



## PMW 146

The Navy Communications Satellite Program Office, or PMW 146, is based in San Diego, California and is responsible for managing narrowband communications satellite systems acquisition, integration, production, launch, test and providing operational support to the Department of Defense (DoD), various U.S. agencies, joint and coalition forces. This small engineering team of 25 personnel with competency support from Space and Naval Warfare Systems Command civilians and contractors is smartly leveraging the latest commercial advances in terrestrial and satellite technology to greatly expand communications opportunities and capability.

PMW 146 reports to the Navy's Program Executive Office (PEO) for Space Systems on the Navy's Mobile User Objective System (MUOS) and Ultra-High Frequency (UHF) Follow-On (UFO) programs, and for managing leases on the Leased Satellite (LEASAT) and Skynet commercial satellites.

## NAVY IN SPACE

The U.S. Navy, with its unique needs for communications at sea, has a rich and successful heritage in space. It began with the first American satellite program, Vanguard, in 1955. In 1957 the Navy constructed the first complete satellite-launching facility at Cape Canaveral, Florida. Vanguard I, launched in 1958, is the world's longest orbiting satellite.



Although the Air Force oversees most of the Defense Department's space systems, the Navy is responsible for all of DoD's UHF narrowband satellite communications acquisition. The UHF spectrum is the military's communications workhorse, as it is the most effective military radio frequency for penetrating jungle foliage, inclement weather and urban terrain on the move.

All U.S. military forces and many of their allies rely upon Navy satellites for narrowband communications. More than 60 percent of SATCOM users are supported via the UHF band, and more than 67,000 UHF terminals are currently in military use on more than 50 terminal configurations, many of them designed to be small and portable enough to be carried deep into theaters of operation.

# SATELLITE PROGRAMS

## PEO SPACE SYSTEMS

The Navy PEO for Space Systems is a Navy Echelon II acquisition organization chartered by the Secretary of the Navy as the sole executive agent for the development, procurement, engineering support and executive oversight of all DoD advanced UHF narrowband communication satellites and associated ground systems.



PEO Space Systems organization was formally established May 5, 2004. The Headquarters is based in Chantilly, Virginia with additional staff located in San Diego. PEO Space Systems is headed by Rear Adm. Jerry Burroughs, who reports directly to the Assistant Secretary of the Navy for Research, Development and Acquisition.

## SATELLITE PROGRAMS AT WORK

The UFO constellation is the present narrowband (64 kilobits per second and below) Military Satellite Communications (MILSATCOM) system. UFO achieved Initial Operational Capability in November 1993 and Full Operational Capacity in February 2000. As a gapfiller between UFO and MUOS, the UFO F11 satellite was launched in December 2003. The current UFO constellation consists of eight operational UFO satellites, which is augmented by two FLTSAT satellites and leased services on commercial satellites, all of which comprise the UHF SATCOM constellation.

As development of the MUOS system continues, the UHF constellation is on station 24/7 supporting the warfighter. However, as the current UHF constellation approaches its end of life, and to satisfy the increased warfighter demand for SATCOM capability, the PMW 146 UFO team developed several innovative mitigation activities to optimize UHF SATCOM capacity in the event of a loss of an on-orbit satellite. As a result, today's UHF SATCOM constellation provides the warfighter approximately 111 more channels world-wide. These additional 111 channels are equivalent to three UFO satellites or 39 percent more than the original required number of worldwide channels.



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# MOBILE USER OBJECTIVE SYSTEM



## MUOS

MUOS is a narrowband Military Satellite Communications (MILSATCOM) system that supports a worldwide, multi-Service population of users in the UHF band, providing increased communications capabilities to smaller terminals while still supporting interoperability with legacy terminals. MUOS is designed to support users that require greater mobility, higher data rates and improved operational availability. MUOS is scheduled to provide initial On-Orbit Capability in 2012 and Full Operational Capability is planned in 2016.

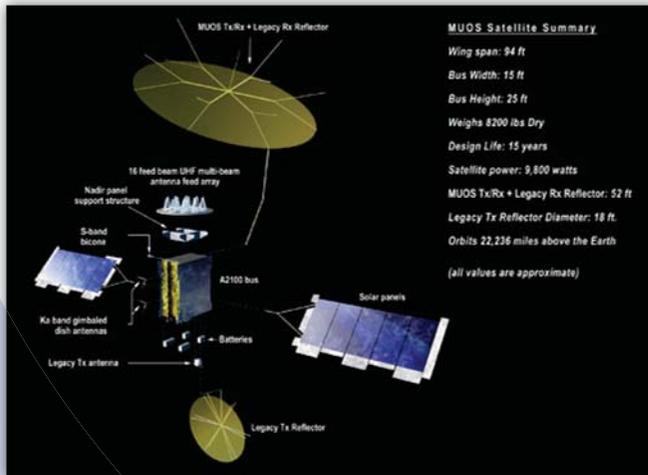
MUOS adapts a commercial third generation (3G) Wideband Code Division Multiple Access (WCDMA) cellular technology with geosynchronous satellites to provide a new and more capable UHF MILSATCOM system. The MUOS program of record includes a satellite constellation of four operational satellites (with one on-orbit spare), a ground control and network management system, and a new waveform for user terminals. The infrastructure to both fly the satellites and control access of the users' communications is managed from the ground.



## MUOS GROUND

User information will flow to the satellite via UHF WCDMA links and the satellites will relay this to one of four interconnected ground sites located in Hawaii, Virginia, Italy and Australia via a Ka-band feederlink. These facilities identify the destination of the communications and route the information to the appropriate ground site for Ka-band uplink to the satellite and UHF WCDMA downlink to the correct users. MUOS will also provide users access to select Defense Information System Network voice and data services.

The prime contractor and system integrator is Lockheed Martin Space Systems of Sunnyvale, California; with team members from Lockheed Martin Commercial Space Division in Newtown, Pennsylvania (spacecraft), General Dynamics C4I of Scottsdale, Arizona (ground and waveform), and Boeing Integrated Systems of El Segundo, California (spacecraft legacy UHF payload and channelizer). The satellites will be launched aboard Evolved Expendable Launch Vehicles from Cape Canaveral, Florida.



MUOS will provide greater than 10 times the communications bandwidth capacity over the current UFO constellation. The new MUOS WCDMA waveform will be ported onto Joint Tactical Radio System terminals and upgraded legacy tactical radios. The first version of the MUOS WCDMA waveform was provided to terminal developers in 2008, with the latest version available January 2012. The final integrated Red/Black waveform is expected to be complete and available to terminal developers by the end of 2012.

Each MUOS satellite carries a legacy payload similar to that flown on UFO-11. These legacy payloads will continue to support legacy terminals, allowing for a more gradual transition to the MUOS WCDMA waveform.



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