Space Road Map

Year-long process will produce funding-neutral tech guidelines

FRANK MORRING, JR./WASHINGTON

A major technology-needs inventory now underway at the U.S. National Research Council (NRC) will provide guidance for civil, military and commercial spaceflight managers, regardless of the funding NASA receives for technology development in the years ahead.

The space agency hired the NRC to conduct a survey of the spaceflight "community" similar to the decadal surveys of space-science priorities that already guide its mission planning. Working from a set of draft "road maps" produced by teams from across NASA for the new Office of the Chief Technologist (OCT), the NRC panels will poll program managers, university professors, aerospace contractors and others for a highly detailed look at U.S. technology capabilities and needs (*AW&ST* Dec. 6, p. 23).

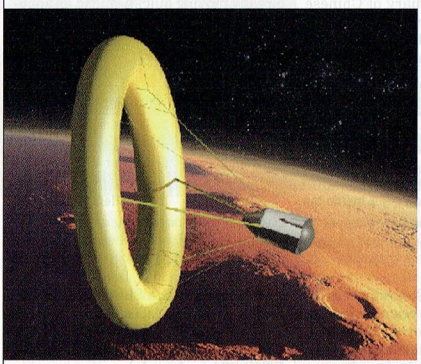
A lifting-towed ballute aerocapture at Mars is just one of many future technologies that NASA is considering.

"These draft road maps were developed by NASA experts," says Chief Technologist Bobby Braun. "They contain input both for the technology push and the technology pull parts of NASA's portfolio. Frankly, they describe the seed-corn investments required for tomorrow's space endeavors."

Broken into 14 technology areas, the drafts cover everything from launch propulsion to nanotechnology for energy generation and storage, propulsion and sensors. Taken together, they will inform future investments in robotic missions all over the Solar System, and human missions to Lagrange points; low-, high- and geosynchronous orbits; the Moon, asteroids and other near-Earth objects, and Phobos, Deimos, Mars and elsewhere.

One technology area is designated "human exploration destination systems," which includes detailed looks at the technologies needed to sustain astronauts at these locations. Among them are in-situ resource utilization; systems for logistics, maintenance and repairs; spacesuits, rovers and off-surface "human maneuvering units," including jetpacks, flyers and balloons for bodies with atmospheres; advanced habitats; crew training; environmental protection and planetary safety; and systems covering construction/assembly, destination characterization and dust mitigation.

To facilitate reaching the surface of extraterrestrial bodies, the draft on entry, descent and landing systems includes thermal protection systems; deployable hypersonic decelerators like ballutes (see photo) and supersonic retropropulsion. To go from Earth orbit to the more distant targets, among the possible technologies in the draft are electric, solar sail, thermal and tether propulsion in the near-term, and beamed energy, electric sail, fusion, advanced fission and anti-matter propulsion.



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"The teams developed our visions of the future based on very limited guidance about the funding end of it," says Braun. "These are documents that we intend to use in strategic planning for both the investment in the mission directorates and within OCT."

The NRC work is meant to be "transparent," Braun says, with the hope that it will gather as much input as possible. Starting this week, the council will begin accepting web comments on the NASA plans at http://sites.nationalacademies.org/DEPS/ASEB/

The year-long NRC study will be headed by Ray Colladay, a former NASA associate administrator, director of the Defense Advanced Research Projects Agency and president of Lockheed Martin Astronautics who chairs the NRC Aeronautics and Space Engineering Board. He will be working with a steering committee and six technology panels to digest the NASA road maps. Interim reports are to be published before the end of 2011, with recommendations and a final report due in January 2012.

NRC panels will be identifying technology gaps and technologies not covered in the NASA documents, weighing the usefulness of specific technologies, identifying risks and setting priorities that managers can use in shaping investments.

Those managers could include companies that see business opportunities in developing a particular technology and then selling it to others, sparing them the cost of independent development.

"This is what NASA thinks the future will be," Braun says. "Companies, knowing that, may choose to put some of their IRAD [independent research and development] money in a particular area [or] may decide to partner with NASA, and use some of their own capital to leverage some of the investments we're making."

The amount of NASA investment in technology remains uncertain as Congress works through the agency's appropriation for Fiscal 2011, which possibly will come in the form of a 10-month continuing resolution at Fiscal 2010 levels, with "anomalies" permitting work on new projects. Originally the agency requested startup funds of $572.2 million for Fiscal 2011 and annual layouts of more than $1 billion a year on technology through Fiscal 2015 (*AW&ST* March 1, p. 24).

Until the future funding is set, Braun's office is limited. On Dec. 8 it announced it will negotiate about $4.5 million in small business innovation research and small business technology transfer contracts for technology research.