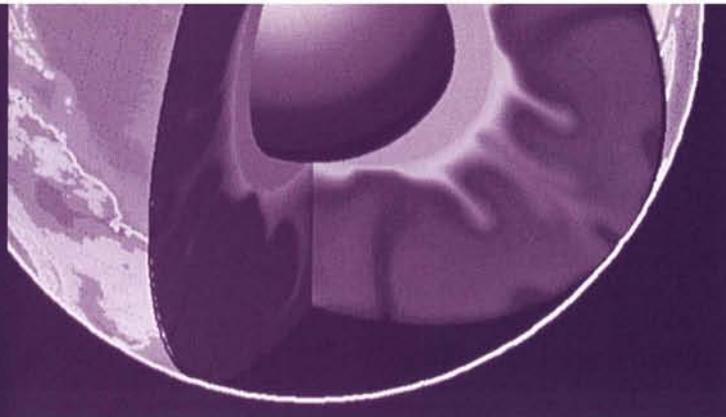


A Space Shuttle-derived information management system with broad potential for private industry applications leads a selection of spinoffs in the field of computer technology



**A**t current schedules, each of NASA's four Space Shuttle Orbiters must fly two or three times a year. On the surface, that might not seem much of a problem. But a little known part of the Space Shuttle story is the incredi-

bly complex process of preparing an Orbiter for its next mission.

Much of the work is accomplished in the Orbiter Processing Facility (OPF) at Kennedy Space Center. There technicians must repair the heat shielding tiles and other areas of the Orbiter's exterior damaged by reentry into the atmosphere; they must repair or replace on-board equipment that caused in-flight anomalies on the previous mission; payloads from the last mission must be removed, a task much more complex than it sounds; new payloads must be installed and integrated, demanding many modifications to the Orbiter; the crew module must be reconfigured for the new mission; and, in the final phase, every component of every system in the Orbiter must be thoroughly tested for individual function and complete system integrity.

All of that is only a skeletal summary of the demanding, intricate work that goes on at the OPF. One can get a general idea of the extraordinary effort involved by these statistics: the average "flow" — the complete cycle of refurbishing an Orbiter — requires the integration of approximately 10,000 work events, takes 65 days and some 40,000 technician labor hours.

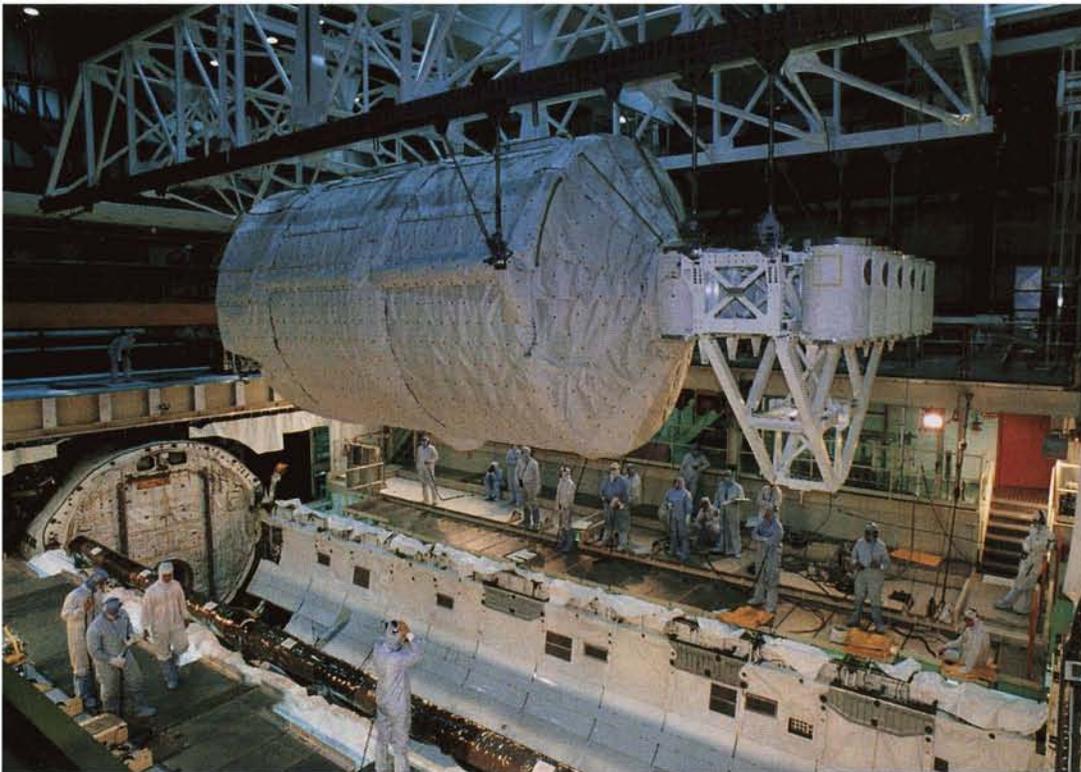
Under the best of conditions, scheduling each of the 10,000 work events in a single flow would be a task of monumental proportions. But the job is further complicated by the fact that only half the work is standard and predictable; the other half is composed of problem generated tasks and jobs specific to the next mission, which creates a highly dynamic processing environment and requires frequent rescheduling.

