

## ESPA Augmented Geosynchronous Laboratory Experiment (EAGLE)

### EAGLE Program Description

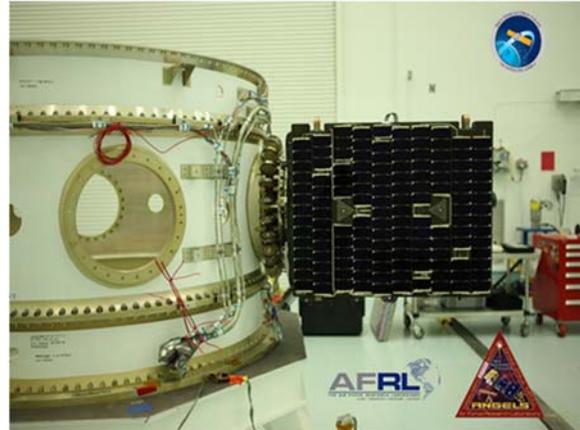
The Air Force Research Laboratory performs research and development vital to keeping the nation's technological edge in the space domain.

In support of that mission, the AFRL Space Vehicles Directorate scientists and engineers have developed over the past several years a space flight experiment called EAGLE. The EAGLE spacecraft flight experiment goals are to advance space access, improve spacecraft resiliency and increase space situational awareness (SSA).

EAGLE is a triple-nested acronym that when broken out is: Evolved Expendable Launch Vehicle (EELV) Secondary Payload Adapter (ESPA) Augmented Geosynchronous Laboratory Experiment. ESPA is an AFRL innovative technology that increases the number of satellites that can be put into space on a single launch. Much like a train can just add extra cars to transport more cargo, one or more ESPA rings can be added under the primary payload to launch more satellites.



ESPA Ring before payloads added. Photo Credit MoogCSA



AFRL's 2014 "ANGELS" experimental satellite shown mounted to an ESPA ring. Photo Credit: AFRL Space Vehicles Directorate

### Benefits

EAGLE will demonstrate a maneuverable ESPA-based space vehicle design which allows six or more deployable or hosted spacecraft in geosynchronous orbit.

It will also demonstrate the capability to provide low-cost access to geosynchronous orbit and geosynchronous transfer orbit for smaller class space vehicles by using excess weight and volume available on the EELV launch vehicle family.

In addition, EAGLE will provide the opportunity to share the cost of launch as well as provide essential services, on orbit, such as power, communications, propulsion, pointing and navigation for payload experiments unable to afford the full cost of a host space vehicle.



## EAGLE Experiments

One of the EAGLE payload experiments is another AFRL developed spacecraft called Mycroft, which is a separable, fly-away satellite. The Mycroft vehicle will deploy from EAGLE, drift to approximately 35 km away and cautiously progress over several months to ranges approaching 1 km. As in previous Air Force Research Laboratory SSA experiments, rigorous research and development have been conducted to ensure that the satellite can perform safe automated spacecraft operations near geosynchronous earth orbit.

The Air Force Research Laboratory is using a layered strategy that combines system design, testing, mission design, procedures and flight operations controls to ensure safety. Before the start of experimental operations, AFRL will calibrate the various spacecraft subsystems and verify navigation capabilities.

Mycroft will evaluate the region around EAGLE using a SSA camera. Mycroft will also use its sensors and software to perform advanced guidance, navigation and control functions—key functions in all satellite operations.



ATA-Aerospace fueling crew in hazard suits preparing to fuel the EAGLE spacecraft (in background). Photo credit: AFRL Space Vehicles Directorate

While in orbit the Mycroft spacecraft will be supporting the Mycroft program's three experimental objectives to advance SSA technology in near geosynchronous orbit. It will explore ways to enhance space object characterization and navigation capabilities, it will investigate control mechanisms used for flight safety, and it will explore the designs and data processing methods for enhancing space situational awareness. Mycroft is expected to remain in orbit between 12 and 18 months.

Other experiments hosted on the EAGLE will detect, identify and analyze system threats such as man-made disturbances, space weather events or collisions with small meteorites. Together, EAGLE and Mycroft help train operators and development of tactics, techniques and procedures during exercises or experiments to improve space warfighting.

## EAGLE Launch

EAGLE is manifested on Air Force Space Command-11 (AFSPC-11) mission for a launch in mid April 2018 from Cape Canaveral, Florida. Launch preparation is ongoing with United Launch Alliance (ULA) for integration on an Atlas V rocket. The one-year, on-orbit experiment will enlist numerous military, civilian and contractor scientists and engineers to analyze the data. Launch integration and flight operations of both spacecraft are performed in partnership with the Department of Defense Space Test Program, located at Kirtland Air Force Base, N.M.

The EAGLE and Mycroft spacecraft will be disposed of in a safe orbit at the end of the experiment period.