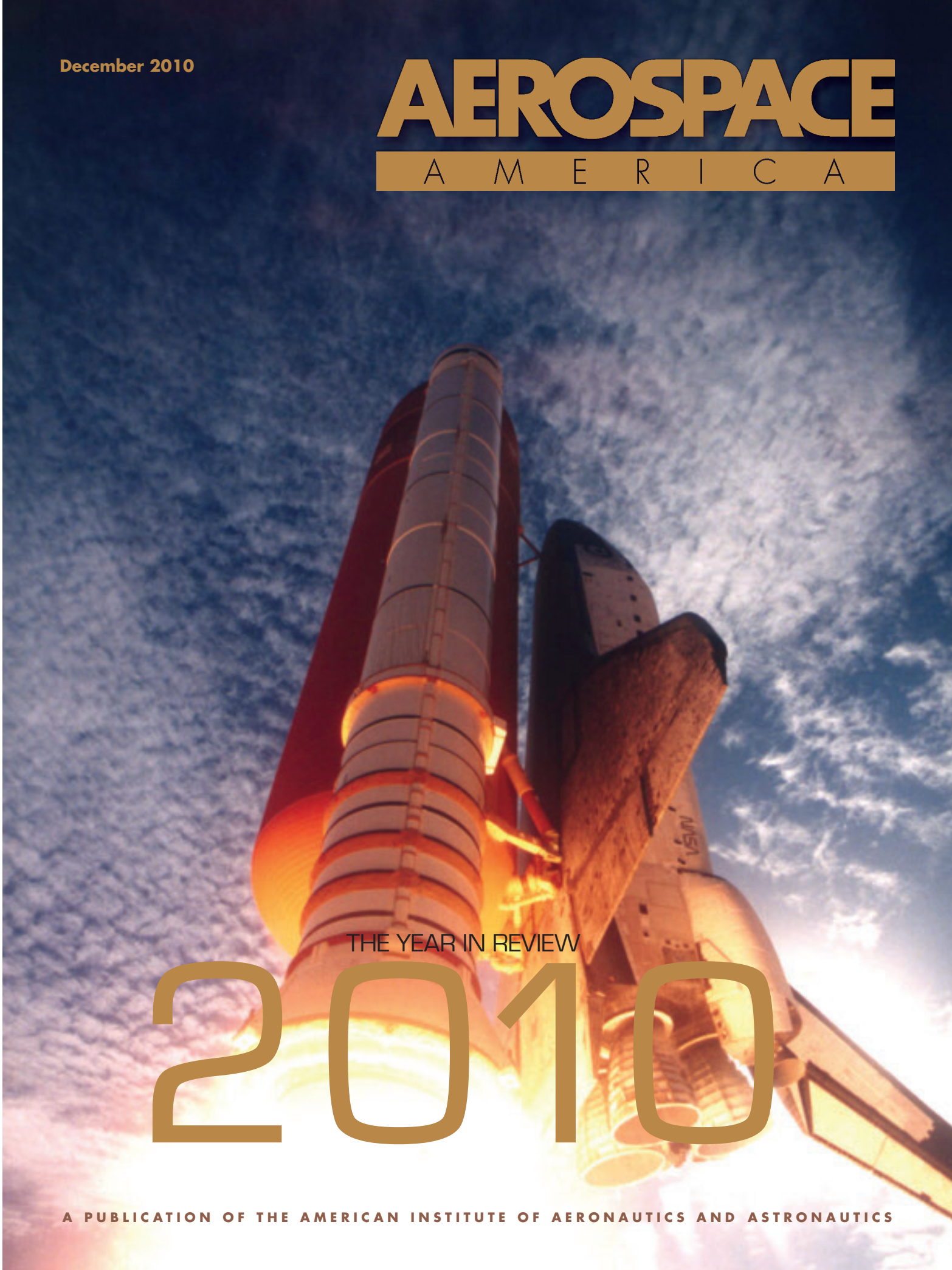
December 2010

AEROSPACE AMERICA

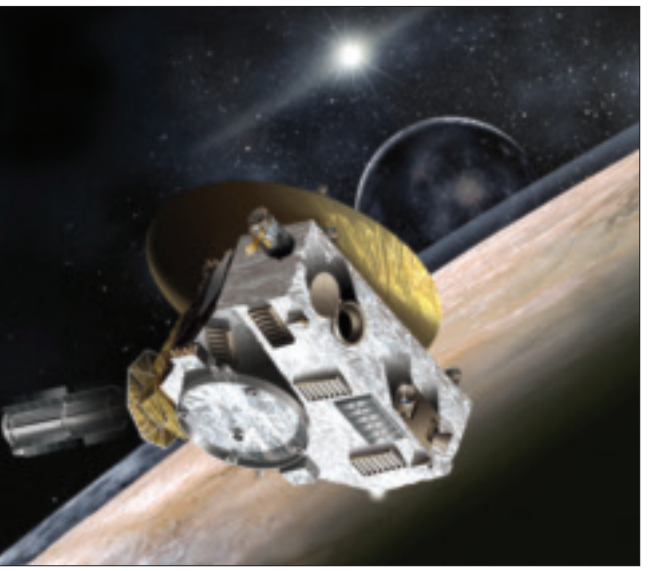


THE YEAR IN REVIEW

2010

A PUBLICATION OF THE AMERICAN INSTITUTE OF AERONAUTICS AND ASTRONAUTICS

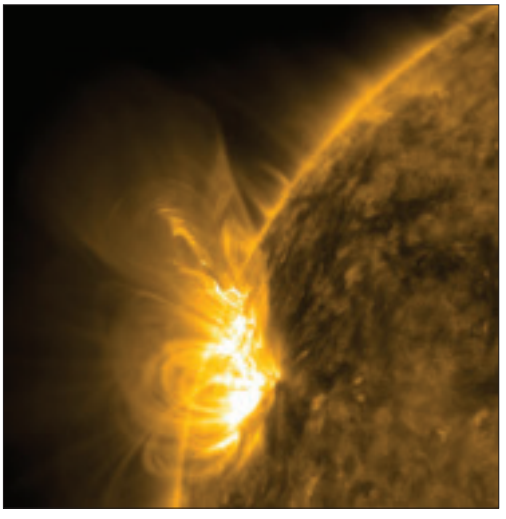
Space systems



The New Horizons satellite is scheduled to arrive at Pluto on July 14, 2015. Image courtesy JHUAPL/SwRI.

Innovative satellite systems designed to carry out scientific exploration are a mainstay of our nation's space systems. A steady stream of satellites since Explorer 1, launched in January 1958, has quietly and proudly been expanding the frontiers of human scientific knowledge. In the midst of changes and upheaval that marked the year 2010, we celebrate these achievements, which represent some of the best of human endeavors. Despite the challenges faced by other parts of NASA, its Science Mission Directorate is enjoying one of the most fruitful time periods, with more than 15 science satellites in operation. Worldwide, scientists are getting more data from space-based observations than ever before.

A slew of Earth-observing space systems were launched in 2010 to help further understand our planet and its environment. Managed by NASA Goddard, the Solar Dynamics Observatory (SDO) was launched on February 11 on an Atlas V 401 to a geosynchronous orbit to provide continuous monitoring of the Sun. SDO is providing unprecedented multi-wavelength observation of the Sun, continuously downloaded to its own dedicated ground station. High-definition near-real-time images are available to the public on the SDO web site. "By some estimates, SDO will transmit as much as 50 times more science data than any mission in NASA history," says Dean Pesnell of Goddard.



A close-up look at a substantial active region on July 9 shows a hotbed of magnetic activity that leads to a small solar flare bursting out into space. The images were taken by SDO's AIA instrument in the 171-Å wavelength of extreme ultraviolet light. The thin arcing loops are really particles spiraling along magnetic field lines above the active region.

