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USE OF THE BIG FALCON ROCKET FOR MANNED TITAN MISSIONS

Abstract

Elon Musk's IAC 2017 presentation unveiled SpaceX's plans for the Big Falcon Rocket (BFR) for Mars and Lunar missions. A key feature is use of orbital refueling to achieve the desired delta-vee. For single stage Lunar Return missions, the Big Falcon Spaceship (BFS) would stage from a Highly Elliptical Earth Orbit (HEEO) after refueling. Staging from HEEO also enables high speed elliptical or parabolic orbits direct to Saturn's moon Titan, at which the BFS can aerobrake for direct entry and landing. A 10 person mission is sketched and prospects for In Situ Resource Utilization (ISRU) examined. Recent developments in molecular manufacturing make the dense N2/CH4 atmosphere of Titan particularly attractive for large scale production of polymer based structures for orbital use and the ISRU propellant prospects, especially the abundant acetylene on the surface, highlight Titan as a major source of materials for large-scale space structures, rather than the usual options of the Moon, Mars or the asteroids.