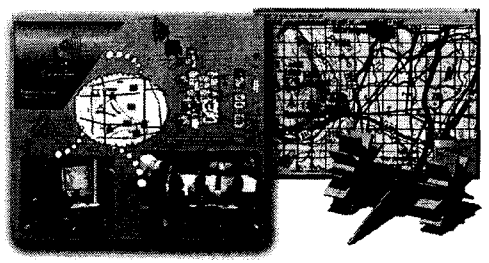
Experienced, Highly Trained Staff

Staff members of the Modeling and Simulation Technologies Group have an average of 20 years experience, >60% with advanced degrees, and impressive breadth and depth of domain expertise spanning a wide range of engineering and science disciplines such as computer science, mathematics, aerospace engineering, physics, electrical engineering, mechanical engineering, military systems, military operations and economics.

The group has both software and modeling expertise, which enables us to provide full support for software simulations on NASA, DoD or industry partner projects. For fast and reliable implementations, we also provide pre-built frameworks that can be used to get projects implemented quickly.

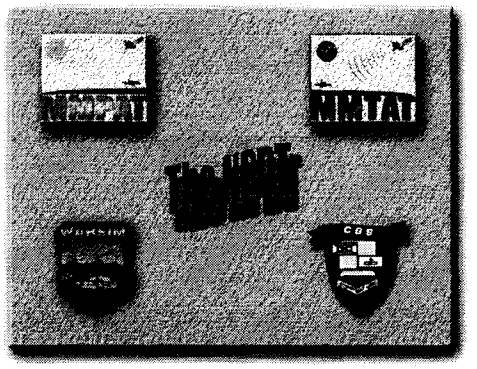
The Corps Battle Simulation (CBS) software we develop is used to train all senior U.S. Army commanders and their staffs. We also have extensive experience in developing space vehicle performance and resource analysis tools for flight projects, and in setting up concurrent design environments for distributed problem solving sessions. The group also hosts an annual New Design Paradigms Workshop chaired by Dr. Knut Oxnevad (http://NewDesignParadigms.jpl.nasa.gov).



Our Mission:

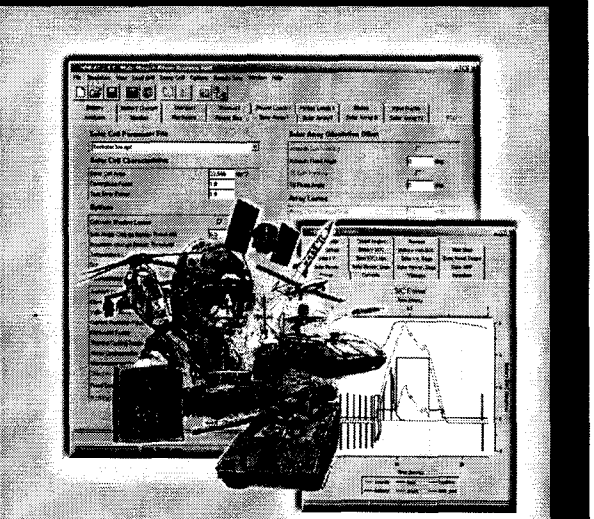
To provide state-of-the-art modeling and simulation development and consulting services to both NASA and non-NASA customers.

To design, develop and deliver first-of-a-kind simulation systems for use in projects of national importance, which by nature of their complexity, require innovative modeling approaches.



Comments or Questions about the Group:
Please contact Mark Kordon at
Mark.A.Kordon@jpl.nasa.gov
Phone: (818) 393-0476

NASA Jet Propulsion Laboratory
California Institute of Technology



The Modeling and Simulation Technologies Group

at the
Jet Propulsion Laboratory

Providing modeling and simulation solutions to both NASA and non-NASA customers for over twenty years

MODELING AND SIMULATION DEVELOPMENT SERVICES

MODELING AND SIMULATION TECHNOLOGIES GROUP

OVERVIEW

The Modeling and Simulation Technologies (MST) Group provides research, development, consulting and training to both NASA and non-NASA customers in the field of modeling and simulation. The group provides a full range of modeling and simulation services such as mathematical model consulting and development, simulation software design and implementation as well as consulting and development of state-of-the-art concurrent analysis, simulation, and design environments utilizing high-end commercial-off-the-shelf simulations.

