ture efforts would focus on multilayer bonding, fabrication of prototypes, and overcoming limitations.

This work was done by Kevin N. Barnes, Robert Bryant, Robert Fox, Nancy Holloway, and Fred Draughon of **Langley Research Center**. *For further information, contact the Langley Innovative Partnerships Office at (757) 864-8881.*
LAR-16503

Lightweight Radiator System for a Spacecraft

Three documents describe various aspects of a proposed lightweight, deployable radiator system for dissipating excess heat from the life-support system of a habitable spacecraft. The first document focuses on a radiator tube that would include a thin metal liner surrounded and supported by a thicker carbon-fiber-reinforced composite tubular structure that, in turn, would be formed as part of a unitary composite radiator-fin structure consisting mostly of a sheet of reticulated vitreous carbon laminated between carbon-fiber-reinforced face sheets. The thermal and mechanical properties, including the anisotropies, of the component materials are taken into account in the design. The second document describes thermo-structural bumpers, in the form of exterior multiple-ply carbon-fiber sheets enclosing hollows on opposite sides of a radiator fin, which would protect the radiator tube against impinging micrometeors and orbital debris. The third document describes a radiator system that would include multiple panels containing the aforementioned components, among others. The system would also include mechanisms for deploying the panels from compact stowage. Deployment would not involve breaking and remaking of fluid connections to the radiator panels.

This work was done by Robert J. Copeland, Georgia Mason, and Mark M. Weislogel of TDA Research, Inc., for **Johnson Space Center**. *For further information, contact the Johnson Technology Transfer Office at (281) 483-3809.*
MSC-23252/3/4

Heated-Pressure-Ball Monopropellant Rocket Engine

A recent technology disclosure presents a concept for a monopropellant thermal spacecraft thruster that would feature both the simplicity of a typical prior pressure-fed propellant supply system and the smaller mass and relative compactness of a typical prior pump-fed system. The source of heat for this thruster would likely be a nuclear-fission reactor. The propellant would be a cryogenic fluid (a liquefied low-molecular-weight gas) stored in a tank at a low pressure. The propellant would flow from the tank, through a feedline, into three thick-walled spherical tanks, denoted pressure balls, that would be thermally connected to the reactor. Valves upstream and downstream of the pressure balls would be operated in a three-phase cycle in which propellant would flow into one pressure ball while the fluid underwent pressurization through heating in another ball and pressurized propellant was discharged from the remaining ball into the reactor. After flowing through the reactor, wherein it would be further heated, the propellant would be discharged through an exhaust nozzle to generate thrust. A fraction of the pressurized gas from the pressure balls would be diverted to maintain the desired pressure in the tank.

This work was done by William D. Greene of **Marshall Space Flight Center**. *Further information is contained in a TSP (see page 1).*

This invention is owned by NASA, and a patent application has been filed. For further information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov. Refer to MFS-32102-1.

Improved Emergency Egress Lighting System for the ISS

Emergency lights provide illumination in corridors, stairwells, ramps, escalators, aisles, and exit passageways during power failures. Safety and visibility are critical during a power outage. If emergency lights fail to operate properly, the building occupants can become disoriented. Four documents in a collection discuss different topics relating to a proposed improved emergency egress lighting system (EELS) for the International Space Station (ISS). While the present EELS is designed around rows of green-light-emitting diodes, the proposed system contains strips of electroluminescent tape using different colors for each egress path. The proposed EELS can be powered by the same battery currently used by the present EELS, but would require an inverter because electroluminescent devices require AC. Electroluminescent devices also require significantly less current and, depending on the color, would emit 3 to 8 times the light of the present EELS. In addition, they could operate for up to 75 hours (versus ≈20 minutes for the present system). The first document contains a one-page summary of the proposal and an evaluation of technical merit. The second document summarizes the motivation for, and the design of, the proposed EELS. The third document addresses relevant aspects of the measurement of spectral sensitivity and the psychophysics of perception of light. The fourth document presents additional background information and technical specifications for the electroluminescent tapes.

This work was done by Leslie L. Eaton and Don A. Barr of GHG Corp. for **Johnson Space Center**. *For further information, contact the Johnson Technology Transfer Office at (281) 483-3809.*
MSC-23431

Spacecraft Solar Sails Containing Electrodynamic Tethers

A report discusses a proposal to use large, lightweight solar sails embedded with electrodynamic tethers (essentially, networks of wires) to (1) propel robotic spacecraft to distant planets, then (2) exploit the planetary magnetic fields to capture the spacecraft into orbits around the planets. The purpose of the proposal is, of course, to make it possible to undertake long interplanetary missions without incurring the large cost and weight penalties of conventional rocket-type propulsion systems. Through transfer of momentum from reflected solar photons, a sail would generate thrust outward from the Sun. Upon arrival in the vicinity of a planet, the electrodynamic tethers would be put to use: Motion of the spacecraft across the planetary magnetic field would induce electric currents in the tether wires, giving rise to an electromagnetic drag force that would be exploited to brake the spacecraft for capture into orbit. The sail with embedded tethers would be made to spin to provide stability during capture. Depending upon the requirements of a particular application, it could be necessary to extend the tether to a diameter greater than that of the sail.

This work was done by Les Johnson of **Marshall Space Flight Center** *and Greg Matloff of New York City Technical College, The City University of New York (CUNY). Further information is contained in a TSP (see page 1). MFS-31503*