Satellite Programs Overview

ABS – EUTELSAT

In March 2012, ABS and Satélites Mexicanos (Satmex), now owned by Eutelsat, placed the first order for the 702SP (small platform) satellite, the newest addition to the 702 product line. The 702SP couples proven technology from Boeing’s previous designs with next-generation technology and processes, resulting in an affordable, lightweight, all-electric propulsion spacecraft. The ABS-Eutelsat joint procurement is for four 702SP satellites, with options for four more. The new satellites will enable ABS to become a global satellite operator by expanding its current fleet to serve the Atlantic, Pacific and Indian Ocean regions; ABS-3A will allow the extension of C- and Ku-band services into the Atlantic Ocean. Eutelsat West 115B, a hybrid satellite with both C- and Ku-band capacity, will serve customers in Latin America and also provide the company with new expansion capacity. ABS-3A and Eutelsat West 115 B were launched together in March 2015 on a Falcon 9 launch vehicle. In July 2013, ABS 2A and Satmex 9, now known as Eutelsat West 117 B, were ordered. Both are Ku-band satellites and are scheduled to launch together on a Falcon 9 launch vehicle in late 2015. Eutelsat West 117 B will also feature a hosted payload that will augment the Federal Aviation Administration’s wide area augmentation system (WAAS).

DIRECTV 10, 11, 12

DIRECTV Inc. returned to Boeing to expand its constellation of communications satellites. Three Boeing 702HP satellites, dubbed DIRECTV 10, DIRECTV 11, DIRECTV 12, and six Ka-band uplink sites enable DIRECTV to significantly expand broadcasting to its customers across the continental United States, Hawaii, and Alaska. In addition to offering expanded national HDTV broadcasting, standard definition television broadcasting and interactive television, the three satellites provide the capability for DIRECTV to broadcast local HDTV to a majority of its customers.
GOES N-P SERIES
Boeing delivered three Geostationary Operational Environmental Satellites (GOES) to provide more accurate prediction and tracking of severe storms and other weather phenomena, resulting in earlier and more precise warnings to the public. The satellites – GOES-N, GOES-O, and GOES-P – support NOAA and NASA scientists by providing steadfast atmospheric surveillance of severe weather events such as tornadoes, flash floods, hail storms and hurricanes. When these conditions develop, the GOES satellites can monitor developing storms and track their movement.

GLOBAL POSITIONING SYSTEM (GPS) IIF
The Global Positioning System IIF (GPS IIF) is an upgrade of the current GPS, which is a worldwide timing and navigation system made up of 24 satellites orbiting some 12,000 miles above the Earth. Boeing is delivering 12 GPS IIF satellites, which use atomic clocks to continuously transmit digital radio signals pertaining to the exact time and exact location of the satellites. By referring to signals transmitted by four satellites, GPS can be used to calculate longitude, latitude and altitude. Since 1978, Boeing has built multiple generations of GPS satellites that have cumulatively provided more than 540 years of service.

INDOSTAR II/PROTOSTAR II
In 2008, Boeing announced a contract award from ProtoStar Ltd. to provide IndoStar II/ProtoStar II, a 601HP satellite that is delivering direct-to-home satellite television programming and broadband Internet access throughout Asia. IndoStar II/ProtoStar II is the most powerful satellite in the ProtoStar fleet and will significantly expand capacity throughout the Asia-Pacific region. ProtoStar is developing a satellite constellation of high-powered geostationary satellites that will provide a satellite network enabling robust direct-to-home services in India, Indonesia, Taiwan, the Philippines and Southeast Asia.
INMARSAT-5
Boeing is building four 702HP spacecraft to provide new Ka-band global and high-capacity satellite services to Inmarsat, the leading provider of global mobile satellite communications services. Leveraging Boeing’s extensive expertise in Ka-band satellite communications systems, the new satellites will join Inmarsat’s fleet of geostationary satellites that provide a wide range of voice and data services through an established global network of distributors and service providers. The Boeing satellites will provide Inmarsat with the ability to adapt to shifting subscriber usage patterns of high data rates, specialized applications and evolving demographics over a projected 15-year lifetime. In a separate arrangement, Boeing has also entered into a distribution partnership with Inmarsat to provide L- and Ka-band capacity services to key users within the U.S. government.

INTELSAT
In July 2009, Intelsat Ltd., the world’s leading provider of fixed satellite services, became the first customer for the Boeing 702MP satellite when it awarded a four-satellite contract to Boeing. The satellites refresh and add new capacity to Intelsat’s global satellite fleet. The Intelsat 22 satellite included an ultra-high-frequency, government-hosted payload for the Australian Defence Force. The 702MP, an evolution of the proven Boeing 702HP satellite, offers satellite operators a spacecraft that operates in the medium-level power ranges, with six-to-12 kilowatts of onboard power and a more flexible, modular design that maintains the spacecraft’s advanced technologies. In May 2013, Intelsat returned to Boeing with a second order for four 702MP satellites, and in July 2014 an order for a ninth Intelsat MP was announced. Six of the Intelsat 702MPs will carry the EpicNG high performance, next generation platform.

MEXSAT
In 2010, Secretaria de Comunicaciones y Transportes (SCT) de México ordered an end-to-end turnkey satellite communications system that will become Mexico’s next-generation telecommunications system. Boeing will design and deliver a complete system consisting of: two Boeing 702HP geostationary satellites; a satellite from Orbital Sciences Corporation for fixed satellite services; two ground stations in México, with a spacecraft operations center for network management and operation; and ground-based beam-forming and communications network equipment. Boeing also will deliver reference user terminals, which enable the end users of Mexsat to test and validate the system. The Mexsat
system will relay civil communications in urban and remote areas throughout the country, providing mobile, voice and data services. The satellites will operate over México and its patrimonial seas, including the Gulf of Mexico and the Pacific Ocean. The first 702HP Mexsat satellite was launched in May 2015, but was lost due to a Proton vehicle launch failure. The second Mexsat satellite is scheduled to launch in late 2015.

