FACT SHEET

UNITED STATES AIR FORCE

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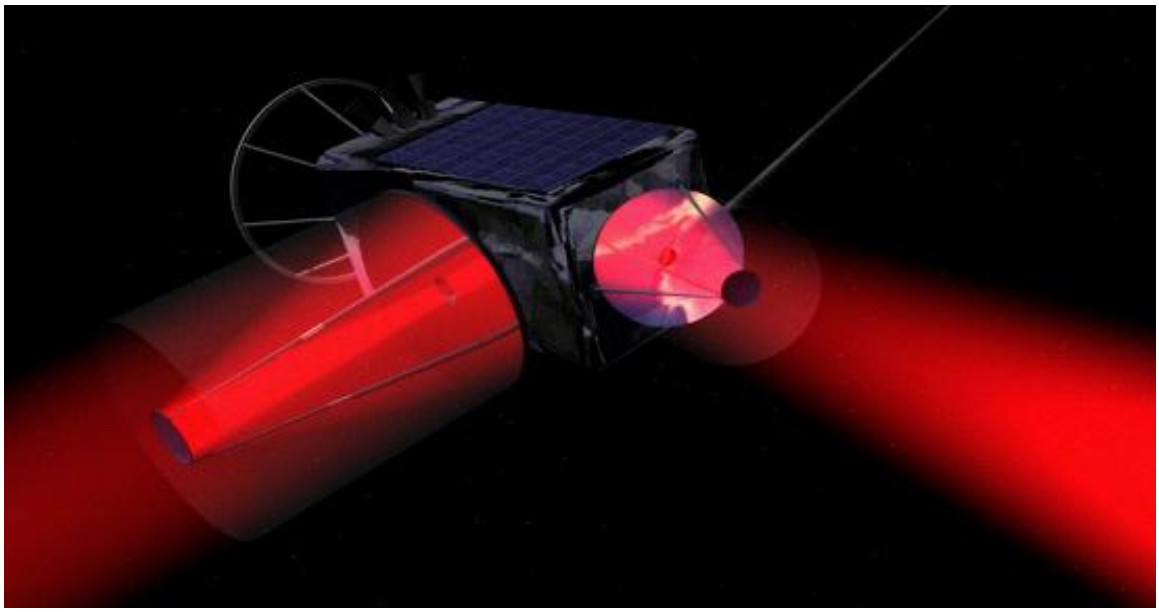
RELAY MIRROR TECHNOLOGY



Relay Mirror Technology, under the Air Force Research Laboratory's Directed Energy Directorate at Kirtland Air Force Base, New Mexico, is looking at using a dual-mirror instrument in the air or in space to transfer laser energy from one part of Earth to another.

Initially known as EAGLE, or Evolutionary Aerospace Global Laser Engagement, this technology is also exploring the potential for developing a constellation of large aperture satellites around the Earth.

These low-Earth-orbit relay-mirror satellites would be used to relay laser energy from one point to another, providing a worldwide speed-of-light capability to the warfighter. In a typical application, a laser beam would be directed at a "receive mirror." That mirror would collect the beam, then pass it to a beam control system, which would "clean it up" optically, then refocus and retransmit from a second mirror. This would be a practical application for moving laser energy from one part of Earth to another – extending laser energy beyond the horizon, beyond the limiting confines of the Earth's curvature.

The goal of the program is to identify and develop key technologies needed to produce a relay mirror demonstration in the near future. The emphasis is on the relay mirror technology and technical synergy with other airborne or space-based directed energy systems, not on laser source development.

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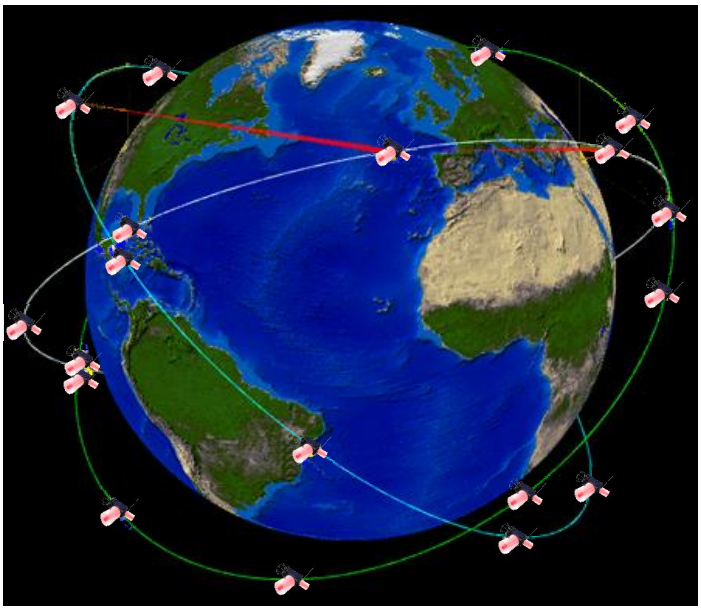
In attaining this goal several critical technologies must be examined. They include space vehicle design, vibration and thermal management, attitude control, large angle slewing and momentum control of a multi-body system (two mirrors, optical bus and space bus). In terms of optics, the system must be able to precisely point, acquire and track the laser source and the targets, requiring line-of-sight maintenance for both mirrors. Finally, large, lightweight (potentially deployable) mirrors must be developed as well as optical coatings and techniques for controlling jitter and optical aberrations.

The Directed Energy Directorate is developing a subscale relay mirror payload to reduce program risk and demonstrate critical technologies. Known as the Aerospace Relay Mirror System, or ARMS, the project will utilize two 75-centimeter telescopes to redirect laser energy from the ground to objects in the air or space. The product of the ARMS program will be an upgradeable relay mirror testbed that demonstrates traceable performance to that of potential airborne and space based operational systems.

Some of this research builds on the Directorate's Relay Mirror Experiment, conducted in the late 1980s and early 1990s. This was an experiment to determine the precision upon which scientists could fire a ground-based laser to an orbiting mirror passing overhead, and bounce – or relay – that laser beam from that mirror to a target board on the ground several miles away. The experiment, which was repeated many times using Air Force facilities in Maui, Hawaii, proved this could be done successfully.



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