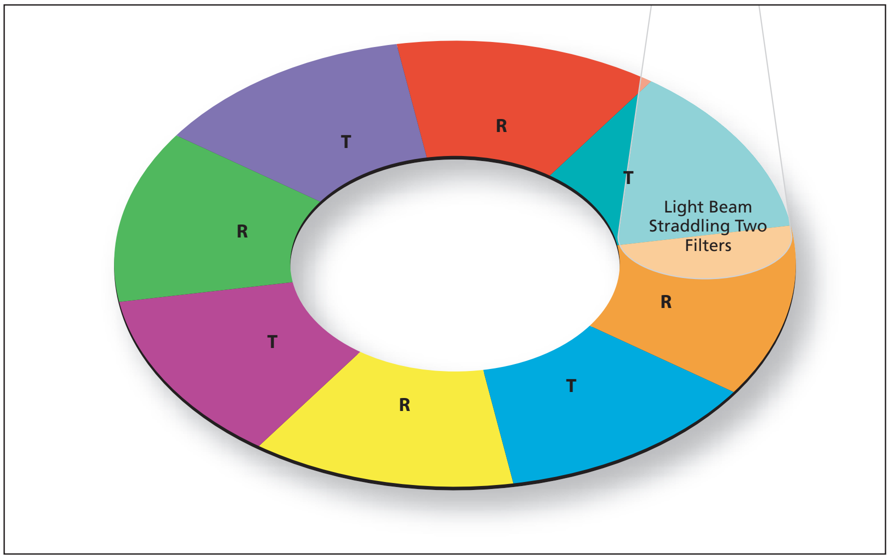

Figure 2. The **Filter Wheel** contains narrow-band-pass filters arranged so that the pass bands of adjacent filters lie, alternately, in the transmission (T) and reflection (R) spectral band of the dichroic filter.

the entire cross section of the beam of light coming out of the telescope, the spectrum of light that reaches the dichroic beam splitter lies entirely within the pass band of that filter. Therefore, the beam in its entirety is either transmitted by the dichroic beam splitter and imaged on the longer-wavelength FPA or reflected by the beam splitter and imaged onto the shorter-wavelength FPA.

When the beam straddles two narrow-band-pass filters on the wheel, the spectrum of the light incident on the dichroic beam splitter includes one component in the transmission band and one component in the reflection band. The fraction of beam power in each component at a given instant of time is approximately equal to the fraction of the cross-sectional area of the beam occupied by the corresponding narrow-band-pass filter. The out-of-band signal on each path downstream of the dichroic beam splitter is further attenuated by the broad-band-pass filter on that path. Each FPA integrates incident light during frame times synchronized with the rotation of the filter wheel. Because the dichroic filter and the broad-band-pass filter on each path block out-of-band light, each FPA can integrate a spectrally pure image, not only when the light beam is passing through a single filter, but also when it is straddling two adjacent filters.

The dichroic beam splitter and the narrow-band filters, in combination, act like a shutter for each FPA at the end of its integration period, making it possible to read out each FPA without incurring degradation of the image. The focusing lens and the FPA for each optical path downstream of the dichroic beam splitter can be optimized over a range of wavelengths spanning half the spectral bands of the system.

This work was done by James C. Bremer of Swales Aerospace for **Goddard Space Flight Center**. *Further information is contained in a TSP (see page 1).*
GSC-14783-1

Integral Radiator and Storage Tank

Weight and volume are reduced.

John H. Glenn Research Center, Cleveland, Ohio

A simplified, lightweight system for dissipating heat of a regenerative fuel- cell system would include a heat pipe with its evaporator end placed at the heat source and its condenser end integrated into the wall of the regenerative fuel cell system gas-storage tanks. The tank walls act as heat-radiating surfaces for cooling the regenerative fuel cell system. The system was conceived for use in outer space, where radiation is the only physical mechanism available for transferring heat to the environment. The system could also be adapted for use on propellant tanks or other large-surface-area structures to convert them to space heat-radiating structures.

Typically for a regenerative fuel cell system, the radiator is separate from the gas-storage tanks. By using each tank's surface as a heat-radiating surface, the need for a separate, potentially massive radiator structure is eliminated. In addition to the mass savings, overall volume is reduced because a more compact packaging scheme is possible. The underlying tank-wall structure provides ample support for heat pipes that help to distribute the heat over the entire tank surface.

The heat pipes are attached to the outer surface of each gas-storage tank by use of a high-thermal conductance, carbon-fiber composite-material wrap. Through proper choice of the composite layup, it is possible to exploit the high longitudinal conductivity of the carbon fibers (greater than the thermal conductivity of copper) to minimize the unevenness of the temperature distribution over the tank surface, thereby helping to maximize the overall heat-transfer efficiency.

In a prototype of the system, the heat-pipe and the composite wrap contribute an average mass of 340 g/m^2 of radiator area. Lightweight space radiator panels have a mass of about 3,000 g/m^2 of radiator area, so this technique saves almost 90 percent of the mass of separate radiator panels. In tests, the modified surface of the tank was found to have an emissivity of ≈0.85. The composite wrap remained tightly bound to the surface of the tank throughout the testing in thermal vacuum conditions.

This work was done by Kenneth A Burke and John R. Miller of **Glenn Research Center**, *and Ian Jakupca and Scott Sargi of Analex Corp. Further information is contained in a TSP (see page 1).*

Inquiries concerning rights for the commercial use of this invention should be addressed to NASA Glenn Research Center, Innovative Partnerships Office, Attn: Steve Fedor, Mail Stop 4–8, 21000 Brookpark Road, Cleveland, Ohio 44135. Refer to LEW-17666-1.