consolidates the national and DoD's infrared detection systems into a single overarching architecture that fulfills the nation's security needs in the areas of missile warning, missile defense, technical intelligence, and battlespace characterization.
- **Performance Parameters:** SBIRS enables global, simultaneous surveillance, tracking and targeting of multiple objects in multiple areas of responsibility (AORs) and surveillance of infrared sources of operational, intelligence, and national significance.

Space Radar (SR)

Acquisition Status

• **Program Status:** Acquisition Phase A (Study Phase), Concept and Architecture Development
  • OSD SBR Roadmap published in Feb 02
  • Mission Need Statement approved by Air Force and Joint Requirements Oversight Councils (AFROC, Oct 01; JROC, Apr 02)
  • System Engineering and Integration (SE&I) contract awarded 25 Sep 03
  • Ground Moving Target Indication (GMTI) Analysis of Alternatives (AoA) began in Oct 01, interim results were reported in Nov 02; AFROCC review, Nov 03; Final Report, Mar 04
  • Initial Concept of Operations (CONOPS) and Initial Capabilities Document (ICD) approved by JROC, 29 Sep 03; Intelligence Community (IC) Mission Requirements Board review complete, 25 Nov 03
  • SECDEF and DCI signed memorandum committing to pursue a comon space radar for DOD and IC, 13 Jan 05
• **Contractors: (Current)**
  • Prime Contractors: Lockheed Martin (LM), Northrop Grumman (NG)
  • Major Subs: Harris, NGES, Raytheon, General Dynamics (Veridian)
  • Systems Engineering & Integration Contracts: SAIC (Prime), Major Subcontractors LM, Partners in Air & Space, SPARTA, Steller, BD Systems, General Dynamics-AIS



• **Schedule:**
  • Key Decision Point (KDP) -A successfully met at 10 Jul 03 Defense Space Acquisition Board (DSAB) allowing SBR to proceed into the study phase
  • System Engineering and Integration (SE&I) contract awarded Sep 03
  • Request for Proposal (RFP) for Concept Development, Jan 04
  • Alternate Systems Review (ASR), Sep 04
  • System Readiness Review (SRR), Jun 07
  • System Design Review (SDR), Jun 08
  • KDP-B, FY08
  • Initial Launch Capability (ILC): Accelerated radar demo satellite, CY2008; SR ILC, FY 2015
  • Changed structure and focus of Program Office to increase collaboration with stakeholders from the DoD and IC
  • Radar satellite demonstrator to be launched in CY2008--will validate cost and technology maturity and demonstrate CONOPS and user utility
  • AF restructuring program to address Congressional concerns and DoD/IC differences in requirements
  • Preserve SR FY15 ILC option while working Interface Control Doument revisions with DoD/IC team

Capabilities/Profile

• **Payload:** Satellites notionally equipped with Electronically Scanned Array (ESA) to provide:
  • Synthetic Aperture Radar (SAR) Imagery
    • Surface Moving Target Indication (SMTI)
  • High Resolution Terrain Information (HRTI)
• **Tasking, Collection Processing, Exploitation, Dissemination:** Dynamic tasking capability including theater-based tasking, machine-to-machine interfaces, timely data dissemination, cross-cueing to airbourne ISR to complement tracking, and data processing compliant with communications links and imagery processing standards
• **Launch Vehicle:** Evolved Expendable Launch Vehicle

Functions/Performance Parameters

• **Mission:** Radar in space will be essential to providing the deep look, all weather, day and night surveillance and reconnaissnce capabilities required by both the national intelligence and joint warfighters. SR will provide rapid Battlespace Dominance and Operational Decision Superiority through:

- Day/night, all-weather, globally persistent surveillance with SAR imaging, HRTI and SMTI from Space
- Deep-look, wide area surveillance of denied areas allowing for responsive, precision targeting for the warfighter

• **Performance Parameters:** Exact surveillance capabilities and numbers of spacecraft are subject to technical tradespace considerations--These considerations will be evaluated as part of the ongoing concept and architecture study phase.

