# IDENTIFYING HIGH-PRIORITY TECHNOLOGY DEVELOPMENTS FOR LOW COST PLANETARY EXPLORATION MISSIONS**

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Within the past two years, the leadership of NASA has developed a vision for the agency that seeks to encourage the use of new technology on NASA missions to enhance the competitiveness of the USA in the global marketplace. Additionally, it has been clear for many years that the use of newer technology could reduce the cost of some planetary science missions. While the environment for new technology for planetary missions is quite good now, there still remains the challenge to identify which technologies can provide the largest benefit with the least investment. The purpose of this paper is to present the results of one recent approach which seeks to identify high priority new technology items for low cost planetary exploration missions.

This process began with a long list (~ 75 items) of technologies which potentially had benefit to low cost planetary missions. This list of technologies was assessed relative to a mission model for future planetary missions. The mission model included: 1 ) both low and higher cost missions, 2) a broad range of mission types and 3) missions with diverse technical challenges. The missions included near-Earth object flyby, outer solar system flyby, near Earth object rendezvous, Mercury orbiter, Venus lander, Mars lander and Mars sample return.

The technologies were assessed in terms of their potential benefits to the model missions, technology readiness schedule, and predicted development cost. Each technology received a rating based on mission benefit and development cost, and the top ten were selected for further study. Those selected were: cabling mass decrease by 30%, pyrotechnics cabling decrease by 50%, downlink data reductions by 10OX and 10000X, data storage density increase by I OX and 100X, battery energy density increase by 3-4X, electronics packaging density increase by 5-20X, MMH/NTO propulsion $I_{sp}$ increase by 5%, and full conductance control of heat pipes.

This screened list of 10 technologies was then assessed by more than 10 experts against the model missions to determine the benefits (if any) in the areas of spacecraft mass and cost, launch cost, and mission operations cost. Mass reductions and Isp improvements were converted to estimated launch cost savings by metrics that were also developed in the study, Total cost savings and development cost estimates (as available) were then provided in the final report.

The process described in this paper is meant to be applied to additional grouping of technologies and mission sets. While the results of this process are in themselves valuable, the process developed may be the more important result. The final paper will describe this process and the results of its initial use in more detail.

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