

Spaceflight Now +

Premium video content for our Spaceflight Now Plus [subscribers](#).

Space shuttle update

Space shuttle program officials Friday held a news conference at the Johnson Space Center to provide a status report on efforts to understand and fix the external tank foam insulation problems and confirm that the next launch won't happen before May 2006.

■ [Dial-up](#) | [Broadband](#)

Saturn's spongy moon

Stunning images of Saturn's moon Hyperion taken by the Cassini spacecraft show a surface dotted with craters and modified by some process, not yet understood, to create a strange, "spongy" appearance, unlike the surface of any other moon around the ringed planet.

■ [Play video](#)

ISS crew back on Earth

Russian recovery forces pull the space travelers from the just-landed Soyuz capsule as dawn begins to break over the touchdown site in north-central Kazakhstan.

■ [Play video](#)

Astronaut parade

The astronauts from space shuttle Discovery's return to flight mission recently paid a visit to Japan, the homeland of mission specialist Souichi Noguchi, and were treated to a grand parade.

■ [Play video](#)

ISS command change

The International Space Station's outgoing Expedition 11 crew and the new Expedition 12 crew gather inside the Destiny laboratory module for a change of a command ceremony, complete with ringing of the outpost's bell, as the human

Future 'smart' space missions will be multi-tiered

UNIVERSITY OF ARIZONA NEWS RELEASE

Posted: October 17, 2005

Remote-sensing orbiters, probes, landers and rovers are returning astonishing discoveries about our solar system. But some of the most exciting geological and potentially astrobiological places in our family of planets and moons are dangerous and difficult to explore.

University of Arizona, California Institute of Technology, and U.S. Geological Survey Flagstaff researchers propose a novel space mission concept for finding and exploring the most scientifically important surfaces and subsurfaces throughout the solar system.

These next-generation robotic missions will simultaneously explore distant locales at several levels - from orbit, from the air and on the ground - to home in on important geology, hydrology, climate and possibly astrobiology in distant worlds, said James M. Dohm of The University of Arizona. Dohm, a planetary geologist in UA's department of hydrology and water resources, has mapped Mars at local to global scales. He is involved with autonomous long-range roving, sensor web and orbiting spacecraft experiments.

Wolfgang Fink, a visiting associate at Caltech, Dohm and others discuss the new mission concept in an article, "Next-generation robotic planetary reconnaissance missions: A paradigm shift," to be published in Elsevier's journal of Planetary and Space Science.

They spearheaded a team effort that includes Mark Tarbell, who is Fink's associate in Caltech's Visual and Autonomous Exploration Systems Research Lab; Trent Hare of the U.S. Geological Survey office in Flagstaff; and Victor Baker, Regents' Professor of the UA departments of hydrology and water resources, planetary sciences and geosciences.

The new mission concept would feature orbiting spacecraft, blimps and balloons at planets or moons with sufficient atmospheres, such as Titan, and numerous simple, deployable mobile and immobile ground sensors. These spaceborne, airborne, and ground agents would be programmed to look smartly at the environment and interact with each other, offering a true "tier-scalable" perspective needed for a science-driven mission, Dohm said.

ADVERTISEMENT



[For All Mankind - Criterion Collecti...](#)

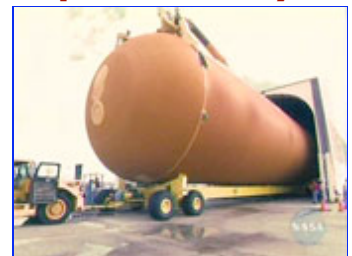
Jim Lovell

Buy New \$35.96



[Privacy Information](#)

Space video clip of the day



Space shuttle external fuel tank No. 120 is moved out of Kennedy Space Center's Vehicle Assembly Building and loaded onto a barge for transport to the Michoud Assembly Facility in New Orleans. Once there, the tank will undergo modifications prior to being returned to Florida for a future launch.

■ [PLAY VIDEO](#)

■ [HOW DO I SIGN UP?](#)

Columbia Report

A reproduction of the official accident investigation report into the loss of the space shuttle Columbia and its crew of seven.

■ [Check your story...](#)



presence in space continues.

■ [Play video](#)

Expedition 11 in review

The Expedition 11 mission of commander Sergei Krikalev and flight engineer John Phillips aboard the International Space Station is winding down, and this narrated retrospective looks back at the key events of the half-year voyage in orbit.



■ [Play video](#)

Pluto spacecraft

The Pluto New Horizons spacecraft, destined to become the first robotic probe to visit Pluto and its moon Charon, arrives at NASA's Kennedy Space Center in advance of its January blastoff.



■ [Play video](#)

Life on the station

NASA astronauts Bill McArthur and John Phillips chat with Associated Press space reporter Marcia Dunn about life aboard the International Space Station in this live space-to-Earth interview from the Destiny laboratory module on October 5.



