

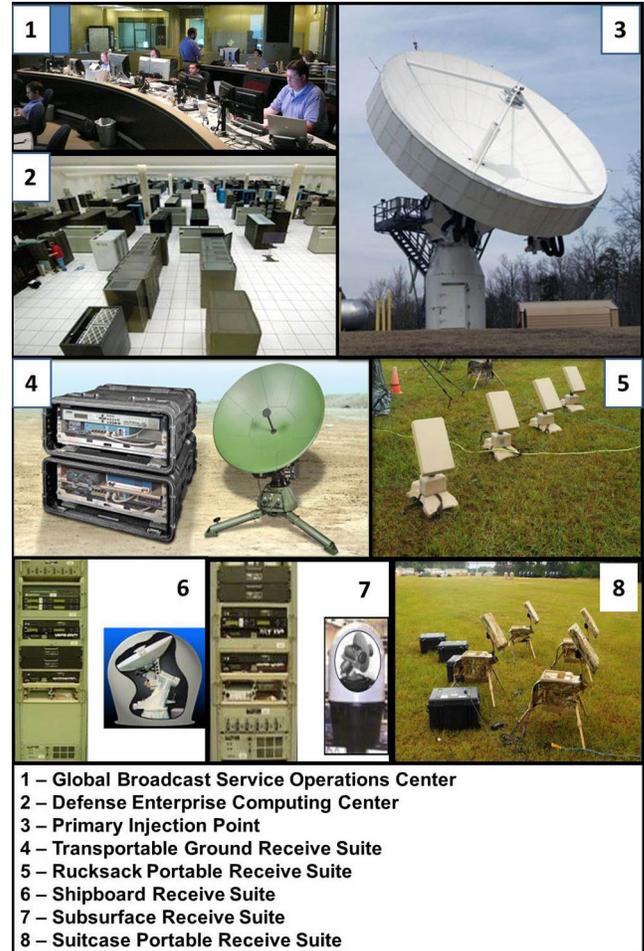
Global Broadcast Service (GBS) System

Executive Summary

- The program manager is developing the Global Broadcast Service (GBS) Phase-IV capability that includes an upgraded Transportable Ground Receive Suite (TGRS), new Rucksack Portable Receive Suite (RPRS), new Suitcase Portable Receive Suite (SPRS), and integration of the Digital Video Broadcasting – Satellite – Second Generation (DVB-S2) waveform that should provide more efficient use of available satellite bandwidth.
- The Air Force Operational Test and Evaluation Center (AFOTEC) conducted FOT&E-1 from May 25 through June 30, 2016, with participation from the Army Test and Evaluation Command, Marine Corps Operational Test and Evaluation Activity, and the Navy’s Commander, Operational Test and Evaluation Force. FOT&E-1 included operators from the Air Force, Marine Corps, and Army operating and maintaining receive suites at Robins AFB, Georgia. The USS *Carl Vinson* (San Diego, California) and USS *Santa Fe* (Pearl Harbor, Hawaii) participated for the Navy, communicating over the Wideband Global Satellite Communications (WGS) system.
- The GBS receive suites are operationally effective in providing a continuous flow of high-speed, high-volume, multimedia communications for deployed and garrisoned forces.
- The GBS is not survivable against internal or external cybersecurity threats. The Army Threat Systems Management Office found 17 cybersecurity vulnerabilities on the GBS system that could be exploited by potential adversaries.
- The GBS receive suites are not suitable because the system did not demonstrate that it could meet reliability and maintenance repair times, and the documentation lacked adequate troubleshooting procedures. The systems can be made suitable once corrective actions to improve cable durability, system shutdowns, and technical documentation are made and verified. The program manager is in the process of updating technical orders and technical manuals, performing root cause analysis, and implementing corrective actions.

System

- The GBS is a satellite-based broadcast system providing near-worldwide, high-capacity, one-way transmission of operational military data.
- The GBS system consists of three segments:
 - The space segment includes GBS transponders on WGS, Ultra High Frequency Follow-On (UFO) satellites, and an additional government-leased commercial satellite capability to meet operational demand.
 - The transmit segment consists of the GBS Operations Center and Satellite Broadcast Manager (SBM). The GBS Operations Center, located at Peterson AFB, Colorado,



remotely creates and manages the GBS broadcast through the primary and alternate SBM located at Oklahoma City, Oklahoma, and Mechanicsburg, Pennsylvania, respectively. The SBM receives data and video products from a variety of sources and packages that source material into a satellite broadcast. The SBM interfaces through DOD Teleport sites for the WGS satellites and fixed Primary Injection Points for the UFO satellites and commercial satellites.

- The receive segment consists of ground- and sea-based mobile terminals that extract the appropriate information for distribution to the end users within selected areas of operation. The receive suite configurations include the TGRS, RPRS, SPRS, Shipboard Receive Suite, and the Subsurface Receive Suite.

Mission

- Combatant commanders and operational forces worldwide use GBS to provide a continuous high-speed and high

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volume flow of data, audio, imagery, and video at multiple classification levels for sustained operations.

- Commanders use the GBS capability to provide intelligence and battlespace weather information, increasing the joint operations mission data available to deployed and garrisoned military forces across the globe.