Current and completed tasks include development of a large-scale, integrated, real-time military training simulation; development of multi-mission space vehicle performance and resource analysis tools; organizing concurrent design sessions for the study of future Mars rovers and the development of a Monte Carlo Bayesian simulation of military operations for course of action decision making. Software has been developed as a stand-alone application, linkable libraries or as part of a distributed simulation on the VAX/VMS, Sun Solaris, PC Linux and PC Windows platforms using a wide variety of programming languages.

REAL-TIME TRAINING SIMULATIONS

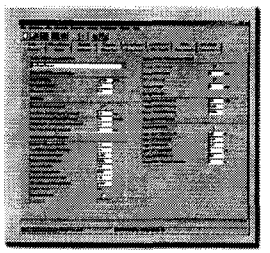
The Modeling and Simulation Technologies Group at JPL has been developing real-time training simulations for the U.S. Army for over two decades. The largest simulation developed by the group is the Corps Battle Simulation (CBS). CBS is the premier Corps / Division-level training and simulation system for the U.S. Army, and is used to train commanders worldwide. It is also the principal element of the Aggregate Level Simulation Protocol (ALSP) Confederation, a worldwide linkage of training simulations for the Army, Air Force, Navy, and Marines.

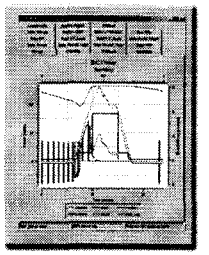
In the stand-alone mode, CBS provides support to Army staffs down to brigade and battalion levels and Air Force staffs to ATOC/TOCC levels. Existing CBS terrain databases cover the Korean peninsula, Southwest Asia, Central America, Central Europe, Northern Africa, and other areas of the world. Unit databases are available for most U.S. and many allied forces. The CBS simulation is used at all Army Corps headquarters, all Army Division headquarters, and other sites in Europe and Korea. In addition, both the National Simulation Center at Fort Leavenworth, Kansas, and the Joint Warfighting Center at Fort Monroe, Virginia, operate full CBS simulation centers.

As a member of the ALSP confederation, CBS provides the simulation of ground combat for all ALSP confederated military training exercises.

SPACE VEHICLE SUBSYSTEM SIMULATIONS

The Multi-Mission Subsystem Analysis Tools provide a robust, variable fidelity solution to space vehicle trade studies and performance analysis in packages that are easy-to-use, easy-to-integrate, and provide fast, accurate results at a level of fidelity appropriate to each stage of the project lifecycle.



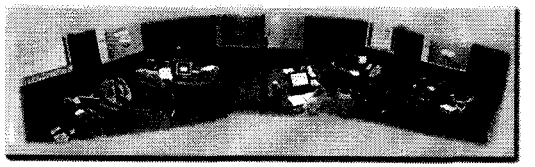


Each tool models a particular space vehicle subsystem, such as power or telecom, and is able to support a wide variety of space mission types, phases and hardware configurations. They can be used as a stand-alone application, as part of an integrated simulation environment or in a distributed simulation. These tools have been developed by a JPL-wide collaboration of engineers and are currently being used on the Deep Impact, Mars Exploration Rover and Mars Reconnaissance Orbiter flight projects.

Future work on these tools will focus on the utilization of evolutionary computing for subsystem design search and optimization, employing a multi-agent system to perform trade studies for the entire space vehicle and the use of detailed space vehicle designs in mission trade studies.

CONCURRENT DESIGN CONSULTING

The Modeling and Simulation Technologies Group provides research, development, consulting and training on state-of-the-art concurrent design approaches, processes, environments, and tools for the entire lifecycle of any design/development process. Our concurrent design approach, based upon the "Eight Principles of Concurrent Design", emphasizes a total systems approach, high number of trades, in-depth analysis and features multi-disciplinary design teams, and interconnected high-end analysis, design, and simulation tools. It has been used successfully on a wide variety of payloads; orbits, landers, rover, and Sub Sea probe analysis and design problems.



Consultation can include setting up, training and implementing a new concurrent design team for a project or organization. The team usually takes the form of a Next Generation Project Development Team (NPDT) that utilizes a distributed problem solving approach where each member has the responsibility for some aspect of the problem. Team members can be provided by the customer or formed from previous teams. Facilities and equipment can be provided by the customer or by one of the JPL design facilities.

Research topics in this area include better use of commercial-off-the-shelf computational fluid dynamics (CFD), immersive of 3D (VR) simulations and virtual testing technologies.

MODELING AND SIMULATION CONSULTING SERVICES