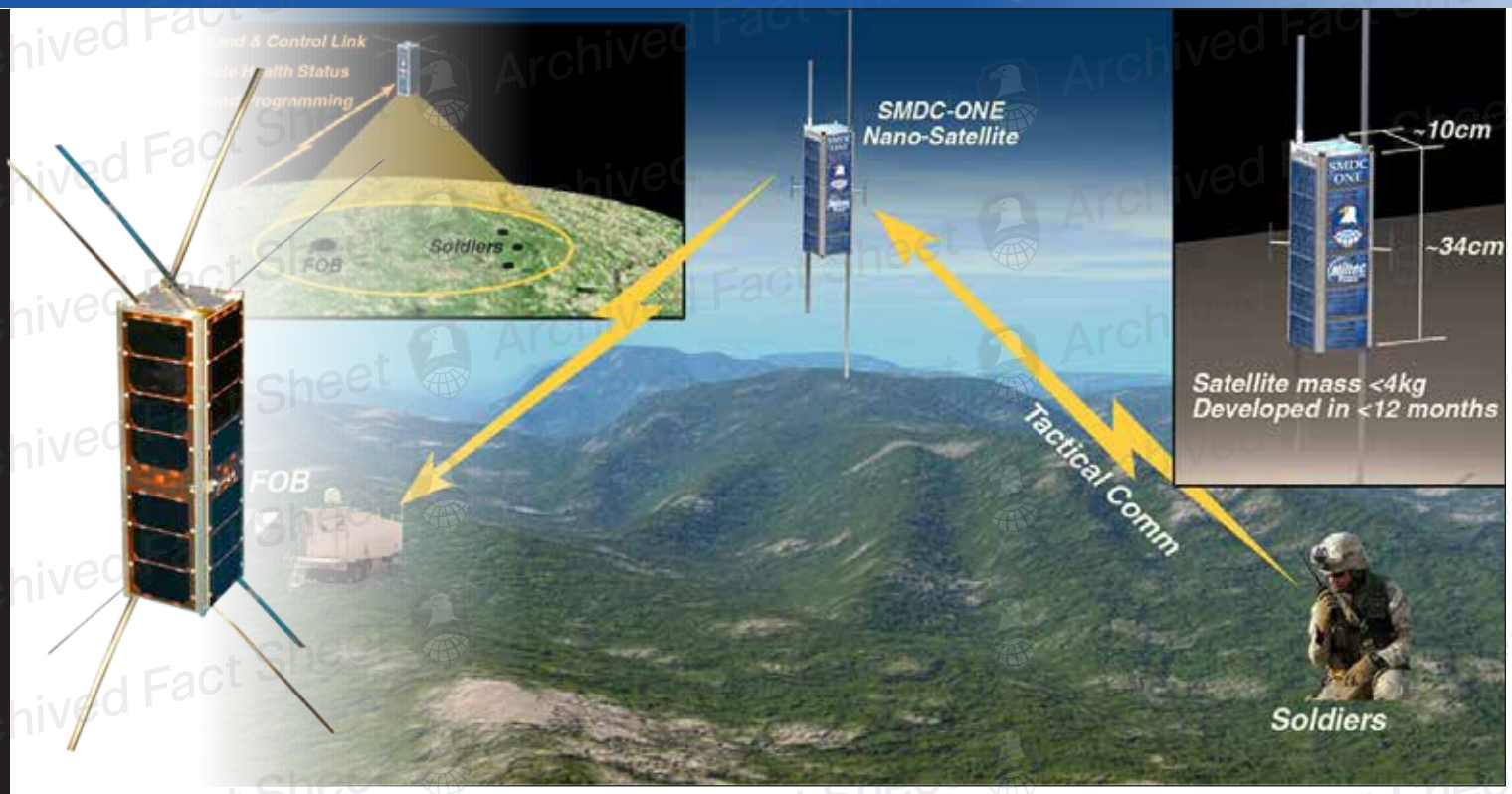
SMDC-ONE

SMDC-Orbital Nanosatellite Effect Technology Demonstration



SMDC/ARSTRAT successfully demonstrated acquisition responsiveness in rapidly designing, developing and testing a militarily relevant low-cost spacecraft in one year

The U.S. Army Space and Missile Defense Command/Army Forces Strategic Command Technology Center took delivery of eight four-kilogram satellites at the end of a one-year development effort. To date six SMDC-ONE satellites in various configurations have flown. On the first mission one ground station was located at the command's headquarters on Redstone Arsenal, Ala., and a second ground station was located at the command's Battle Lab in Colorado Springs, Colo. Subsequent missions have been performed out of the Redstone Arsenal ground station. The primary objective for these satellites is to receive data from a ground transmitter and relay that data to a ground station was fully met as an unqualified success. A follow on objective to demonstrate beyond-line-of-sight relay for military radio voice and data communications was added after the original spacecraft delivery. This has also been successfully demonstrated. The intent of this technology demonstration series is to deploy a number of nanosatellites to demonstrate persistent tactical communications capability and evaluate nanosatellite constellation performance.

