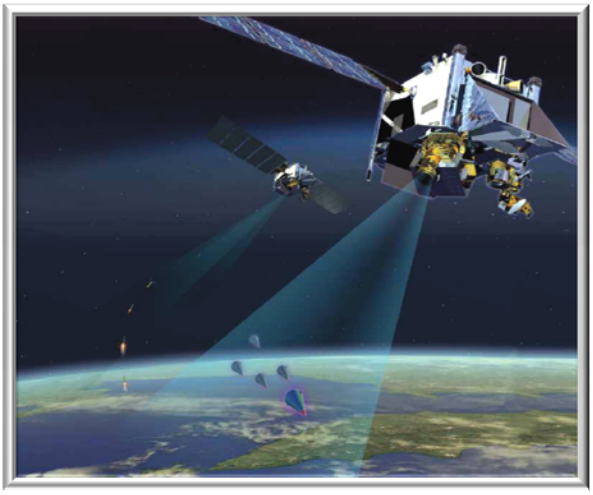
NORTHROP GRUMMAN FACTS

Space Tracking and Surveillance System Demonstration

The Space Tracking and Surveillance System (STSS) demonstrators currently on-orbit are the culmination of more than 30 years of development, beginning with the “Brilliant Eyes” component of President Ronald Reagan’s Strategic Defense Initiative. The satellites currently are demonstrating unprecedented “cradle-to-grave” tracking of incoming missile threats.

STSS consists of two low-Earth-orbiting satellites separated by ~35 degrees, providing “stereo coverage” of ballistic missiles. Each satellite has a short-wave infrared, wide-field-of-view acquisition sensor that monitors and autonomously detects and tracks missiles during boost phase.



Validated tracks are autonomously handed over to a narrow-field-of-view, gimbaled track sensor capable of tracking the missile, post-boost through midcourse, and through intercept or re-entry, using multiple infrared bands.

Tracks from both sensors are communicated to the mission ground station, via object sighting messages, which contain the observation time, satellite position and inertial line-of-sight to the object.

Ground mission data processing software takes the two-dimensional angles data from each satellite and fuses it into a three-dimensional track of each object, which is reported to the centralized battle manager. A radio frequency crosslink is available between the space vehicles, facilitating communication and 3-D track formation when only one satellite is in view of a ground station.

The two-spacecraft system was launched on a Delta II rocket from Cape Canaveral on Sept. 25th, 2009. Following successful deployment, a series of early-on-orbit (EOT) tests was conducted to validate spacecraft bus operations and to calibrate both sensors – line-of-sight (LOS) and radiometric) using ground lasers, fixed-point sources, stars and resident space objects such as other satellites.

Sensors on both space vehicles were fully calibrated during early-on-orbit tests. STSS met critical LOS performance requirements on both sensors with significant margin. EOT demonstrated all of the functions required to perform the missile defense mission:

- Autonomous acquisition sensor detection and tracking
- Hand-off to the track sensor, and
- Successful stereo tracking of detected objects.

In parallel with EOT completion, STSS was tasked to participate in on-going missile defense tests based on the calibration status of each sensor. Each successive test demonstrated

additional, never-before-accomplished capabilities, along with generating data that was used to improve system performance on subsequent tests.

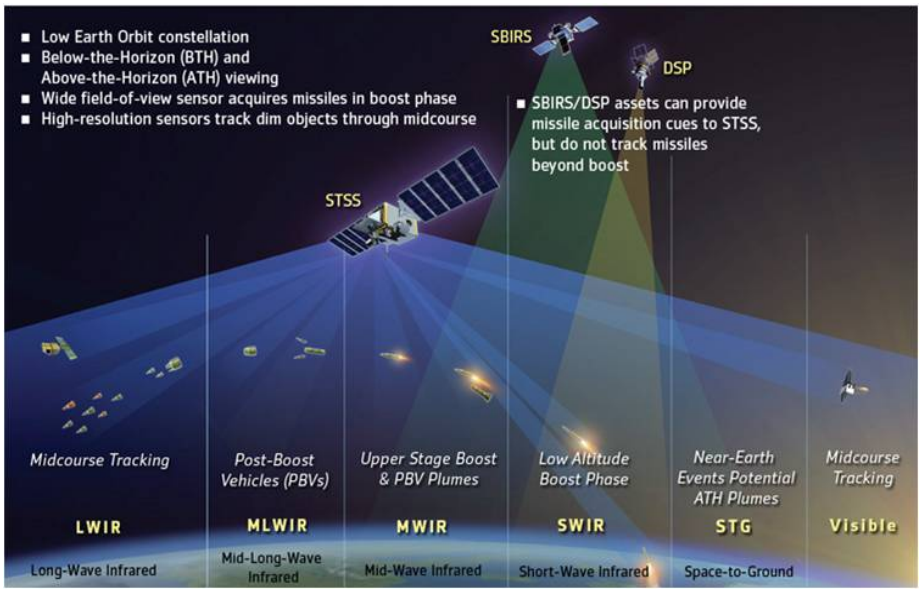
Stereo autonomous acquisition sensor detection and tracking of a Minuteman III ICBM was demonstrated June 16 during Glory Trip 200. Autonomous handover to the track sensor and extended track sensor tracking were demonstrated on Sept. 17, 2010. Stereo track sensor tracking during boost and into midcourse was demonstrated during Oct. 6, 2010. EOT was completed Nov. 3, 2010.

The system continues to demonstrate expanded performance and capabilities through an aggressive campaign of U.S. Missile Defense Agency missile events. These include:

- Targets of opportunity
- Experiments focused on making the system more “operational in nature”
- Concurrently satisfying MDA critical engagement conditions through empirical measurement events, and
- Providing a wealth of lessons-learned to MDA for its planned operational constellation, the Precision Tracking and Surveillance System.

Fast Facts about the STSS Demonstration Program

- Prime Contractor: Northrop Grumman Corp.
- Contract Award: 2002
- Deliverables: Two STSS satellites with ground segment and core systems engineering support



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