delity simulation while making it possible to rapidly change avionic displays and the underlying model algorithms. The pre-existing simulation programs are Shuttle Engineering Simulation, Shuttle Engineering Simulation II, Interactive Control and Docking Simulation, and Shuttle Mission Simulator playback.

The COTS program — Virtual Application Prototyping System (VAPS) — not only enables the development of displays but also makes it possible to move data about, capture and process events, and connect to a simulation. VAPS also enables the user to write code in the C or C++ programming language and compile that code into the end-product simulation software. As many as ten different avionic-upgrade ideas can be incorporated in a single compilation and, thus, tested in a single simulation run. CAPE can be run in conjunction with any or all of four simulations, each representing a different phase of a space-shuttle flight.

This program was written by Daniel Deger and Kenneth Hill of Johnson Space Center and Karsten E. Braaten of United Space Alliance. Further information is contained in a TSP (see page 1). MSC-23453-1/15-1

Simulating the Phoenix Landing Radar System

NASA's Jet Propulsion Laboratory, Pasadena, California

A computer program called "phxlrsim" simulates the behavior of the radar system used as an altimeter and velocimeter during the entry, descent, and landing phases of the Phoenix lander spacecraft. The simulation includes modeling of internal functions of the radar system, the spacecraft trajectory, and the terrain. The computational models incorporate representations of nonideal hardware effects in the radar system and effects of radar speckle (coherent scatter of radar signals from terrain).

This program was written by Curtis W. Chen of Caltech for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

This software is available for commercial licensing. Please contact Karina Edmonds of the California Institute of Technology at (626) 395-2322. Refer to NPO-44431.

Phoenix Mission Lander on Mars, artist's concept.

Injecting Artificial Memory Errors Into a Running Computer Program

NASA's Jet Propulsion Laboratory, Pasadena, California

Single-event upsets (SEUs) or "bitflips" are computer memory errors caused by radiation. BITFLIPS (Basic Instrumentation Tool for Fault Localized Injection of Probabilistic SEUs) is a computer program that deliberately injects SEUs into another computer program, while the latter is running, for the purpose of evaluating the fault tolerance of that program. BITFLIPS was written as a plug-in extension of the open-source Valgrind debugging and profiling software. BITFLIPS can inject SEUs into any program that can be run on the Linux operating system, without needing to modify the program's source code. Further, if access to the original program source code is available, BITFLIPS offers fine-grained control over exactly when and which areas of memory (as specified via program variables) will be subjected to SEUs.

The rate of injection of SEUs is controlled by specifying either a fault probability or a fault rate based on memory size and radiation exposure time, in units of SEUs per byte per second. BITFLIPS can also log each SEU that it injects and, if program source code is available, report the magnitude of effect of the SEU on a floating-point value or other program variable.

This program was written Benjamin J. Bornstein, Robert A. Granat, and Kiri L. Wagstaff 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-45368.