

# Software Schedules Missions, Aids Project Management

## Originating Technology/NASA Contribution

NASA missions require advanced planning, scheduling, and management, and the Space Agency has worked extensively to develop the programs and software suites necessary to facilitate these complex missions. These enormously intricate undertakings have hundreds of active components that need constant management and monitoring. It is no surprise, then, that the software developed for these tasks is often applicable in other high-stress, complex environments, like in government or industrial settings.

NASA work over the past few years has resulted in a handful of new scheduling, knowledge-management, and research tools developed under contract with one of NASA's partners. These tools have the unique responsibility of supporting NASA missions, but they are also finding uses outside of the Space Program.

## Partnership

Knowledge-Based Systems Inc. (KBSI), of College Station, Texas, has worked with NASA on a handful of long-term **Small Business Innovation Research (SBIR)** contracts, which have ultimately allowed the company to develop several advanced technology solutions.

The first NASA SBIR contract was entered into with Johnson Space Center to create the Knowledge Aided Mission Planning System, or KAMPS, software for modeling and analyzing mission planning activities, simulating behavior and, using a unique constraint propagation mechanism, updating plans with each change in mission planning activities.

This successful NASA project led to another SBIR contract, this time with Kennedy Space Center, through which KBSI created another software solution, this one named the Optimization Modeling Assistant, or OMA, a set of tools to enable project managers to formulate optimization models—intelligent decisions made using

a ranked system of prioritized choices. The various decision-making programs developed by KBSI under these research projects with NASA have spun off into U.S. Air Force applications, have entered the commercial sector under the name of WorkSim, and have also been reintegrated into NASA programs where they have been used to model shuttle flows.

A third SBIR, again with Kennedy, resulted in the development of yet another software, this one a Web-based product, called the Portfolio Analysis Tool, or PAT, which allows teams of managers on the same project to

make strategic investment decisions. This tool is currently in use by NASA, the U.S. Air Force, and the U.S. Army.

Yet another SBIR with Kennedy allowed KBSI to create the Range Process Simulation Tool (RPST), which is now in use by the U.S. Army Black Hawk Fleet for operational performance.

The company also created the Toolkit for Enabling Adaptive Modeling and Simulation (TEAMS), through another Kennedy SBIR, which later, through a Phase III contract, evolved into the TEAMS+, a real-time operational analysis software that helps develop, maintain,



Knowledge-Based Systems Inc.'s AIOXFinder is an ideal search engine for sharing information in multisystem computer application environments.

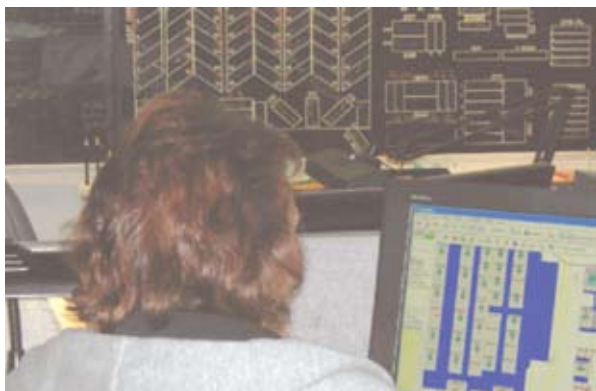
and reconfigure operations analysis models and is the most recent commercialized product to have come out of KBSI's long history of NASA involvement, which includes years of working on NASA contracts since the company's founding in 1988.

United Space Alliance, one of the world's leading space operations companies, based near Johnson Space Center in Houston, is now using TEAMS for space shuttle ground processing to support operations analysis, planning, and scheduling. The program provides operations modeling and analysis for space transportation systems. According to Dr. Perakath Benjamin, KBSI vice president, the SBIR program has helped the company build and deploy advanced technology solutions that are benefiting NASA, the U.S. Department of Defense, and private industry.

## Product Outcome

Three specific commercial products that KBSI developed trace their roots directly back to the work with NASA: WorkSim, Model Mosaic, and AIOXFinder.

WorkSim is a resource-constrained daily work-dispatching tool that generates optimized, daily schedules. It helps agencies streamline and speed their



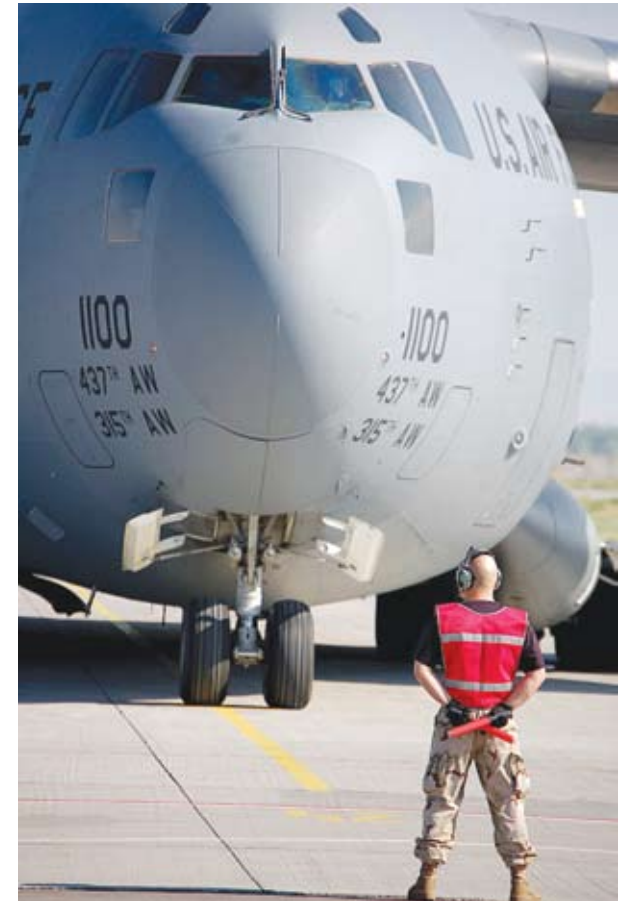
Through partnering with NASA, Knowledge-Based Systems Inc. developed several advanced technology solutions that are aiding space missions and industry.

planning and scheduling and assists in the routine management of workflow and personnel, and its schedules can be generated in either Microsoft Excel or Project.

Model Mosaic is a knowledge-management work kit, much of which was developed through foundational work at Johnson Space Center. This software, while still under development, is based on the IDEF5 ontology description capture method that was developed by KBSI and is a government standard for object-oriented modeling. It allows users to extract the essential nature of concepts in the ontology domain and to document, in a structured manner, the behavior of entity relations in terms of the sanctioned inferences that can be made with them. The Model Mosaic toolkit includes an ontology management component that allows users to archive and, over time, to develop collections of ontologies that can be selectively analyzed, compared, pruned, and combined for use in novel systems development efforts. The Model Mosaic software also provides import and export capability to other popular ontology modeling languages like OWL and UML, and is plug-compatible with other OWL-based ontology editors.

AIOXFinder is an ontology-driven integration framework (ODIF), a type of search engine that is ideal for knowledge sharing and communication in large military enterprises or in multisystem computer application environments. The software refines a user's search according to that user's profile, or ontology, making it easier for researchers to weed out non-applicable hits in databases or through Internet searching. It is a document-centric, semantics-driven search engine, using text mining and natural language analysis to fine-tune search results. It is currently being tested by the U.S. Air Force at Cape Canaveral. ❖

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The company has been able to apply the work it has done with NASA to several U.S. Air Force projects.