MOBILE USER OBJECTIVE SYSTEM (MUOS)
Boeing is providing both new UHF capabilities and the proven performance of its legacy Ultra-High-Frequency Follow-On (UHF F/O) program to the MUOS satellite, which ensures full backwards compatibility with existing UHF satellite user communities. The next-generation narrowband tactical satellite communications system, MUOS provides global SATCOM narrowband (64 kpbs and below) connectivity for voice, video and data for U.S. and allied services.

SES
Continuing a relationship spanning more than 25 years, SES, a world-leading satellite operator providing reliable and secure satellite communications solutions, returned to Boeing in 2012 for a new spacecraft, SES-9. The new satellite will provide maritime communication services and direct-to-home services in the Ku-band for a wide variety of commercial customers in the Asia Pacific region. This spacecraft will join SES' fleet of more than 50 geostationary satellites that provides a far-reaching infrastructure that enables their customers to reach 99% of the world’s population. In 2015, SES ordered SES-15, which will be a Boeing 702SP satellite.

SPACE BASED SPACE SURVEILLANCE SYSTEM
The Space Based Space Surveillance System (SBSS) is the only on-orbit sensor in the U.S. Air Force Space Surveillance Network that can detect, track and monitor debris, spacecraft and other space objects without the interference from weather, atmosphere or time of day that hampers ground-based observations. The agile gimbal-mounted camera and reprogrammable onboard software enable the system to respond quickly to changing mission requirements, and the ground system’s open architecture allows the addition of more satellites and sensors. Boeing was awarded the contract in 2004 and was teamed with Ball Aerospace to design and deliver the first satellite, ground segment, and perform mission operations activities.
SPACEWAY
SPACEWAY is the next generation in satellite communications technology built by Boeing for Hughes Network Systems, Inc. SPACEWAY is enabling a full-mesh digital IP network that interconnects with a wide variety of end-user equipment and systems such as personal computers, servers, local area networks, and home networks. This broadband satellite network provides a range of innovative applications, enterprisewide, throughout North America. The SPACEWAY satellite features innovative, on-board digital processors, packet switching and spot beam technology. Spot beam technology will enable the satellite to provide services to small terminals, while on-board routers will enable mesh connectivity; users of the system will be able to directly communicate with any other user of the system without requiring connection through a central hub.

THURAYA
Boeing has provided three 702HP geomobile satellites to Thuraya. The satellites, coupled with a gateway and handsets, also provided by Boeing, is enabling regional satellite communications by delivering mobile telephone, data, fax and messaging service. The Thuraya coverage area encompasses the Middle East, North and Central Africa, Europe, Central Asia and the Indian subcontinent. Thuraya offers GSM-compatible mobile telephone services, transmitting and receiving calls through each satellite’s 12.25-meter-aperture reflector. The satellites employ state-of-the-art on-board digital signal processing to create more than 200 spot beams that can be redirected on-orbit, allowing the Thuraya system to adapt to business demands in real time. Calls are routed directly from one handheld unit to another, or to a terrestrial network. The system has the capacity for 13,750 simultaneous voice circuits.

TRACKING AND DATA RELAY SATELLITES (TDRS)
NASA returned to Boeing in December 2007 for its next-generation series of Tracking and Data Relay Satellites, continuing the communications satellite line that began with the launch of TDRS H in 2000 and, coupled with Boeing’s other work for NASA, spans more than four decades. The contract includes the design and manufacturing of three TDRS K series satellites as well as upgrades to NASA’s TDRS system ground terminals. The satellites incorporate a modern design based on flight-proven performance. The
three previous TDRS satellites were based on Boeing 702HP-class electronics, which are still the standard for the newest spacecraft Boeing is building today. Additionally, Boeing has modernized the technologies in the payload, power, and propulsion subsystems to current state-of-the-art technologies being used in other Boeing-built spacecraft.

VIASAT-2
In May 2013 ViaSat Inc. ordered its first satellite from Boeing. The satellite, ViaSat-2, is a Boeing 702HP satellite and will provide high-speed satellite broadband services to subscribers of the ViaSat Exede® Internet service, as well as address its growing mobile broadband businesses. The companies also will cooperatively offer the system to other satellite providers.

WIDEBAND GLOBAL SATCOM (WGS)
WGS is the highest-capacity military satellite communications system fielded by the U.S. Department of Defense and provides a quantum leap in communications capabilities for the U.S. warfighters and their allies around the world. Built on the proven Boeing 702HP platform, WGS satellites provide reconfigurable coverage areas and can connect X-band and Ka-band users anywhere within a satellite’s field of view via an onboard digital channelizer. The current contract includes 10 spacecraft, three in Block I and seven in the Block II series. Block II will incorporate a radio frequency bypass capability designed to support the additional bandwidth required by airborne intelligence, surveillance and reconnaissance platforms.

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.

X-37B ORBITAL TEST VEHICLE
The X-37B Orbital Test Vehicle is an unmanned space vehicle that will be used by the United States Air Force to explore reusable space vehicle technologies in support of long-term space objectives. Objectives of the X-37B program include space experimentation, risk reduction, and concept of operations development. Boeing’s involvement in the program dates back to 1999.
Spectrolab Inc., a wholly owned subsidiary of The Boeing Company, is the world's leading provider of epitaxial wafers, space solar cells and solar panels, concentrator terrestrial solar cells and high intensity searchlights. Spectrolab has been in operation more than 55 years and has built and delivered more than three million multi-junction gallium arsenide solar cells.

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