Space launch system: A year of powering forward

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Artist concept of the NASA Space Launch System initial crew vehicle launching from the Kennedy Space Center. Credit: NASA

(Phys.org)—NASA is powering ahead toward new destinations in the solar system. This week marks one year of progress since the formation of the Space Launch System (SLS), the nation's next step in human exploration efforts.

On Sept. 14, 2011, NASA announced a new capability for America's space program: a heavy-lift rocket designed to carry the Orion spacecraft and send astronauts farther into space than ever before. And now, one year later, NASA has made swift progress improving on existing hardware, testing and developing new components, and paving the way for a new launch vehicle. The SLS will make human exploration of deep space a reality and create new possibilities for scientific discovery.

"The SLS is a national capability and will be the largest rocket ever built, providing the power we need to truly explore beyond our current limits," said Todd May, Space Launch System program manager. "Not only will it take us beyond low Earth orbit, but it will take us there faster."

NASA's SLS team began work immediately after the 2011 announcement, finding new methods of creating designs, conducting reviews and improving scheduling and budget planning.

Watch NASA's video on the first year of SLS achievements:

"Our goal was to become a leaner and more efficient program, based on lessons learned from previous successes by the agency," May said. "But even more important is to build a safe vehicle for our astronauts and one that can sustain exploration for years to come. That takes time and we're off to a great start. We want to inspire the next generation of scientists, engineers and explorers."

The SLS initially will be capable of carrying 70 metric tons to space. A larger, future version of the rocket will launch up to 130 metric tons—equivalent to about 75 sport utility vehicles—to future destinations such as an asteroid, near-lunar space and, eventually, Mars. View concept images of SLS configurations.

NASA is working with partners in industry to construct a robust rocket and build off of existing elements and proven propulsion, including more robust solid rocket booster designs and main engines used during the Space Shuttle Program.

Pratt-Whitney Rocketdyne of Canoga Park, Calif., which manufactured the RS-25 engines used during the shuttle era, is updating flight computer hardware and software to bring the engine technology into the 21st century. A new five-segment booster has been tested three times. ATK, of Promontory, Utah, will test a flight-qualified booster next year.

NASA is relying on the expertise at the Boeing Co. of Huntsville, Ala., to build the SLS core stage at the agency's Michoud Assembly Facility in New Orleans, where more than a hundred external tanks were built for the shuttle program. Early welding is paving the way for building the tanks and infrastructure to the SLS's J-2X and RS-25 engines.

Although swift progress is under way on the 70-metric-ton initial configuration, the program created an advanced development team to look for ways to enhance and upgrade future designs of the heavy-lift vehicle, including more powerful advanced boosters.

NASA is performing a battery of tests on the J-2X engine its Stennis Space Center in Bay St. Louis, Miss. Some test firings this past year broke duration records and pushed the new engine design to its limits. The J-2X will power the upper stage of the rocket.

The program also reached a critical milestone earlier this summer with agency-level approval of the system requirements and system definition review. Guiding the course of the program, this key step was a pivotal moment. It allowed SLS to move from concept to design and target preliminary design review next year.

As the vehicle comes together, SLS, managed at NASA's Marshall Space Flight Center in Huntsville, Ala., is working closely with the Orion Program at the agency's Johnson Space Center in Houston and the Ground Systems Development and Operations Program at NASA's Kennedy Space Center in Florida. The launch facilities include a mobile launcher and a new firing room for the SLS.

The Orion Program continues improvements of the spacecraft, using water landing tests and parachute drop tests to expand confidence in the design. Meanwhile, the ground crew at Kennedy is processing an Orion test module for its first flight in 2014—just a few years before SLS will take its place on the launch pad.

When Orion flies for the first time, SLS also will test the spacecraft payload integration adapter ring. Engineers and machinists at Marshall are building this section of the rocket, which will mate the spacecraft to the Delta IV stand-in for SLS during Orion's test flight in 2014 and the rest of the Space Launch System in 2017. The adapter ring was designed for both applications as an example of NASA's commitment to affordable solutions for the human exploration of space.

"Each decision made in support of SLS has been carefully considered," May said. "We're moving forward with our eyes on deep space, contributing critical technology and functional knowledge to meet our nation's exploration goals. At the same time, we realize how lucky we are to write the next chapter in space exploration and hopefully inspire future generations."

Provided by NASA