■ [Dial-up](#) | [Broadband](#)

West Coast Delta 4

In preparation for the West Coast launch of Boeing's next-generation Delta 4 rocket, the two-stage vehicle is rolled out of its horizontal hangar and driven to the Space Launch Complex-6 pad for erection. The nose cone for the NRO payload is then brought to the pad.



■ [Play video](#)

West Coast shuttle

Boeing's Delta 4 rocket pad at Vandenberg Air Force Base was renovated in recent years, transforming Space Launch Complex-6 from the West Coast space shuttle launch site into a facility for the next-generation unmanned booster. This collection of footage shows the 1985 launch pad test using NASA's orbiter Enterprise.



■ [Full coverage](#)

■ [Become a subscriber](#)
■ [More video](#)

"We are now at an optimal window in time when spacecraft and airborne units can coordinate with ground-based sensors, especially since much of the technology is already available," said Fink, a physicist and an expert in imaging systems, autonomous control and space mission science analysis systems. "Even technology not currently available -- software, primarily -- is quite attainable."

"It's important to look at layers and layers of evidence, not just one type," Dohm said.

For example, Fink said, a rover with feature-recognition software can look for a unique rock that could contain a critical piece of the history of Mars. "If you add an airborne perspective, you also see what's on the other side of the hill at the same time, and you know the rover's exact field location as well," he said. The orbiter has the global picture of what's going on and commands the airborne and ground tiers below it.

The orbiter in a tier-scalable mission is equipped with current information about the surface, atmosphere and other features of its destination. Its sensor suite might include optical and thermal cameras, spectrometers, and ground-penetrating radar. These instruments would collect information on areas that the orbiter's software recognizes as possible interesting targets given the overall mission science goals.

"The orbiter can deploy the airborne agents for a closer look," Fink said. "The orbiter also can command the airborne agents to safely deploy ground agents to the prime targets. The airborne agents help detect and confirm prime targets."

"The ground agents can measure information such as heat or moisture," Dohm said. "Or they can sample or collect diverse rocks and, in the case of Mars, possible near-surface water. There could be numerous lightweight, expendable sensors, so that even if you lost a few, you'd still have mission."

The sensors send information back to their respective airborne probes, and ultimately to the orbiting spacecraft. Based on this new information, the orbiter sends new commands that drive the mission.

"The spaceborne, airborne, and ground agents all work together as a field geologist," Dohm said. "They analyze information to form a working hypothesis." They would be ideal for exploring Valles Marineris, the expansive canyon system of Mars, or Europa's putative ice-covered ocean, he added.

In the case of Valles Marineris, for instance, Dohm said, the orbiting spacecraft would deploy sensors that would transmit weather conditions back to the spacecraft. If the sensors give the spacecraft a good weather report - no high winds, for

■ Choose your store:
[U.S.](#) - [U.K.](#) - [E.U.](#) - [Worldwide](#)

Mars Panorama



DISCOUNTED! This 360 degree image was taken by the Mars Pathfinder, which landed on the Red Planet in July 1997. The Sojourner Rover is visible in the image.

■ Choose your store:
[U.S.](#)

Apollo 11 Mission Report

Apollo 11 - The NASA Mission Reports Vol. 3 is the first comprehensive study of man's first mission to another world is revealed in all of its startling complexity. Includes DVD!



■ Choose your store:
[U.S.](#) - [U.K.](#) - [E.U.](#) - [Worldwide](#)

Rocket DVD

If you've ever watched a launch from Kennedy Space Center, Cape Canaveral, Vandenberg Air Force Base or even Kodiak Island Alaska, there's no better way to describe what you witnessed than with this DVD.

■ Choose your store:
[U.S.](#) - [U.K.](#) - [E.U.](#) - [Worldwide](#)



example - the spacecraft would then release the balloons or blimps. These airborne agents would start their searches for targets important to mission goals, collecting and adding new information as they go and deploying ground agents at promising candidate sites. The ground agents would collect and return data to the higher-level airborne probes, or the orbiter, or both. "If the goal at Valles Marineris was to find possible water seeps or near-surface water, a drill rig might even be deployed at the most promising site," Dohm said.

Fink and Dohm say the new concept needs further design, testing and ground-truthing in diverse Earth environments. They envision field camps for international researchers for designing and testing possible tier-scalable reconnaissance systems.

Intelligent, science-driven robotic space missions are a decade or two in the future, they will be international, and they will have significant corporate and private sponsorship, Dohm and Fink predict.

[INDEX](#) | [PLUS](#) | [NEWS ARCHIVE](#) | [LAUNCH SCHEDULE](#)
[MISSION REPORT](#) | [ASTRONOMY NOW](#) | [STORE](#)
[ADVERTISE](#)

© 2005 Pole Star Publications Ltd