Element Concepts for a Mars Mission Architecture. H.J. Trammell[1], A. Chavez[1], T. Hockenberry[1], J. Doehring[1] D. Ladewig[1]
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Introduction: The current state of space mission architecture is one of a single path. However, as time and experience has showed, very little of what is actually planned goes accordingly. This is why a mission to Mars, which hold such enormous uncalculated data and unforeseen hazards, should allow for an architecture built around flexible elements and goals [9]. Technology deficiencies are outlined by the P-SAG give a good outline for areas that need to be addressed. This study (Jan '11 – Aug '11) addresses several of these issues listed, along with innovative ways to attack old problems. Main areas addressed are areocapture/ aerobraking designs and techniques, surface power options/orbital strategies, mission architecture concepts, ascent capabilities [10] [11].

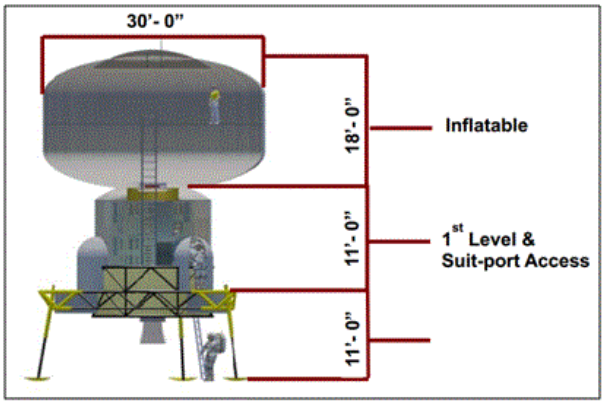

Fig. 1 – Mission Design Architecture

Aerocapture/aerobraking propulsion system, have pros and cons [3]. Mass savings achieved in the future will depend on the design and selection of the appropriate aeroshell design based on the mission and orbital requirements [8]. The highest level of this tradeoff is the selection of the type of aeroshell shape [5]. The basic aeroshell shape options considered, based on the performance criteria, include symmetric conic, asymmetric conic, symmetric bi-conic, bent or raked bi-conic, parabolic winged glider and ballute or flexible aerobrakes [7].

There are options for placing an SEP stage besides Mars parking orbit, which will be addressed to optimize both communication and power beaming [2] to the surface (if utilized). Supplemental surface power options will be addressed and include solar, radioisotope thermoelectric generators (RTGs) [6] [12], and possibly in-situ resource ultilization (ISRU). This flexible mission architecture, to achieve the highest percentage of a mission success, is the leading design principle that was considered when designing payload and surface operations for a Multiple Purpose Mars Vehicle [1] [4].

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