AFRL

SPACE - THE ULTIMATE FRONTIER

From developing the latest in space component technology to flying state-of-the-art satellite experiments, the Air Force Research Laboratory (AFRL) ensures that the United States and its allies maintain space superiority. AFRL's Space Vehicles Directorate, the Air Force's center of excellence for space research, develops and transitions technologies that provide space-based capabilities to the nation. AFRL's scientists and engineers lead premier spacecraft programs.

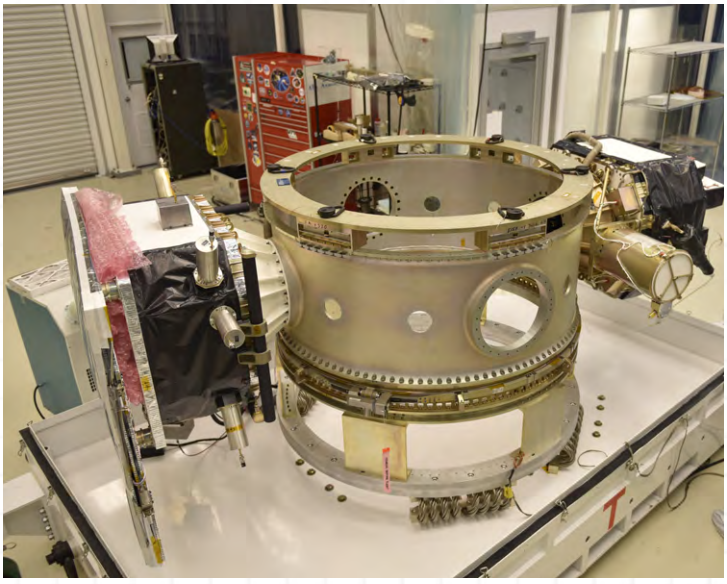
Navigation Technology Satellite-3 (NTS-3)

AFRL is developing advanced techniques and technologies to detect and mitigate interference to position, navigation, and timing (PNT) capabilities, and increase system resiliency for military, civil, and commercial users. In 2019, the U.S. Air Force designated NTS-3 as one of three Vanguard programs, priority initiatives that integrate several technology components to deliver new game-changing capabilities. Expected to launch in 2022, NTS-3 will be the first experimental PNT spacecraft in orbit in more than 40 years.

Artist's concept for NTS-3 in geostationary orbit. Harris Corporation will integrate NTS-3 using Northrop Grumman's ESPAStar bus, building on EAGLE's flight heritage. Graphic credit: 1st Lt. Jacob Lutz, AFRL Space Vehicles

Demonstration and Science Experiments (DSX) Satellite

Launched in June 2019, AFRL's DSX spacecraft is conducting research to boost the Department of Defense's (DoD) ability to operate in the harsh radiation environment of medium-Earth orbit (MEO). Since radiation from the Van Allen belts at these altitudes can damage spacecraft components, the MEO environment presents unique challenges. DSX will study the effects of this radiation and collect data on its energy distribution and behavior to increase understanding of this orbital regime and enhance DoD capabilities for fielding resilient space systems. As the largest unmanned space structure ever in space, the DSX satellite spans nearly the length of a football or soccer field.



Air Force Research Laboratory engineers inspect the Demonstration and Science Experiments spacecraft just before transporting it to Cape Canaveral for launch on a SpaceX Falcon Heavy rocket. With the successful rocket launch on June 25, 2019 the DSX satellite is now in medium-Earth orbit set to perform its data collection mission. Photo credit: U.S. Air Force

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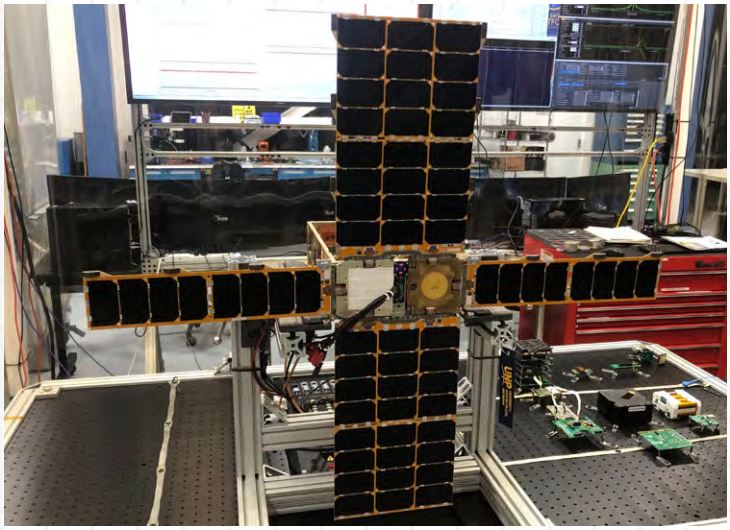
EAGLE Spacecraft

