

Ice Dragon and Icebreaker missions: A paradigm shift in Mars exploration.

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NASA's Mars decadal program has been cancelled and a new program devised. Two new space missions have been proposed that are a paradigm shift in Mars exploration. Both missions have the search for past or present life as the primary mission objective, and one mission, in addition, offers the testing of human precursor technology for Mars exploration.

The first mission is Ice Dragon. This mission proposes to use the SpaceX Dragon capsule, designed to ferry people and cargo to the International Space Station (ISS), and has the capacity to return to land using rocket thrusters. This feature can be adopted to land a capsule on Mars with payloads greater than 1 tonne, providing a relatively low cost Earth - Mars transport system. The proposed Ice Dragon mission is characterized as a "human precursor" mission that 1) tests a prototype manned lander; 2) investigates that the surface soil is safe for humans by drilling into ice and soil looking for life biomarkers; and 3) tests resource extraction equipment for future human missions. The mission landing site is in the Utopia Planitia region near the Viking 2 landing site. Mission funding is proposed to be as per the current ISS Dragon capsule, through the Commercial Orbital Transportation Services (COTS) program, a program that assists American industry to develop privately operated space transportation systems. The Ice Dragon concept could be adopted as part of a Mars sample return mission or a 'off the shelf' cargo vehicle to regularly transport science payloads to Mars.

The second mission is Icebreaker. This mission proposes to return to Phoenix lander site to the 70 degree latitude north region of Mars with the 'search for life' as the mission objective. This region is believed to have had liquid water some 5 million years ago due to the Mars 45 degree obliquity during that epoch. The Icebreaker lander is identical to Lockheed's Phoenix lander except it is equipped with a drill and life detection instruments to drill into ice and soil located centimeters under the surface. If microbial life existed in the water 5 million years ago it may be frozen in the ice today. The Icebreaker mission is a low cost science mission with potentially a very significant science returns.