Space Surveillance Network (SSN)

Acquisition Status

• **Program Status:** Operational
• **Unit Assignment:** Air Force space operations units worldwide
• **Current Inventory:** 8 dedicated sensors (1 space-based), 8 collateral sensors, and 14 contributing sensors
• **Projected Inventory:** 8 dedicated, 8 collateral sensors, and 14 contributing sensors
• **Contractors:**
  • Northrop Grumman (Redondo Beach, CA--Space Based Space Surveillance)
  • ITT Industries (Colorado Springs, CO--Space Situational Awareness Initiatives, Eglin Service Life Extension Program)
  • Lockheed Martin (Colorado Springs, CO--Space Situational Awareness Initiatives)
  • MIT/Lincoln Lab (Lexington, MA--Haystack Upgrade)
  • Northrop Grumman Colorado Springs, CO—Ground -based Electro Optical Deep Space Surveillance (GEODSS)
  • TBD (Orbital Deep Space Imager)
• **Current Upgrades:**
  • (GEODSS) charge coupled device (CCD) camera; replacement of telescope and dome controllers
  • Eglin Radar Service Life Extension Program (SLEP)
  • Haystack Ultra-wideband Satellite Imaging Radar (HUSIR) Upgrade

  • Space Situation Awareness Command and Control (C2) Initiatives
  • Space-Based Space Surveillance (SBSS) System
  • Orbital Deep Space Imager (ODSI)
  • Air Force Space Surveillance System (AFSSS) Fence S-Band Replacement

Capabilities/Profile

• **Ground Sensors (dedicated):** 4 Optical and 3 Radar
• **Ground Sensors (other):** 8 collateral; 14 contributing sensors
• **Satellites (dedicated):** 1 Midcourse Space Experiment/ Space-Based Visible (MSX/ SBV)
• **Range:** Near Earth object tracking to 6000km, deep space tracking to 40,000km from ground-based sensors
• **Dimensions:** Varies by sensor/site; Very High Frequency Fence: 30 cm (Near Earth); GEODSS: 30 cm (Deep Space)

Functions/Performance Parameters

• **Mission:** Contributes to space situation awareness by detecting, tracking, identifying, characterizing, and monitoring all man-made objects in Earth orbit. The SSN operates a worldwide network of dedicated, collateral, and contributing electro-optical and radar sensor systems integrated with required C2, data processing, and analysis functions
• **Performance Parameters:** Provides awareness of all space events and activities such as:
  • Satellite attack warnings and satellite overhead threat warnings
  • New foreign launches and space treaty monitoring
  • Space object break-ups or decays
  • Satellite maneuvers
  • Space object identification mission payload assessment (SOI/MPA)
  • Supports DoD, NRO and NASA space operations
  • The space object catalog contains over 10,000 objects. Approximately 80% are near Earth objects; 20% deep space. Much of this data is shared with the United Nations, NASA, U.S. allies, and foreign launch agencies.

Space Test Program (STP)

Acquisition Status

• **Experimental Satellite System (XSS)-11 mission on Minotaur Launch Vehicle:** Develop autonomous mission planning, rendezvous and proximity operations.
• **Communication/Navigation Outage Forecasting System (C/NOFS) mission on Pegasus in FY05:** Forecast ionospheric scintillations that degrade communication, navigation and surveillance systems
• **STP-EELV mission with first Evolved Expendable Launch Vehicle (EELV):** Secondary Payload Adapter (ESPA) in FY06, which will launch 6 experimental satellites

Capabilities/Profile

• Conducts space missions for DoD space research community: Approx $40M RDT&E program
• Acts as the primary interface between NASA shuttle and International space station programs and the DoD
• Performs risk reduction through direct flight test of prototype components
• Responsible for all secondary payload flight opportunities on Air Force launch vehicles
• Flight tests new space system technologies
• Improves operational capabilities by characterizing environment, sensor physics
• Develops and tests advanced launch vehicle technologies and capabilities