EAGLE, short for Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geosynchronous Experiment, is host spacecraft for a multi-mission flight experiment launched in April 2018. The EAGLE bus, using the ESPA ring as the primary structure, is an innovative technology that increases the number of satellites that can be put into space on a single launch. Much like a freight train adds extra cars to transport more cargo, the propulsive ESPA, sitting under the primary payload, allows increased opportunities for proving out new technologies in space. EAGLE is projected to transition to operational use in late summer 2020.

Very Low Frequency (VLF) Propagation Mapper (VPM)

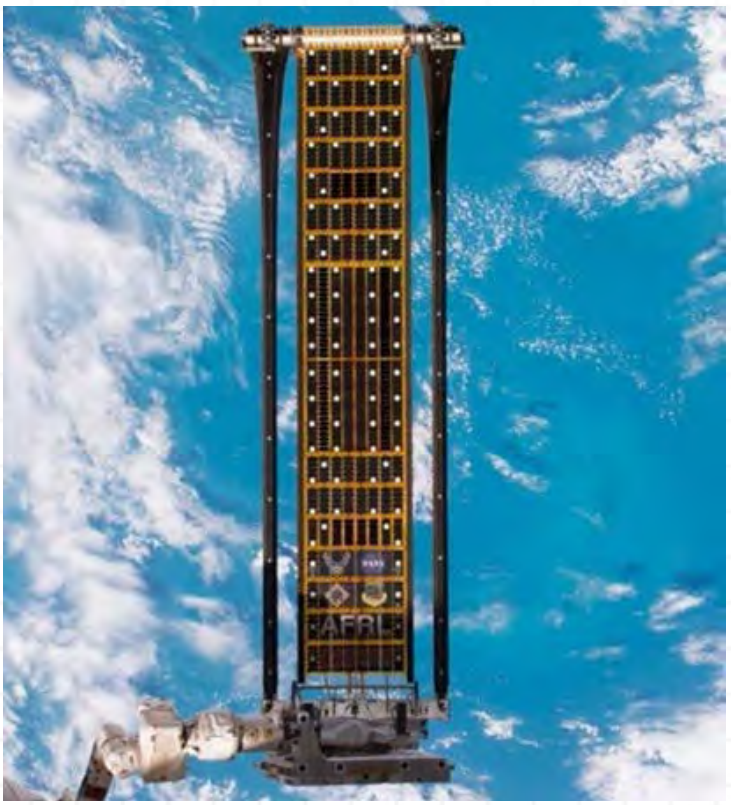
Launched in December 2019, VPM is an AFRL nanosatellite program that will be in orbit for about one year. The six cubic unit (6U) nanosatellite is designed to augment the AFRL's Demonstration and Science Experiments (DSX) satellite. VPM will fly lower in a circular low earth orbit (LEO) at approx. ~500 km altitude to measure the presence and intensity of VLF transmissions from DSX. When DSX and VPM are in the same magnetic field, gathering in-situ science data is possible where the VPM serves as a receiver of DSX's transmitter.



The Air Force Research Laboratory's Very Low Frequency Propagation Mapper (VPM) satellite with solar panels deployed. The VPM satellite was launched from Cape Canaveral, Florida on board a SpaceX rocket on Dec. 5, 2019. Photo credit: AFRL

Roll-Out Solar Array (ROSA)

AFRL's ROSA technology uses stored strain-energy in composite slit-tube booms, to deploy a flexible blanket array, eliminating significant complexity, cost, mass, and stowed volume as compared to traditional solar arrays. It is estimated that this technology advance could potentially enable millions of dollars in savings for U.S. Air Force communication and navigation programs. ROSA was successfully tested at the International Space Station in 2017. The ROSA power systems are on course to be used in the NASA Gateway program, which aims to land U.S. men and women on the moon by 2024.



Demonstration of the Roll-Out Solar Array on the International Space Station in June 2017. Multiple deployments and retractions of the array were demonstrated with all scientific objectives met. Photo credit: NASA