Books & Reports

Tailoring Ion-Thruster Grid Apertures for Greater Efficiency

A report proposes tailoring the diameters of the apertures in the accelerator grid of an ion thruster to reduce the open grid area through which un-ionized propellant gas can escape. The result would be a reduction in the loss of propellant gas and a corresponding increase in propellant efficiency. In a typical ion thruster, the plasma density decreases with radial distance from the centerline, and as a consequence, the diameters of ion beamlets decrease with increasing radial distance. According to the proposal, the apertures, through which the ion beamlets must pass, would be sized to match the diameters (with margin) of the beamlets. The decrease of the aperture diameters with radial distance would result in a significant reduction in the open grid area: In an example based on representative design parameters, the reduction could be as much as 30 percent. In this example, the transparency to un-ionized propellant would decrease from 0.24 to 0.17 and, as a result, the propellant efficiency would increase from 0.91 to 0.96.

This work was done by John Brophy of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*
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Lidar for Guidance of a Spacecraft or Exploratory Robot

A report describes the Laser Mapper (LAMP) — a lightweight, compact, low-power lidar system under development for guidance of a spacecraft or exploratory robotic vehicle (rover) at Mars or another planet. The LAMP is intended especially for use during rendezvous of two spacecraft in orbit, for mapping terrain during descent and landing of a spacecraft, for capturing a sample that has been launched into orbit, or navigation and avoidance of obstacles by a rover traversing terrain. The LAMP includes a laser that emits high-power, short light pulses. The laser beam is aimed in azimuth and elevation by use of a mirror on a two-axis gimbal, which scans the beam across a field of regard. Light reflected by a target is collected by a telescope, and the distance to the target is determined by measuring the round-trip travel time for reflected light pulses. The distance information is combined with directional information to construct a three-dimensional map of targets in the field of regard.

This work was done by Carl Christian Liebe, Robert Bunker, Sohrab Mobasser, Curtis Padgett, Jacob Chapsky, Gary Spiers, Randall Bartman, Michael Newell, Alexander Abramovici, Hemad Hemmati, Alejandro San Martin, Chengchih Chu, William Roberts, Malcolm Wright, James W. Dillon, Daniel S. Clouse, David M. Tratt, Zachary G. Warfield, Robert Calvet, and Robert W. Hausmann of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*
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