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11 things Americans will be doing in space in 2011

With new missions to Mars, private space flights and satellites to help determine how planets are made, there's a lot launching in 2011.

By Space.com

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ASTEROID SEEKER: NASA's Dawn spacecraft, shown in an artist's concept, is propelled by ion engines. The satellite will study asteroids to help understand how planets form. (Illustration: NASA)

From private spaceflights to NASA missions to the moon, Mars and beyond, the next year promises to be a busy one for Americans in space. Here's a preview of just some of the coming attractions for U.S. spaceflight in 2011.

1. Banking on private space planes

The year 2011 could be the time space tourism finally makes it big. In October 2010, the privately developed space plane [SpaceShipTwo](#) detached from its mother ship

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for the first time and glided safely to Earth from a height of more than 45,000 feet (13,700 meters), landing at the Mojave Air and Space Port in [New Mexico](#). Two additional test runs followed shortly thereafter.

Sir Richard Branson's space tourism company, Virgin Galactic, is banking on SpaceShipTwo to carry up to six passengers at a time on a 2 1/2-hour trip to the edge of outer space, where they will experience a few minutes of weightlessness. According to the company, more than 370 wannabe astronauts have put down deposits toward

the \$200,000 ticket to secure a seat on a future flight.

Although Virgin hasn't committed to a fixed schedule yet, SpaceShipTwo's successful test glides paved the way for a series of powered test flights in early 2011. Designer Burt Rutan has said that 50 to 100 such flights will be needed before Virgin can begin accepting paid passengers.

2. Roving and spying on Mars

While one of NASA's twin Mars rovers lies dormant, the other looks set to [keep on trucking in 2011](#), marking the seventh straight year of activity since the rovers landed on the Red Planet in 2004.

The Spirit rover, stationary since getting stuck in deep sand in April 2009, finally went silent in March 2010 and is thought to be hibernating. Meanwhile, Opportunity remains on course to visit the 13.7-mile-wide impact crater Endeavor.

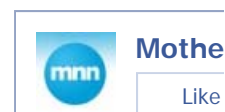
NASA's Mars Reconnaissance Orbiter has spotted evidence of clay minerals along Endeavor's rim. If Opportunity can make it there, the rover would be able to conduct the first up-close inspections of Martian clays, which are believed to have formed in the presence of water.

Look forward to a year full of electronic picture postcards as Opportunity continues its 11.8-mile journey, begun from Victoria Crater in late 2008. As of September, the rover had covered half the distance to Endeavor. The trip was originally estimated to take two years.

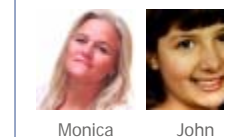
3. Testing private orbital spaceships

Some new players in transport to the International Space Station (ISS) could come online in 2011. Hawthorne, Calif.-based company SpaceX conducted the [first successful launch](#) and recovery of its Dragon capsule in early December 2010, marking the first time a private company has achieved such a feat.

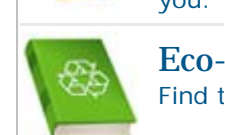
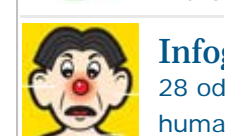
In 2006, NASA chose SpaceX to develop a cargo launch system for the ISS. The company came up with Dragon, an Apollo-like capsule designed to carry up to seven people, or a mix of cargo and people. NASA's agreement with SpaceX calls for three progressively more complex test flights, but with the success of the initial flight, the company said it might combine the second and third flights and send Dragon directly to the ISS as soon as next year.



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A second recipient of a NASA contract — Dulles, Va.-based Orbital Sciences — was scheduled to launch its Cygnus spacecraft in late 2010 aboard a Taurus II rocket, but the test was postponed until mid-2011.

4. Arriving at a comet

The early months of 2011 should see NASA missions make contact with a pair of previously visited celestial bodies — one small, one large.

First up is the Stardust-NExT mission, scheduled to fly within 200 kilometers (120 miles) of comet Tempel 1 on Valentine's Day. In 2005, the Deep Impact spacecraft slammed an impactor probe into Tempel 1, leaving a crater 100 meters wide and 30 meters deep.

Stardust-NExT (for Next Exploration of Tempel) will concentrate on taking high-resolution images of the comet's surface, including the crater, as well as measuring the comet's composition and the size distribution and flux of its dust grains.

The following month, NASA plans to insert the [MESSENGER spacecraft](#) into an elliptical, 12-hour orbit around Mercury, the [solar](#) system's innermost planet.

MESSENGER (short for MErcury Surface, Space ENvironment, GEochemistry, and Ranging) has already flown past Mercury three times in a series of breaking maneuvers, sending back the first up-close views of the planet since the mid-1970s and taking measurements of its magnetic field.

Once in orbit around the planet, MESSENGER will study its magnetic field in greater detail and examine Mercury's surface for evidence of volcanic processes.

5. Retiring the space shuttle fleet

On April 12, 1981 — 20 years to the day after the former Soviet Union put the first person in space — NASA inaugurated the space shuttle program with the maiden voyage of the Columbia orbiter. In 2011, the shuttle program is set to come to a close.

