

DeepSpace one: NASA's First Deep-Space Technology Validation Mission

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Under development for launch on July 1, 1998, Deep Space One (DS 1) is the first flight of NASA's New Millennium Program, chartered to validate carefully selected technologies required for future low-cost space science programs. Advanced technologies chosen for validation on DS 1 include solar electric propulsion, high-power solar concentrator arrays, autonomous on-board operations including optical navigation, two highly integrated and low-mass science instrument packages, and several telecommunications and microelectronics technologies. Throughout the two year primary mission, the technology payload will be exercised extensively to assess each product's performance so that subsequent flight projects will not have to incur the cost and risk of being the first users of these new capabilities. An important component of the DS 1 mission is diagnosing any in-flight anomalies or failures.

Although DS 1 is driven by the requirements of the technology validation, it also presents an important opportunity to conduct solar system science. DS 1 will be the first mission to encounter a near-Earth asteroid and is the next spacecraft targeted to encounter a comet. During the primary mission, the spacecraft will fly by asteroid 3352 McAuliffe, Mars (and possibly one of its moons), and comet P/West-Kohoutek-Ikemura. Depending upon the spacecraft's health, an encounter with another small body is likely during the extended mission if approved. The two science instruments that are being validated, an integrated visible imager and UV and IR imaging spectrometer and a plasma physics package, will be used to collect science data during the cruise and encounters. In addition, a suite of fields and particles sensors included to aid in the quantification of the effects of the solar electric propulsion on the spacecraft and near-space environment may be used for science measurements complementary to those of the plasma physics instrument. The return of science data will demonstrate that all of the technologies are compatible with the demands of future scientific missions and will ensure that this rare opportunity to encounter such a variety of solar system targets during a short mission will be fully exploited.