dimension of patches produces the required frequencies.

To achieve excellent polarization isolation and control of antenna sidelobes for the MSPA, the orientation of each stacked-patch element within the array is optimized to reduce the cross-polarization. A specialized feed-distribution network was designed to achieve the required excitation amplitude and phase for each stacked-patch element.

The patches are thin copper/Kapton layers bonded to Astro-Quartz layers. As illustrated in the figure, three copper/Kapton/Astro-Quartz layers are built to function as the upper patch, lower patch, and ground plane. The lower radar patches sit on a honeycomb dielectric structure above the conducting ground plane. The honeycomb is filled mostly with air and, therefore, introduces only a small loss at L-band frequencies. On the top of the radar patches sits another honeycomb dielectric structure to support the radiometer patches. All of the layers and the honeycombs are drilled to allow attachment to the feed wires to the lower patch (radar). The lower patch is fed through the ground plane, while the upper patch acts as a parasitic patch to introduce the 1.413 GHz.

A seven-element stacked patch array with elements forming a hexagonal pattern is the most suitable for space applications; however, a 16-element array with a 4×4 rectangular configuration is better for airborne and ground applications.

This work was done by Yahya Rahmat-Samii, Keerti Kona, and Majid Manteghi of the University of California at Los Angeles (UCLA); and Steven Dinardo, Don Hunter, Eni Njoku, William Wilson, and Simon Yueh of Caltech for NASA's Jet Propulsion Laboratory. For more information, contact iaoffice@jpl.nasa.gov. NPO-44470

Biomedical Wireless Ambulatory Crew Monitor

John H. Glenn Research Center, Cleveland, Ohio

A compact, ambulatory biometric data acquisition system has been developed for space and commercial terrestrial use. BioWATCH (Biomedical Wireless and Ambulatory Telemetry for Crew Health) acquires signals from biomedical sensors using acquisition modules attached to a common data and power bus. Several slots allow the user to configure the unit by inserting sensor-specific modules. The data are then sent real-time from the unit over any commercially implemented wireless network including 802.11b/g, WCDMA, 3G.

This system has a distributed computing hierarchy and has a common data controller on each sensor module. This allows for the modularity of the device along with the tailored ability to control the cards using a relatively small master processor. The distributed nature of this system affords the modularity, size, and power consumption that betters the current state of the art in medical ambulatory data acquisition.

A new company was created to market this technology.

This work was done by Alan Chmiel and Brad Humphreys of ZIN Technologies for Glenn Research Center. 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-18357-1.

Wireless Avionics Packet To Support Fault Tolerance for Flight Applications

A simple network interface supports fault detection and autonomous fault recovery.

NASA's Jet Propulsion Laboratory, Pasadena, California

In this protocol and packet format, data traffic is monitored by all network interfaces to determine the health of transmitter and subsystems. When failures are detected, the network interface applies its recovery policies to provide continued service despite the presence of faults. The protocol, packet format, and interface are independent of the data link technology used. The current demonstration system supports both commercial off-the-shelf wireless connections and wired Ethernet connections. Other technologies such as 1553 or serial data links can be used for the network backbone.

The Wireless Avionics packet is divided into three parts: a header, a data payload, and a checksum. The header has the following components: magic number, version, quality of service, time to live, sending transceiver, function code, payload length, source Application Data Interface (ADI) address, destination ADI address, sending node address, target node address, and a sequence number.

The magic number is used to identify WAV packets, and allows the packet format to be updated in the future. The quality of service field allows routing decisions to be made based on this value and can be used to route critical management data over a dedicated channel. The time to live value is used to discard misrouted packets while the source transceiver is updated at each hop. This information is used to monitor the health of each transceiver in the network.

To identify the packet type, the function code is used. Besides having a regular data packet, the system supports diagnostic packets for fault detection and isolation. The payload length specifies the number of data bytes in the payload, and this supports variable-length packets in the network. The source ADI is the address of the originating interface. This can be used by the destination application to identify the originating source of the packet where the address consists of a subnet, subsystem class within the subnet, a subsystem unit, and the local ADI number. The destination ADI is used to route the packet to its ultimate destination. At each hop, the sending interface uses the