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## NASA TECH BRIEF



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## **Trajectory Optimization Using Regularized Variables**

When a space vehicle trajectory passes through regions with significantly different gravitational fields, accurate numerical analysis often requires much computer time. Results obtained in celestial mechanics indicate that regularization transformations may be used in the formulation of trajectory optimization problems to reduce the computation time.

In this investigation, regularized equations for a particular optimal trajectory are obtained and compared with the unregularized equations with respect to computational characteristics, using perturbationtype numerical optimization. The comparison, for the case of a three-dimensional, low-thrust, Earth-Jupiter rendezvous, indicates that the regularized equations yield a significant reduction in computing time. Also, within the range of values considered, the convergence of the regularized equations is much less sensitive to errors in the unknown boundary conditions.

## Note:

. Requests for further information may be directed to: Technology Utilization Officer Manned Spacecraft Center, Code BM7 Houston, Texas 77058 Reference: TSP69-10810

## Patent status:

No patent action is contemplated by NASA.

Source: Jay M. Lewallen Manned Spacecraft Center, and Byron D. Tapley and Victor Szebehely of Texas Center for Research in Applied Mathematics and Mechanics under contract to Manned Spacecraft Center (MSC-13370)

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