Major Contractor

- General Dynamics C4 Systems – Taunton, Massachusetts
- AQYR Technologies – Hollis, New Hampshire

Activity

- The program manager is developing GBS Phase-IV capability that includes an upgraded TGRS, new RPRS, new SPRS, and integration of the DVB-S2 waveform that provides more efficient use of available satellite bandwidth.
- On November 13, 2014, the DOD Chief Information Officer instructed the Director, Defense Information Systems Agency to redirect the acquisition strategy of the Joint Internet Protocol Modem from a development program to a commercial off-the-shelf solution. The commercial solution is named the Enterprise Satellite Communications (SATCOM) Gateway Modem. The GBS program's Phase-V is intended to integrate the Enterprise SATCOM Gateway Modem in the GBS architecture to provide waveform protection through implementation of transmission security to prevent potential communications traffic analysis by adversaries.
- The GBS program manager, AFOTEC, and Service representatives updated the GBS Test and Evaluation Master Plan (TEMP) to include the Phase-IV capabilities and testing. DOT&E approved the TEMP update on March 21, 2016.
- The Air Force's 46th Test Squadron (46 TS) conducted a government Developmental Test and Evaluation 2 (DT&E-2) from October 19 through November 20, 2015, at Robins AFB, Georgia, and Naval Base San Diego, California, to assess the end-to-end broadcast and receive capabilities of the GBS receive suites using the DVB-S2 waveform.
- The 46 TS conducted a government DT&E-2 regression test from February 16 through March 18, 2016, at Robins AFB, Naval Base San Diego, and Pearl Harbor, Hawaii, to assess the end-to-end broadcast and receive capabilities of the GBS receive suites running the new GBS receive suite software. The GBS Program Manager delivered updated GBS receive suite software and technical manuals prior to the 46 TS DT&E regression test.
- The Air Force's 92nd Cyberspace Operations Squadron conducted a cybersecurity Cooperative Vulnerability and Penetration Assessment (CVPA) from February 21 through March 12, 2016, during the program manager's developmental test period.
- AFOTEC conducted FOT&E-1 from May 25 through June 30, 2016, with participation from the Army Test and Evaluation Command, Marine Corps Operational Test and Evaluation Activity, and the Navy's Commander, Operational Test and Evaluation Force. FOT&E-1 included operators from the Air Force, Marine Corps, and Army operating and maintaining receive suites at Robins AFB. The USS *Carl Vinson* and USS *Santa Fe* participated for the Navy, communicating over

WGS. AFOTEC conducted FOT&E-1 in accordance with the DOT&E-approved TEMP and test plan. The FOT&E-1 start date was preceded by a dry run period from May 16 – 30, 2016. Prior to the operational test, the program manager provided updated GBS operator manuals.

- The Army's Threat Systems Management Office conducted a cybersecurity Adversarial Assessment on the GBS system from June 1 – 20, 2016, during AFOTEC's FOT&E-1.
- DOT&E submitted a report for an Air Force Space Commander operational acceptance decision planned for November 2016.

Assessment

- The 46 TS conducted DT&E-2 to evaluate the receive capabilities of the TGRS, RPRS, and SPRS over the DVB-S2 broadcast and to document and report discovered deficiencies for the program manager to correct prior to the DT&E-2 regression test. The GBS successfully completed 26 of 29 test objectives. The GBS system did not verify three reliability objectives because the allotted test time was insufficient to provide data for evaluating reliability with statistical confidence. The testers also found that the receive suite technical orders troubleshooting steps were incomplete or inaccurate. The incorrect and missing procedures led to delays in users resolving problems and restoring the systems to operation.
- The DT&E-2 regression test demonstrated that the receive suites correctly received and processed data and video, but testers and users noted problems with reliability. Once set up, the GBS system is intended to operate without operator attention for a minimum of 24 hours, and up to 83 days. The reliability problems cause operators to intervene to restore the system to operations, diverting them from other mission needs. The updated documentation for troubleshooting still lacked clarity, with missing or incomplete troubleshooting steps.
- During the CVPA, the 92nd Cyberspace Operations Squadron discovered 54 potential vulnerabilities and compliance findings with the GBS system. The program manager corrected some of the discovered potential vulnerabilities and compliance findings, but many remained uncorrected or successfully mitigated in the operational test.
- The GBS receive suites are operationally effective in providing a continuous flow of high-speed, high-volume, multimedia communications for deployed and garrisoned forces.

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- The GBS is not survivable against internal or external cybersecurity threats. The Army Threat Systems Management Office found 17 vulnerabilities on the GBS system that could be exploited by potential adversaries.
- The GBS receive suites were not suitable because the system did not demonstrate it could meet reliability and maintenance repair times, and documentation lacked adequate troubleshooting procedures. The systems can be made suitable once corrective actions to improve cable durability, system shutdowns, and technical documentation are made and verified. The program manager is in the process of updating technical orders and technical manuals, performing root cause analysis, and implementing corrective actions.

Recommendations

- Status of Previous Recommendations. The Air Force has addressed all previous recommendations.
- FY16 Recommendations. The Air Force should:
 1. Correct the problems with the cables, system shutdowns, and documentation, and verify the corrections in the GBS operational trial period and FOT&E-2.
 2. Correct the cybersecurity vulnerabilities and conduct a CVPA and Adversarial Assessment in the next operational test.

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