



Boeing workers and subcontractors install a new radome at Diego Garcia in the Indian Ocean under the U.S. Air Force Global Positioning System Ground Antenna Replacement project. The radome protects the satellite dish from the weather. Boeing also replaced the radomes at Ascension Island in the South Atlantic, Kwajalein Atoll in the Pacific Ocean and Cape Canaveral, Fla.

BOEING PHOTO

# Stay in *touch*

## Meet the satellite support team that keeps you connected 24-7

By Ed MEMI

A fighter pilot releases a smart bomb and hits his target dead-on with no harm to civilians. A driller on a North Sea oil rig gets crystal-clear reception on a phone call from his wife thousands of miles away. A sports enthusiast feels like he's right there at a big game, thanks to the razor-sharp images of high-definition TV.

Chances are none of them give a thought to the satellite link that connects them instantly and reliably any time of day or night. That's the job of a Boeing team that keeps watch on the Iridium, DIRECTV and Global Positioning System (GPS) satellite constellations 24-7.

The 650-person Boeing Service Company Satellite Operations and Ground Systems (SO&GS) team acts as mission control for the satellite constellations by tracking and monitoring their status, keeping them in operation, ensuring signals can be received and processed, and supporting ground facilities and antenna tracking sites. Lessons learned in operating these satellites and ground systems can be applied to the operations and support contract for NASA's mission control center and training facilities at Johnson Space Center in Houston.

Don Hull, director of SO&GS, with operations in Colorado, Texas, Virginia and Arizona, said his engineers and technicians absolutely love their work. "Think of all these satellites circling the globe with all types of data constantly being transmitted. It's technically very interesting and challenging work," he said.

Here's a look at the systems the SO&GS team supports.

### IRIDIUM

Iridium is the largest commercial satellite constellation in the world, with 66 satellites and multiple backup satellites. Positioned about 400 miles (640 kilometers) above the earth, they provide voice and data communications capability anywhere in the world.

The Iridium network is used by fishermen, oil industry workers and the military to operate satellite phones and data communications equipment in areas where cellular phones can't be used, such as in the middle of the ocean or desert. Tens of thousands of aircraft and boats are equipped with Iridium-based systems.

A team of 230 Boeing and contractor employees issue an average of more than 400,000 commands a year to these satellites, said Jim Compton, program manager for Iridium operations and maintenance. "Those commands might include software updates or even changing the orientation of the satellites—actions designed to keep the satellites healthy," he said.

### DIRECTV

David Larsen gets a lot of satisfaction when he watches DIRECTV at home. Not only because the images are so vivid and lifelike, but also because he heads a team of 18 at the DIRECTV control center. DIRECTV satellites transmit digital satellite television and audio to millions of households and businesses across the United States.

The two DIRECTV satellites that Boeing operates are in geostationary orbits, 22,300 miles (35,900 kilometers) over the equator, so they stay in the same spot over the earth, giving viewers a clear, high-definition TV picture. Larsen's team ensures the satellites are exactly where they're supposed to be in the sky. If there's an anomaly, they fix the problem or provide a "workaround" to ensure there are no interruptions in service. "It is exciting to be operating a product that is used and enjoyed by millions every day," Larsen said.

### GPS

Another team, of 220 Boeing and 80 contractor employees, maintains the GPS hardware and software. GPS is a constellation of 33 satellites about 10,000 miles (16,100 kilometers) high. The team does for the master GPS control center everything short of commanding the actual satellite. Indeed, the team, led by GPS Operations Director Mike Shiikitus, won the 2007 Boeing Atlas Award for excellence in sustainment operations.

In 2007, the team began installation of a program that is replacing GPS' legacy mainframe system with a distributed hardware/software architecture. The new program has built-in automation capabilities that can reduce the workload for U.S. Air Force crew operators. The group also supports the satellite during launch, when on-orbit problems occur or when the satellite reaches the end of its life.

Leland Horn, senior manager of GPS Sustainment, said the biggest challenge in the future will be managing obsolescence of a system that must always be operational. "It's like replacing parts on your car while driving down the highway. You can't exactly stop the

GPS system to replace software or hardware," he said.

Originally developed for the military, GPS is now used by millions worldwide for business and recreation. "It's easy to take it for granted because it's so convenient and easy to use," Hull said. "Push a button on your dashboard unit, and you have instant turn-by-turn driving directions, thanks not only to the satellite system but to the folks who keep the system running." ■

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**Top: Misa Iovanov (standing), orbit analyst, works with Mission Director Donna McLamb to plan a maneuver activity in the Iridium Satellite Network Operations Control facility in Leesburg, Va. In the background, Boeing controllers monitor the health of the 66 Iridium satellites that provide voice and data communications capability worldwide. BOEING PHOTO**

**Bottom: DIRECTV Mission Operations Manager David Larsen and lead orbit analyst Jennifer Siefert are shown at the ground-system monitoring and control console in Houston reconfiguring telemetry, tracking, and commanding antennas at remote Earth stations. PATRICK ARMSTRONG PHOTO**

