

Defense, Space & Security  
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## Wideband Global SATCOM

### Description and Purpose:

The mission of the Wideband Global SATCOM (WGS) system is to provide broadband communications connectivity for U.S. and allied warfighters around the world. WGS is the highest-capacity military communications system in the U.S. Department of Defense arsenal, providing a quantum leap in communications capability for the U.S. military.



Boeing's investments in phased array antennas and digital signal processing, combined with innovations in the commercial satellite market, have resulted in a flexible WGS system that delivers the capacity, coverage, connectivity and control required by the most demanding operational scenarios.

**Customer:** The U.S. Air Force MILSATCOM Systems Directorate at Los Angeles Air Force Base (AFB) is the WGS customer.

### General Characteristics:

WGS is designed for coverage, capacity and connectivity, and can process more than 3.6 gigabits per second of data – more than 10 times that of the previous system. Operating at both X-band and Ka-band, the system will enable networks for tactical Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR).

WGS supports communication links throughout the allocated 500 MHz of X-band and 1 GHz of Ka-band spectrum. Through frequency reuse and digital channelization, each WGS payload can exploit more than 4.8 GHz of usable communications bandwidth.

The WGS design includes 19 independent coverage areas – 10 Ka-band and 8 X-band spot beams can be positioned anywhere in the field of view of each satellite. Full-Earth coverage in X-band is also provided. Use of phased array technology allows the eight X-band beams to be steered and shaped to apply gain and power exactly where it's needed.

Communications between users is enhanced using the digital channelizer, which allows for very efficient use of a satellite's bandwidth. It divides the uplink bandwidth into nearly

1,900 independently routable sub-channels, providing the connection from any uplink coverage area to any downlink coverage area.

**Background:**

The first three WGS satellites, which constitute Block I, are all on-orbit and are meeting or exceeding all operational requirements. WGS-1 was placed into service over the Pacific Ocean Region in April 2008. WGS-2 was placed into service over the Middle East in August 2009. WGS-3 went into operations over Europe and Africa in June 2010. WGS-4, the first in the Block II series, was placed into service over the Indian Ocean Region in August 2012. WGS-5 was placed into service on October 1, 2013, and WGS-6, the last in the Block II Follow-On series, was placed into service on December 12, 2013. The Block II satellites include an RF bypass enhancement to support high-data-rate airborne intelligence, surveillance and reconnaissance (AISR) missions.

As is common with DOD satellite contracts, the Government has incrementally increased the size of the constellation through the exercise of contract options for procurement of additional satellites. To that end, the Block II Follow-On (B2FO) contract was awarded in August 2010 with the initial order for satellite 7. Satellites 8, 9 and 10 were awarded in December 2011, January 2012 and July 2012, respectively. The Wideband Digital Channelizer upgrade, which was awarded in June 2012, will be included on WGS-8 and beyond and will provide a 90 percent improvement in satellite bandwidth.

**Miscellaneous:**

The WGS communications payload is controlled from four Wideband Satellite Operations Centers, using ground-based control elements provided by Boeing. Platform control is conducted from Schriever Air Force Base using mission-unique software designed specifically for this program by Boeing in concert with the U.S. Air Force Command and Control System-Consolidated (CCS-C).

WGS leverages a wealth of government and commercial experience and technology, including the proven Boeing 702HP satellite platform – the industry leader in capacity, performance, and cost-efficiency. Enabling technologies of the 702HP platform include xenon-ion propulsion system (XIPS), highly efficient triple-junction gallium arsenide solar cells and deployable radiators with flexible heat pipes.

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November 2015

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## Wideband Global SATCOM

Providing affordable global  
MILSATCOM access to international  
partners

The U.S. Air Force's Wideband Global SATCOM (WGS) is the Department of Defense's (DOD) highest capacity communications satellite. The system provides a global footprint of critical wideband communications for warfighters as well as an unparalleled ability to interconnect users that are geographically dispersed or using different frequency bands.



### WGS-6 and WGS-9 International Partners



Australia became the first international participant in the WGS system under a cooperative agreement with the United States Air Force in 2007. In 2012, five additional partner nations – Canada, Netherlands, Luxembourg, Denmark and New Zealand – executed a similar agreement to gain global access to the WGS system.

### Benefits:

WGS provides modern MILSATCOM wideband services to meet a variety of civilian and military missions, minimizing cost by leveraging the existing infrastructure of compatible wideband ground and user terminals. Existing international partners have recently demonstrated how quickly existing equipment can be used to access the WGS system.

The WGS constellation continues to expand, with three additional spacecraft on contract (WGS-8, 9, 10). WGS-7, the most recent of the system's satellites to be placed on-orbit, expanded the advanced secure communications network that supports the U.S. DOD and its international partners. The on-board digital channelizer, the heart of the WGS payload, will be upgraded starting with the eighth spacecraft to nearly double the payload capacity and further improve connectivity of future spacecraft. The new channelizer also enhances anti-jam (AJ) performance for advanced protected MILSATCOM terminals using next-generation waveforms. In addition, there are affordable ground modifications that can provide adaptive nulling and geolocation capabilities to address the evolving threat environment. The increased bandwidth

provided by the new Wideband Digital Channelizer, combined with the available AJ features described above, provide allied partners assured access to a globally robust and secure constellation to support military or disaster relief activities worldwide.

**Affordability:**

The DOD's program to bring partner nations into the WGS system provides a highly affordable way to gain modern wideband MILSATCOM access globally for a much lower cost than developing a dedicated satellite system. Compatible with existing X- and Ka-band user equipment, WGS can provide high performance, global access, and interoperability with NATO forces and other international partners. The international program has allowed member nations to invest proportional to their specific level of MILSATCOM needs. This arrangement provides the benefits of immediate access through an existing worldwide infrastructure, including multiple gateways, terrestrial networking, and mission planning capabilities. In addition, international partners are able to leverage existing user terminals and telecom equipment.

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November 2015