more, the simulation environment allows the user to "single step" through its execution, pausing, and restarting at will. The system also provides for the introduction of simulated faults specific to Mars rover environments that cannot be replicated in other testbed platforms, to stress test the GNC flight algorithms under examination.

The software provides facilities to do these stress tests in ways that cannot be done in the real-time flight system testbeds, such as time-jumping (both forwards and backwards), and introduction of simulated actuator faults that would be difficult, expensive, and/or destructive to implement in the real-time testbeds. Actual flight-quality codes can be incorporated back into the development-test suite of GNC developers, closing the loop between the GNC developers and the flight software developers. The software provides fully automated scripting, allowing multiple tests to be run with varying parameters, without human supervision.

This work was done by Charles A. Vanelli, Jonathan F. Grinblat, Samuel W. Sirlin, and Sam Pfister of Caltech for NASA's Jet Propulsion Laboratory.

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-46288.

✿ Desktop Application Program To Simulate Cargo-Air-Drop Tests

Lyndon B. Johnson Space Center, Houston, Texas

The DSS Application is a computer program comprising a Windows version of the UNIX-based Decelerator System Simulation (DSS) coupled with an Excel front end. The DSS is an executable code that simulates the dynamics of air-dropped cargo from first motion in an aircraft through landing. The bare DSS is difficult to use; the front end makes it easy to use. All inputs to the DSS, control of execution of the DSS, and post-processing and plotting of outputs are handled in the front end. The front end is graphics-intensive.

The Excel software provides the graphical elements without need for additional programming. Categories of input parameters are divided into separate tabbed windows. Pop-up comments describe each parameter. An error-checking software component evaluates combinations of parameters and alerts the user if an error results. Case files can be created from inputs, making it possible to build cases from previous ones. Simulation output is plotted in 16 charts displayed on a separate worksheet, enabling plotting of multiple DSS cases with flight-test data. Variables assigned to each plot can be changed. Selected input parameters can be edited from the plot sheet for quick sensitivity studies.

This program was written by Peter Cuthbert of Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-24014-1

✿ Multimodal Friction Ignition Tester

## Responses of material specimens to vibrational friction in pressurized oxygen are recorded.

Marshall Space Flight Center, Alabama

The multimodal friction ignition tester (MFIT) is a testbed for experiments on the thermal and mechanical effects of friction on material specimens in pressurized, oxygen-rich atmospheres. In simplest terms, a test involves recording sensory data while rubbing two specimens against each other at a controlled normal force, with either a random stroke or a sinusoidal stroke having controlled amplitude and frequency. The term "multimodal" in the full name of the apparatus refers to a capability for imposing any combination of widely ranging values of the atmospheric pressure, atmospheric oxygen content, stroke length, stroke frequency, and normal force. The MFIT was designed especially for studying the tendency toward heating and combustion of nonmetallic composite materials and the fretting of metals subjected to dynamic (vibrational) friction forces in the presence of liquid oxygen or pressurized gaseous oxygen — test conditions approximating conditions expected to be encountered in proposed composite-material oxygen tanks aboard aircraft and spacecraft in flight.

The MFIT includes a stainless-steel pressure vessel capable of retaining the required test atmosphere. Mounted atop the vessel is a pneumatic cylinder containing a piston for exerting the specified normal force between the two specimens (see figure). Through a shaft seal, the piston shaft extends downward into the vessel. One of the specimens is mounted on a block, denoted the pres-
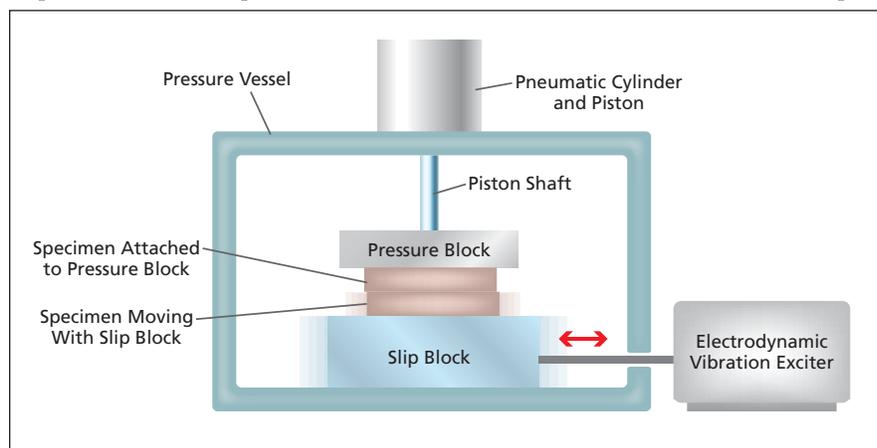
The **Pressure Vessel and Mechanisms** of the MFIT are depicted here in a simplified, partly schematic form emphasizing the basic principle of operation.