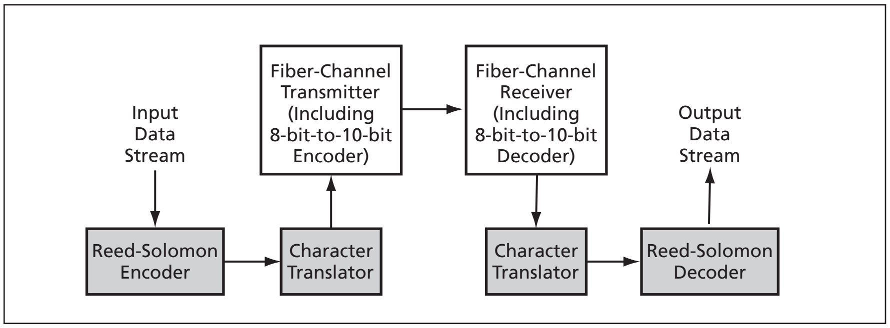

A **Unidirectional Serial Data Link** according to the proposal would be made from a commercial fiber-channel transmitter and receiver augmented externally with character translators and a Reed-Solomon encoder and decoder.

cific application, the physical connection between the transmitter and receiver could be made via an optical fiber or a twisted pair of wires.]

Heretofore, fiber-channel links have ordinarily been bidirectional and have operated under protocols that provide for receiving stations to detect errors and request retransmission when necessary. In the present case, the time taken by processing to request retransmission would conflict with the requirement for real-time transfer of data. To ensure reliability without retransmission, a link according to the proposal would utilize a modified version of the normal fiber-channel character set in conjunction with forward error correction by means of a Reed-Solomon code (see figure). The Reed-Solomon encoding and decoding and the translations between the normal and modified character sets would be effected by logic circuitry external to the fiber-channel transmitter and receiver, which would be commercial off-the-shelf units.

The receiving end of the link could detect and correct errors at a rate as high as 4 million times per second, if necessary. The receiver detects uncorrectable double-byte errors. It has been estimated that uncorrectable-error rate would amount to one failure in about 10^{19} characters.

This work was done by Robert M. Cole and Jamie Bishop of Lockheed Martin Corp. for **Johnson Space Center**.

Title to this invention has been waived under the provisions of the National Aeronautics and Space Act {42 U.S.C. 2457(f)}, to Lockheed Martin Corp. Inquiries concerning licenses for its commercial development should be addressed to:

Lockheed Martin Systems Integration
1801 State Route 17C
Building 102
Owego, NY 13827-3998

Refer to MSC-23763, volume and number of this NASA Tech Briefs *issue, and the page number.*

Data-Analysis System for Entry, Descent, and Landing

NASA's Jet Propulsion Laboratory, Pasadena, California

A report describes the Entry Descent Landing Data Analysis (EDA), which is a system of signal-processing software and computer hardware for acquiring status data conveyed by multiple-frequency-shift-keying tone signals transmitted by a spacecraft during descent to the surface of a remote planet. The design of the EDA meets the challenge of processing weak, fluctuating signals that are Doppler-shifted by amounts that are only partly predictable. The software supports both real-time and post processing. The software performs fast-Fourier-transform integration, parallel frequency tracking with prediction, and mapping of detected tones to specific events. The use of backtrack and refinement parallel-processing threads helps to minimize data gaps. The design affords flexibility to enable division of a descent track into segments, within each of which the EDA is configured optimally for processing in the face of signal conditions and uncertainties. A dynamic-lock-state feature enables the detection of signals using minimum required computing power — less when signals are steadily detected, more when signals fluctuate. At present, the hardware comprises eight dual-processor personal-computer modules and a server. The hardware is modular, making it possible to increase computing power by adding computers.

This work was done by Timothy Pham, Christine Chang, Edgar Sartorius, Susan Finley, Leslie White, Polly Estabrook, and David Fort of Caltech for **NASA's Jet Propulsion Laboratory**. *Further information is contained in a TSP (see page 1).*

The software used in this innovation is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (818) 393-2827. Refer to NPO-41220.