Satellites of the future are getting smaller. Scientists at GTRI have helped the U.S. Air Force Research Laboratory (AFRL) determine that deployment of clusters of microsatellites, orbiting in formation and electronically networked to act as a single large radar-antenna aperture, is a concept with merit. Engineers have completed three years of modeling, simulation, and signal processing studies for the ground-based, moving target indication mission of the TechSat 21 program. Now, GTRI researchers are helping the AFRL plan experiments for a trio of microsatellites they plan to launch in 2006. The benefits of microsatellites over conventional hardware include inherent redundancy, multi-mission capability, and significantly lower cost because of mass production.

This artist's rendering represents the U.S. Air Force Research Laboratory's proposed TechSat 21 microsatellite configuration. A virtual antenna array, composed of multiple satellites sharing information, could aid military maneuvers worldwide. Engineers at GTRI have studied the concept—along with other research teams elsewhere—and have concluded that it has merit.
Probing Microwave Scatter

Controlling microwave scatter is an essential function of modern defense platforms. Yet, the physical variables affecting scatter are often poorly characterized, especially when designs include realistic manufacturing and materials.

With support from the U.S. Office of Naval Research, GTRI scientists have developed new, cost-effective measurement techniques for studying microwave scatter from inhomogeneous structures and materials. Combining a focused microwave beam with near-field holography to probe both radiating and non-radiating fields, the researchers are gaining further insight into electromagnetic scattering and developing a tool for microwave signature diagnosis.

A focused microwave beam and near-field holography are key to developing cost-effective, near-field measurement techniques for inhomogeneous structures and materials. Research Engineer Ed Hopkins aligns the microwave probe to the sample.

Decision Support Systems for the U.S. Navy

Each year, the U.S. Navy and Marines deploy RQ-2 Pioneer Unmanned Aerial Vehicle (UAV) systems to remote locations. These detachments may deploy for weeks or months at a time, and they require large volumes of information, including operation and maintenance technical manuals.

Working with the UAV Fleet Support Team at Patuxent River, Maryland, GTRI engineers have developed a Web-based information management and UAV Maintainer’s Performance Support System (UMEPSS) that will be integrated and tested at the RQ-2 training command at the outlying field in Choctaw, Florida.

Once the system is tested, evaluated, and fully fielded, maintenance and operation personnel will be able to log on through a Web portal and access nearly all the necessary information to operate and sustain the UAV systems. Users will receive automatic downloads of the most current RQ-2 technical manuals and will have laptop computer (or portable electronic display device) access to refresher training, shift pass-down information, and enhanced testing and troubleshooting techniques.

The integrated Web/UMEPSS system will result in improved UAV system readiness and allow fleet users to make better, quicker decisions about how to proceed, even when they are in the middle of nowhere.
Modern military training exercises are designed to simulate real-life battle situations. However, further testing is necessary to determine how realistic and/or effective these training exercises are.

In settings varying from swampy coasts to desert encampments, U.S. military commanders rely on an innovative, GTRI-designed and distributed system, Realistic Operational Communications Scenarios (ROCS), to test and evaluate advanced tactical systems, operations, and equipment, such as amphibious assault vehicles. Designed with an open, modular architecture, ROCS is scaleable and extendable. It can grow and change with different military units’ testing, evaluation, and training needs.