Software Defined Radio With Parallelized Software Architecture  
*Goddard Space Flight Center, Greenbelt, Maryland*

This software implements software-defined radio processing over multicore, multi-CPU systems in a way that maximizes the use of CPU resources in the system. The software treats each processing step in either a communications or navigation modulator or demodulator system as an independent, threaded block. Each threaded block is defined with a programmable number of input or output buffers; these buffers are implemented using POSIX pipes. In addition, each threaded block is assigned a unique thread upon block installation. A modulator or demodulator system is built by assembly of the threaded blocks into a flow graph, which assembles the processing blocks to accomplish the desired signal processing. This software architecture allows the software to scale effortlessly between single CPU/single-core computers or multi-CPU/multi-core computers without recompilation.

NASA spacecraft and ground communications systems currently rely exclusively on ASICs or FPGAs. This software allows low- and medium-bandwidth (100 bps to ≈50 Mbps) software defined radios to be designed and implemented solely in C/C++ software, while lowering development costs and facilitating reuse and extensibility.

*This work was done by Greg Hecker of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16442-1*

Compact Radar Transceiver With Included Calibration  
*Volume and weight are reduced without performance penalties.*  
*Goddard Space Flight Center, Greenbelt, Maryland*

The transceivers include frequency conversion stages, T/R switching, and a calibration path capable of measuring the transmit power-receiver gain product during transmit for pulse-by-pulse calibration or matched filtering. In particular, this calibration path achieves 100-dB isolation between the transmitted signal and the low-noise amplifier through the use of a switching network and a section of physical walls achieving attenuation of radiated leakage.

The transceivers were designed in microstrip PCBs with lumped elements and