- Eight nanosatellite technology demonstrators delivered within 12 months
- Over-the-horizon communications technology demonstrator for tactical forces
- Low cost: Less than $350K/ spacecraft in production
- Operational life of greater than 12 months in Low Earth Orbit
- Extremely successful first flight demonstrating over the horizon communications and extraction of military terrestrial hardware data
- Five satellites on three subsequent missions provide a wealth of technical data and experience
- Technical data and experience is being leveraged for future Army tactical nanosatellites.

U.S. Army Space and Missile Defense Command/ Army Forces Strategic Command

SMDC-ONE

An approach holding great promise to achieve enhanced capabilities from space for the dismounted Warfighter is the deployment of nanosatellite-class satellite constellations into low earth orbit. Because the unit cost for a nanosatellite (nanosat) is low (less than $1 million), large numbers for specific missions can be built and deployed on orbit to generate a persistent effect. What a nanosat may lack in performance and long-life reliability, compared to a single large traditional military satellite, it makes up by its extremely low cost and constellation proliferation potential.

Nanosats constellations can provide access to networked capabilities over large latitudinal swaths of the earth. Rapid technology refresh is achieved through frequent launch of upgraded replacements, which further allows manufacturing economies of scale.

The first SMDC-ONE nanosatellite was launched December 8, 2010, into a slightly elliptical orbit about 185 miles above the Earth. Ground stations in Huntsville, Ala., and Colorado Springs, Colo., sent messages back and forth via the satellite, demonstrating beyond-line-of-sight and over-the-horizon communications between the ground stations located more than 1,000 miles apart. Due to the very low orbit altitude, the satellite re-entered the earth's atmosphere and disintegrated 35 days after launch, having performed exceptionally well throughout its five weeks in space. This brief space technology demonstration indicated great potential for these very small satellites.

In September 2012, two additional SMDC-ONE spacecraft were launched as auxiliary payloads on National Reconnaissance Office Launch 36 (NRO L-36) aboard an ATLAS V rocket to allow for more complete testing. The auxiliary payload mission on NRO L-36 was termed Operationally Unique Technology Satellite, or OUTSat, for the satellites sponsored by the National Reconnaissance Office.

Combined, the NASA- and NRO-sponsored satellites built by government, industry and academia, 11 in all, fit into eight satellite dispensers designed by California Polytechnic State University (CalPoly), San Luis Obispo, Calif.

The dispensers, called Poly-PicoSatellite Orbital Deployers, or P-PODs, were mounted in a Naval Postgraduate School CubeSat Launcher. The NPSCuL together with the eight P-PODs and 11 CubeSats was attached near the nozzle to the Centaur upper stage's Aft Bulkhead Carrier. Because of the success of this mission, the NRO plans to continue allowing auxiliary payloads on future missions.

The two SMDC-ONE satellites launched on OUTSat were manifested as SMDC-ONE 2.1 (Able) and SMDC-ONE 2.2 (Baker). The primary mission objective for the SMDC-ONEs was to demonstrate voice and data communications through a low earth orbit satellite using military standard radios, which had never been done before. Able and Baker have both provided valuable test data since their deployment on-orbit. Able continued to provide usable data for more than one year, exceeding the expected lifetime. Baker provided valuable operations data during its first two months on-orbit, since that time it has gone radio silent.

The SMDC-ONE spacecraft platform was the base system for the Operational Responsive Space Office Operationally Responsive Space Enabler Satellite, or ORSES, which was launched on ORS-3 out of Vandenberg Air Force Base, Calif., in November 2013. The satellite deployed successfully and contact was established. Unfortunately, general system failures limited demonstration success.

Two final SMDC-ONE satellites, SMDC-ONE 3.1 (Charlie) and SMDC-ONE 3.2 (David) were launched in December 2013 on NRO-L39's auxiliary payload mission termed Government Experimental Multi-Satellite, or GEMSat. These satellites were launched to continue the demonstration and evaluation of nanosatellites as game changing technologies.

For more information, please contact:
USASMDC/ARSTRAT Public Affairs Office
P.O. Box 1500
Huntsville, AL 35807
Phone: 256-955-3887
Fax: 256-955-1214
www.army.mil/smdc
www.facebook.com/armysmdc
www.twitter.com/armysmdc
www.flickr.com/armysmdc
www.youtube.com/armysmdc