THE NEED TO KNOW

The Wideband Global SATCOM (WGS) Satellite is a high-capacity satellite communications system designed to support the Warfighter with newer and far greater capabilities than those provided by current systems, yet it is compatible with existing systems and terminals. WGS provides two-way X-band and Ka-band communications as well as Ka-band broadcast services to U.S. Armed Forces and other agencies worldwide. The procuring agency is the U.S. Air Force Space Command's Space and Missile Systems Center at Los Angeles Air Force Base, Calif.

Jointly funded by the U.S. Air Force and U.S. Army, the WGS contract includes options for as many as six Boeing 702 satellites and associated spacecraft and payload ground control equipment. Operational, logistics and training support are also included in the program.

WGS will augment and eventually replace Department of Defense communications services currently provided by the Defense Satellite Communications System (DSCS), which provides Super High Frequency wideband communications, and by the Ka-band Global Broadcast Service, which uses direct broadcast satellite technology to provide critical information to U.S. and allied forces. With the initial launch, Oct. 10, 2007, aboard an Air Force Evolved Expendable Launch Vehicle, WGS provides early transformational capabilities supporting government objectives for a Transformational Communications Architecture in 2009 and beyond.

WGS combines unique commercial spacecraft capabilities that Boeing has developed, including phased array antennas that can electronically steer and shape X-band beams as well as digital signal processing technology providing for an extremely powerful, flexible architecture. Based on the Boeing 702 bus, the satellite has a dry mass of more than 3,000 kg and will produce more than 11 kilowatts of power at the end of its 14-year design life. The system provides tremendous operational flexibility and delivers the needed capacity, coverage, connectivity and control in support of demanding operational scenarios.

Capacity: WGS offers 4.875 GHz of instantaneous switchable bandwidth. The system will provide capacity ranging from 1.2 Gbps to more than 3.6 Gbps to tactical users, depending on the mix of ground terminals, data rates and modulation schemes employed. Thus, each WGS can supply more than 10 times the capacity of a DSCS III Service Life Enhancement Program satellite.

Coverage: The WGS design includes 19 independent coverage areas that can be used throughout the field of view of each satellite to serve Warfighters between 65 degrees North and South latitude. This includes eight steerable and shapeable X-band beams formed by separate transmit and receive phased arrays; 10 steerable Ka-band beams served by independently steerable, diplexed gimbaled dish antennas, including three with selectable polarization; and one X-band Earth coverage beam.

Connectivity: The enhanced connectivity capabilities of WGS enable any user to talk to any other user with very efficient use of satellite bandwidth. A digital channelizer divides the uplink bandwidth into over 1,500 independently routable 2.6 MHz subchannels providing any-coverage-to-any-coverage connectivity (including X-to-Ka and Ka-to-X crossbanding) for maximum operational flexibility. In addition, the channelizer supports multicast and broadcast services and provides an extremely effective and flexible uplink spectrum monitoring capability for network control.

Control: The ground control segment leverages commercial off-the-shelf hardware and software, such as Raytheon's Eclipse™ telemetry and command system,

for a robust and reliable design that is easy to operate and maintain. This design reduces manpower requirements and other life cycle costs. The Army Wideband Satellite Operations Centers (WSOCs) around the world and the Air Force Satellite Operations Center at Schriever Air Force Base, Colo., will be the primary control facilities for WGS. Satellite control can be performed via X-band or Ka-band links, as well as SGLS or USB S-band links.

SATELLITE DESIGN

The Boeing 702 satellite is the world leader in capacity, performance and cost-efficiency. Enabling technologies for the advanced 702 design are the xenon-ion propulsion systems, highly efficient triple-junction gallium arsenide solar cells, and deployable radiators with flexible heat pipes.

Xenon-ion propulsion systems are 10 times more efficient than conventional bipropellant systems. Four 25-cm thrusters remove orbit eccentricity during transfer orbit operations, perform orbit maintenance, and perform station change maneuvers as required throughout the mission life. Xenon-ion propulsion systems engines are produced by Boeing Electron Dynamic Devices.

Deployable radiators with flexible heat pipes provide substantially more radiator area, resulting in a cooler, more stable thermal environment for both bus and payload. This increases component reliability and reduces performance variations over the satellite's service life.

The figure to the right depicts the payload block diagram. It shows how the X-band and Ka-band antenna suites are interconnected via the digital channelizer to provide the unique flexibility and connectivity of WGS.

WGS TEAM

As the prime contractor and WGS integrator, Boeing Satellite Systems leads a team that includes several major subcontractors. Harris Corp., a leading provider of wideband satellite communications ground terminals, will supply the satellite's Ka-band antenna subsystem as well as system engineering support for satellite-to-ground terminal interface verification. ITT Industries, a principal supplier of wideband satellite communications network management and control systems, will develop and integrate the WGS payload command and control element for installation within the WSOCs. Northrop Grumman Information Technology is supplying wideband satellite communications network planning software under separate contract and is leading the WGS effort for system security engineering. Science Applications International Corporation (SAIC) has extensive satellite communications systems engineering capabilities and supports the overall WGS systems engineering effort.

LEVERAGING COMMERCIAL TECHNOLOGY

WGS marked the Department of Defense's first use of Federal Acquisition Regulation Part 12 for satellite system procurement. Use of FAR Part 12 allowed the government to obtain the best value for the Warfighter by leveraging commercially available products to the greatest extent practical.

As the leading provider of advanced satellite communications systems for Geomobile, broadcast and packet-switched satellite communications, Boeing Satellite Systems has been able to leverage a wealth of commercial experience and technology for WGS. This includes the company's extensive investments to develop the Boeing 702, as well as phased arrays and satellite digital processing. Together these developments helped to provide the enormous capacity and tremendous flexibility sought for the WGS space segment. They further allow WGS to evolve and satisfy additional transformational requirements of the Warfighter, such as improved connectivity for intelligence, surveillance, and reconnaissance from unmanned vehicles and network-centric communications architectures.

Information taken from SMDC/ARSTRAT
WGS Fact Sheet