

- Module for sharing files on HPC (High Performance Computing) sites;
- Universal accessibility of staged files as embedded links on other sites (e.g. Facebook) and tools (e.g. e-mail);
- Drag-and-drop transfer of large files, replacing awkward e-mail attachments (and file size limitations);
- Enterprise-level data and messaging encryption; and
- Easy-to-use intuitive workflow.

This work was done by Homa Karimabadi of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-15883-1

General Methodology for Designing Spacecraft Trajectories

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A methodology for designing spacecraft trajectories in any gravitational environment within the solar system has been developed. The methodology facilitates modeling and optimization for problems ranging from that of a single spacecraft orbiting a single celestial body to that of a mission involving multiple spacecraft and multiple propulsion systems operating in gravitational fields of multiple celestial bodies. The methodology consolidates almost all spacecraft trajectory design and optimization problems into a single conceptual framework requiring solution of either a system of nonlinear equations or a parameter-optimization problem with equality and/or inequality constraints.

The use of multiple reference frames that generally translate, rotate, and pulsate between two arbitrary celestial bodies facilitates analysis of such complex trajectories as those that pass (possibly multiple times) through gravitational fields of multiple celestial bodies. A basic building block that can accommodate impulsive maneuvers, maneuver- and non-maneuver-based mass discontinuities, and finite burn or finite control acceleration maneuvers, is used to construct trajectories. The methodology is implemented in an interactive computer

program, COPERNICUS, wherein numerical integration, multi-dimensional nonlinear root-finding, and/or sequential quadratic programming are used for solving trajectory design, targeting, or optimization problems constructed by the analyst.

This work was done by Gerald Condon of Johnson Space Center; Cesar Ocampo, Ravishankar Mathur, and Fady Morcos of the University of Texas; Juan Senent of Odyssey Space Research; Jacob Williams of ERC, Inc.; and Elizabeth C. Davis of Jacobs Technology. For further information, contact the JSC Innovation Partnerships Office at (281) 483-3809. MSC-23671-1/4209-1/4586-1