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Space Architecture: technical aspects, design, engineering, concepts and mission planning (1)

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ORBITAL REFUELING, SPACE DEBRIS, AND ADVANCING A SOLAR SYSTEM ECONOMY

Abstract

Space settlement has been frozen for four decades due in part to a series of dilemmas. While affordable launch seems to finally be resolved, there are limits to vehicle scale without orbital refueling. However, making multi-billion dollar missions depend on fragile stations orbiting in a space debris field is risky. Entry, Descent, and Landing at Mars with current technology is limited by mass and aeroshell diameters. This paper proposes to resolve these issues in a single, affordable, low technology package. Water can be broken down into hydrogen and oxygen for cryopropellants, although the ratio leaves extra oxygen. That oxygen can then be burned more storable fuels. Water can be frozen and reinforced to strengths greater than concrete, and could therefore block orbital debris and cosmic rays from an orbiting crewed base. This paper proposes a small refueling platform able to not only fuel deep space missions, but carry enough fuel to transport itself to orbit around the moon or Mars. An orbiting fuel platform and Mars would allow propulsive entry remove a major limitation on the scale of landing vehicles. Water from the moon and Mars can also be transported to orbit via local shuttles to maintain stock without dependency on Earth. Crews in orbit would have cosmic ray protection much like that on the surface, and the architecture can also be used for surface bases.