Functions/Performance Parameters

• Performs mission design, procures launch services as well as spacecraft -- conducts on-orbit operations
• R&D Experiments selected annually via the DoD Space Experiments Review Board (SERB)
• 20% of payloads fly as secondary payloads
• 50% fly on the Shuttle, Space Station, or Russian Progress vehicles
• 30% fly on dedicated freeflying satellites

Transformational Satellite (TSAT) Communications System

Acquisition Status

- **Program Status:** Risk Reduction and Design Development
- **Satellites on Orbit:** 0
  - First Launch 2Q FY13
- **Satellites in Development:** 6 (to assure the required 5-satellite constellation is achieved)
- **Contractors:**
  - Risk Reduction and Preliminary Design Development: 2 Contractor teams, one led by Lockheed Martin; the other by Boeing Satellite Systems
- **Future Upgrades:** None currently planned
- **Purchase Requirements:** 6 satellites plus ground-based control and networking systems. Individual Services modify or acquire terminals.

Capabilities/Profile

- **Key Performance Parameters Include**
  - **Connectivity - Coverage:** Worldwide between 65 degrees north & south, 24 hours/day
  - **Connectivity - Capacity/ Satellite:** Threshold: 5.7 Gbps (Obj: 37 Gbps)
  - **Connectivity - Nuclear Protection:** Provide assured communications for networks supporting critical functions
  - **Operational Management:** Provide users ability to plan, control, and reconfigure resources
  - **Information Assurance:** Protect against degradation, disruption, denial, and unauthorized access/ monitoring
- Interoperability: Support networking among users from all operational elements
- **Operational Suitability:** Provide networking per the Transformational Communications Architecture based on Internet Protocol version 6

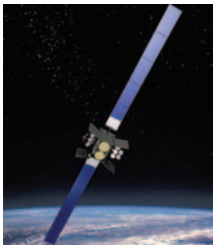
Functions/Performance Parameters

- **Mission:** Replenishes/augments capabilities to be provided by the AEHF and WGS systems. (Note: WGS was to have been followed by the wideband-only Advanced Wideband System [AWS]. AWS has been recast into the new wideband/protected TSAT system). Will use Internet Protocol-based packet switching, laser crosslinks, and both Radio Frequency, and lightwave (laser) communications
  - Provides more capacity
  - Provides more coverage/ communications options
- **Performance Parameters:**
  - Low Probability of Intercept (LPI)
  - Low Probability of Detect (LPD)
  - Maximum protected Data Rate to 45 Mbps, an increase over the AEHF rate of 8 Mbps
- Throughput increases to more than 10 times the total of AEHF and WGS capacities

Wideband Gapfiller System (WGS)

Acquisition Status

- **Program Status:** Production
  - Satellite 1 launch in March 2006
  - Satellite 2 launch in September 2006
  - Satellite 3 launch in February 2007
  - Satellite 4 launch in FY 2009
  - Satellite 5 launch in FY 2010
- **Satellites on Orbit:** 0
- **Satellites in Development:** 5
- **Contractors:**
  - WGS 1-3: Boeing
    - Contract Awarded January 2001
    - Sole Source, FAR Part 12
    - Development & Production
- **Future Upgrades:** Transformational Satellite (TSAT) system
- **Purchase Requirements:** 3 Satellites currently. New contract in progress to acquire 2 additional satellites to be launched in FY09 and FY10



Capabilities/Profile

Key Performance Parameters:

- **Converge:** 24 hours between 65 degrees North & South
- **Capacity/Satellite:** 2.1 Gbps
  - Satellites 4 and 5 will contain capability to pass 274 Mbps for Intelligence, Surveillance, & Reconnaissance users
- **Interoperability:** Interoperable with legacy Defense Satellite Communications System (DSCS) and Global Broadcast System (GBS) terminals

Functions/Performance Parameters

- **Mission:** High data rate satellite broadcast system to bridge gap between current systems (DSCS & GBS) and the TSAT system that has subsumed the conceptual Advanced Wideband System.
- **Performance Parameters:** Wideband communications at X and Ka Band frequencies
  - Two-way X Band
  - New two-way Ka Band
  - Ka broadcast
  - ~12x throughput capacity of most advanced DSCS III satellite