In its 30 years of service, the [space shuttle fleet](#) deployed the Hubble Space Telescope and did the heavy lifting for assembly of the International Space Station. The shuttle was originally scheduled to be mothballed in 2010, to be replaced by a new spacecraft called Orion, part of the Constellation program initiated by the Bush administration. But President Obama reversed course, and Congress canceled Constellation in October.

Russia's Soyuz spacecraft or future commercial spacecraft are now set to take over duties of ferrying astronauts to and from the space station. At least two, and possibly three, final space shuttle flights are scheduled for 2011.

6. Marking 50 years of human spaceflight

Humanity will celebrate its 50th year in space on April 12, 2011. On that date in 1961, 27-year-old Yuri Gagarin became the first person to reach space, orbiting Earth for 108 minutes in Vostok 1.

The space race took off 23 days after Gagarin's epoch-making flight, when the United States put its own astronaut into space — 38-year-old Alan Shepard, piloting the

Mercury capsule Freedom 7. Since then, the only other country to launch a human into space has been China, although more than 30 countries have contributed crewmembers to space flights.

Along the way, a series of ever-larger space stations has maintained a human presence in space, culminating in the ISS, which has been continuously inhabited for the past 10 years.

7. Completing the International Space Station

NASA plans to put the finishing touches on the [International Space Station](#) in the coming year.

The last remaining shuttle missions will help do the job by hauling up large spare parts. In February, Discovery will take up a spare room for storage and a humanoid robot called Robonaut 2.

In April, Endeavor will carry a \$1.5 billion astrophysics experiment, the Alpha Magnetic Spectrometer, to look for signs of antimatter, dark matter and cosmic rays beyond the Milky Way.

And in June, a proposed mission of the shuttle Atlantis could bring up a cargo bay full of spare parts and supplies. Together, the missions will end more than 10 years of construction for the \$100 billion space station, the longest continuously inhabited and operating station in space.

8. Visiting an asteroid

NASA is making preparations for a rendezvous with an asteroid in August 2011. In February, the Hubble Space Telescope acquired new views of Vesta, a 329-mile-long space rock between Mars and Jupiter, to aid in the arrival of the [Dawn spacecraft](#) next August.

Launched in 2007, Dawn is on an eight-year, 3 billion-mile trip to explore Vesta and Ceres, the two largest known asteroids in the solar system. Dawn's mission is to better understand the formation of the solar system. Because asteroids are left-over material from planet formation, scientists expect to learn something from them about what the early solar system was like.

The spacecraft's instruments are designed to hunt for water-bearing minerals and to measure the shape, surface topography, tectonic history, and elemental and mineral composition of both its targets. It is also expected to measure their masses and gravity fields.

Powered by a xenon ion engine, Dawn received a speed boost in February 2009 when it performed a slingshot maneuver around Mars.

9. Heading for Jupiter

The controlled plunge of the Galileo probe into Jupiter's atmosphere in 2003 put an end to the first dedicated mission to the solar system's largest planet. Now the time has come for a return visit.

In April 2010, NASA engineers and technicians began testing and launch preparations for Juno, Galileo's successor. Set to launch in August 2011, the solar-powered probe will reach Jupiter in 2016, where it will enter a highly elliptical orbit and use nine science instruments to begin studying the planet's deep structure, atmosphere and magnetic field.

On the mission checklist: investigating whether Jupiter has a solid core, mapping its intense magnetic field, measuring the amount of water and ammonia in its deep atmosphere, and observing the planet's auroras.

10. Returning to the moon

The mysteries of moon dust and lunar gravity are in NASA's crosshairs for 2011, as a pair of new probes gets set to launch aboard an unmanned Delta 2 rocket in September. Packed together will be the \$80 million LADEE probe and the \$375 million GRAIL spacecraft.

LADEE, short for Lunar Atmosphere and Dust Environment Explorer, is an orbiter designed for a 100-day mission to study the moon's atmosphere and clingy dust, both of which may figure into future manned returns to the moon. LADEE is expected to carry a spectrometer to probe the atmosphere and a dust detector for examining samples of the moon's gritty regolith that have wafted into space. (Regolith is a blanket of loose soil, rocks and dust that covers some celestial bodies.)

Its partner mission, GRAIL (Gravity Recovery and Interior Laboratory), consists of a pair of spacecraft that will orbit in tandem to map the moon's gravity in high detail, which will give scientists a better idea of its subsurface structure and internal history.

The two missions will separate only after they are en route to the moon, with LADEE expected to take about five months to enter orbit and check its systems.

11. Sending a new mission to Mars

Over the past six years, NASA's Mars landers have studied the geology of the Red Planet and discovered water ice at its north pole. The space agency is set to take the next step in its Mars program in 2011 with the launch of the \$2.3 billion Mars Science Laboratory.


Nicknamed [Curiosity](#), the new rover is twice as long and four times as heavy as its predecessors Spirit and Opportunity, or about the size of a Mini Cooper, and comes equipped with a laser for vaporizing samples of rock. The goal of the mission is to determine whether Mars was ever hospitable to microbial life.


Engineers were busy this year putting Curiosity through its paces. In September, they attached and flexed the rover's jointed, 7.5-foot titanium arm, which will eventually sport a camera and a spectrometer to examine samples of rock and soil where they lie. They have also been maneuvering the six-wheeled rover over a series of ramps in a clean room to test its mobility.


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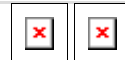
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