

## A New Approach for Prioritizing Space Shuttle Secondary Payloads

in the summer of 1996, the Office of Space Operations Utilization at NASA Headquarters began evaluating a new approach for manifesting Shuttle Secondary payloads. This new process would replace the manual, time-consuming, committee-driven process of manifesting payloads with a computerized one which would establish a clear list of priorities. Headquarters would then send this list to the Johnson Space Center where the actual manifest would be generated.

To obtain more detailed priority information, a computerized (residing on the World Wide Web), market-based system was developed. In this system, each user of the Space Shuttle is allocated "points". Points are employed to express how strong a particular user wants a specific payload to be manifested. Users submit "bids" for each of their payloads they wish to be considered for launch. Each bid has a number of points and an associated Priority Class. Priorities are divided into classes to ensure that some payloads get manifested. Payloads that are in Priority Class One are guaranteed to be manifested in the current year. Priority Class Two payloads are manifested next, followed by the remainder of the Priority Class Three payloads. These classes are run through an algorithm that selects those payloads that maximize the total points. Thus the more points bid or the fewer resources required by a payload, the greater the odds of it successfully being manifested.

In order to prove this concept, a series of experiments were designed, executed and evaluated. In these experiments, a set of payloads were manifested manually by a manifesto. The manifestors task was to decide which payloads should be manifested in such a way as to maximize the utilization of available Shuttle resources (e.g., number of lockers, energy, crewhours) while choosing payloads that had the greatest value to the individual users. The results were then compared to those produced by the computerized trading system which was run by students. The individual students were motivated to produce the best results, i.e., produce the greatest science return, by paying them a dollar amount based on the science value of their payloads which were successfully manifested.

Results from the experiments show that the market-based approach performed by the students were just as good as the one performed by the manifesto except that it was produced in less time, induced better resource utilization, and that those users which did not use their points this year, could use them next year to increase the likelihood of their payloads getting manifested.

It is hoped that once the Shuttle Secondary payload system is implemented at NASA Headquarters, it can be expanded to include Shuttle Get-Away Specials and Shuttle Primary payloads. Once established for the Shuttle, extrapolation to the international Space Station becomes a natural, cost-effective extension.