Identifying Technology Investments for Future Space Missions
James P. Chase
Jet Propulsion Laboratory
California Institute of Technology
4800 Oak Grove Drive
Pasadena, CA 90119

Advancement of critical technologies is a key factor in enabling future space missions. Yet, there is clearly a mismatch between the available funding and the cost of pursuing all technologies that have been identified as critical. Therefore, a process is needed to select the technologies that can provide the highest return on investment. In this paper, a systems engineering model is presented that identifies those technologies which provide the most significant impact.

The model can be tailored for a specific mission or a set of missions, and it is composed of three distinct areas: the objective of the mission, a mission model, and the required technology investment. The objective of the mission may also be characterized as a utility function. Although somewhat subjective, this function is needed to identify the relative difference between alternative technology selections. The mission model decomposes the objective of the mission into a series of specific actions (such as, sample analysis, site access, and landing precision). Using this approach of decomposition, a large systems engineering model is created, which represents a given mission. The last area addressed is the required technology investment. In this portion of the model, the user can select alternative technology investments to influence the model. The resulting technology choices ripple through the model, producing overall differences in value. Thus, the technologies that produce the highest impact with the least cost are identified.