The latest in the Geostationary Operational Environmental Satellite (GOES) series, GOES-P, was launched on March 8 and accepted into service on September 1; it will go by the name GOES-15. It was built by Boeing Space and Intelligence Systems and launched with a Delta IV rocket by ULA. The spacecraft is currently in a parking orbit, ready to take over weather monitoring and tracking should one of the currently active GOES spacecraft experience an anomaly.

The European Space Agency's CryoSat 2 spacecraft was launched on April 8 aboard a Dnepr rocket. It replaces Cryo-Sat, which was lost in a 2005 launch failure. CryoSat 2 is designed to precisely monitor the thickness of ice, both in the ocean and on land. In its most advanced mode, two SAR antennae on the spacecraft use interferometric techniques to accurately measure ice thickness.

This year marked the half-time point in New Horizon's traverse to Pluto. The small spacecraft, weighing only 478 kg, carries six instruments to conduct observations of Pluto, the once-planetary body and now largest of the Kuiper-belt objects. New Horizons was built jointly by the Applied Physics Lab and Southwest Research Institute. With a destination more than 30 AU from the Sun, New Horizons is powered by a radioisotope thermal generator, supplying about 240 W to the grand-piano-size spacecraft. Communication is done via a large, 2.1-m high gain X-band antenna. At its destination, New Horizon has a roundtrip communications latency of ~9 hr, necessitating a relatively autonomous spacecraft that can manage faults and anomalies recovery with minimal ground contact.

The Japanese Aerospace Exploration Agency launched Akatsuki, a Venus orbiter, on May 20 aboard a JAXA H-IIA 202 rocket from Tanegashima. The spacecraft carries innovative silicon nitride ceramic thrusters developed by JAXA for the 500-N orbit maneuvering engine. Akatsuki ("Dawn") is scheduled to arrive at Venus this month and enter into a 30-hr elliptical orbit. Akatsuki carries a multi-wavelength suite of instruments designed to image the Venusian atmosphere from 90 km down to 10 km.

These missions are just a few examples of space systems being built around the world to expand the frontiers of human knowledge.

by **Amy Lo**