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COMPARISION OF AIR-LAUNCHED REUSABLE SYSTEM VS GROUND-LAUNCHED SYSTEM FOR MARS SAMPLE RETURN

Abstract

Sample return missions from the Martian surface have been the most ambitious endeavors for many space agencies, yet there have been no practical trials to accomplish, due to the technical challenges that the missions face. A major setback for these missions is the lack of any possible tested methods to collect the samples and leave the Martian atmosphere. One of the prevailing methods to bring back the collected samples would be to use a launch vehicle from the Martian surface that would impel the sample carrier out of the atmosphere. The downside of using a launch vehicle is its requirement for fuel and an oxidizer, of which the latter is scarce on Mars hence there is a requirement of carrying them from earth. As the above-mentioned problem hinders the mission, the novel idea being proposed here is the use of multiple reusable aerial vehicle systems, that can collect samples from different locations, after which they fly up to the maximum possible altitude based upon the Martian atmospheric constraints, and then the samples are propelled from this vehicle using small single-staged propulsion vehicle to dock the payload with the revolving orbiter. Also, these aerial vehicles could be landed back again, thus could be reused for collecting samples multiple times and even for any other Mars exploration purposes. This paper will mainly focus on the comparison of using aerial vehicle system proposed here, with the method of bringing back samples using a launch vehicle from the Martian surface in terms of feasibility, efficiency, economical aspects, etc.