For all these difficulties, Kennedy Space Center and its prime contractor for Shuttle processing — Lockheed Space Operations Company (LSOC) — are doing an outstanding job of managing OPF operations. They have been helped in that regard by a number of processing innovations in recent years. One of the most important is the Ground Processing Scheduling System, or GPSS. The GPSS is a software system for enhancing efficiency by providing an automated scheduling tool that predicts conflicts between scheduled tasks, helps human schedulers resolve those conflicts, and searches for near-optimal schedules.

This unique system has helped streamline OPF scheduling. It also offers industrial benefits of substantial order and a commercial version of the software is now available to private industry through a newly-formed company known as Red Pepper Software Company, San Mateo, California.

GPSS is a cooperative development of Ames Research Center, Kennedy Space Center, LSOC and a related company, Lockheed Missiles and Space Company. It originated at Ames, where a group of computer scientists conducted basic research on the use of artificial intelligence techniques to automate the scheduling process. A product of that work was a software system for complex, multifaceted operations known as the Gerry scheduling engine.

Kennedy Space Center brought Ames and Lockheed together and the group formed an inter-center/NASA contractor partnership to transfer the technology of the Gerry scheduling



*At left, Kennedy Space Center technicians are preparing a Space Shuttle Orbiter for its next mission, an intricate task that requires scheduling 10,000 separate events over 65 days. A NASA-developed computer program automated the scheduling job and spawned a commercial spinoff, demonstrated (below) by Monte Zweben, president of Red Pepper Software Company.*

engine to the Space Shuttle program. The transfer was successfully accomplished and GPSS has become the accepted general purpose scheduling tool for OPF operations.

The Space Shuttle Ground Processing Project was managed for NASA by Monte Zweben, who had designed and developed several planning and scheduling systems while serving as a deputy branch chief at Ames Research Center. In January 1993, Zweben left Ames and, with finance expert Daniel T. Doles, founded Red Pepper Software Company (RPS). In August of that year, Red Pepper received a license from NASA to commercialize the GPSS system.

The RPS software systems derived from the Shuttle scheduling technology are called ResponseAgent™ products. ResponseAgents, company literature says, “are a new kind of software, providing users with an intelligent assistant to constantly monitor manufacturing variables, report issues and develop optimized solutions to complex problems. The products start with the fundamental objective of satisfying customer demand, then optimize materials, capacity and labor in real time to meet the objective.” ResponseAgents are designed to complement existing transactional and shop control systems.

Red Pepper’s initial product line includes three systems: the Enterprise ResponseAgent, which is designed to integrate the worldwide factories and distribution centers of large companies into one cohesive manufacturing enterprise; the Production ResponseAgent, offering integrated planning and scheduling for production facilities; and the Distribution ResponseAgent, which does the same for distribution centers.

RPS emphasizes real-time responsiveness in the modern manufacturing environment as a primary benefit of its products. Says the company: “In the past, manufacturers could develop a monthly plan and execute. Today, the market requires the flexibility and responsiveness to

deal with real-time unpredictability while still satisfying customer requirements. This level of responsiveness requires a new approach to planning and scheduling, one that responds proactively to real-time change. ResponseAgents provide this new approach.”



™ResponseAgent is a trademark of Red Pepper Software Company.