Submitted to:

United States Department of Labor
Mine Safety and Health Administration

Proposal for:

Underground Mine Rescue
Equipment and Technology

Submitted by:

March 24, 2006

AB44-COMM-62

March 24, 2005

Mr. Robert Stone
Office of Standards, Regulations, and Variances
Mine Safety and Health Administration (MSHA)
1100 Wilson Boulevard, Room 2313
Arlington, VA 22209-3939

> Re: Underground Mine Rescue
> Equipment and Technology MSHA
> RIN 1219-AB44

Mr. Stone:

GeoDecisions is pleased to respond to the Request for Information (RFI) by the Mine Safety and Health Administration (MSHA) regarding new technologies to improve the safety of underground miners. The Director of Safety from a well-known coal mining company based in St. Louis and a senior member of the West Virginia Board of Coal Mine Health and Safety encouraged GeoDecisions to submit its SCOUT technology for MSHA's consideration. After learning about SCOUT, both of these individuals quickly grasped the concept of directly applying our hostage-rescue technology to the problem of rescuing trapped miners.

Please note that we have intentionally deviated from MSHA's prescribed format for our RFI response because our proposed technology suggests a more systemic solution across the mining industry rather than focusing on hardware or equipment.

GeoDecisions, a division of Gannett Fleming Engineers and Architects, is fully committed to helping MSHA achieve ways to increase miners' safety prior to, and following, an accident. We believe that our firm is highly qualified to serve the mining industry for the following three primary reasons. First, as one of the largest firms specializing in geographic information systems (GIS) technology and mapping, we have a proven track record of delivering mission-critical systems in the industries that we serve, including, homeland security, law enforcement, government, military, mining, petroleum, and insurance customers. Secondly, we have already developed a system called SCOUT to support first responders in critical incident planning and response. SCOUT is a GIS-based system specifically designed to map the exterior and interior of facilities and to provide detailed information to first responders during rescue missions. Thirdly, we have carefully assembled a team of experts, comprised of GeoDecisions' top-level staff, who are capable of working with MSHA and the mining industry to implement our technology on a broad scale.

- Generating Intelligent Solutions -

GeoDecisions would welcome the opportunity to demonstrate our SCOUT technology and we are certain that the resulting system will exceed your expectations for thoroughness, robustness, and effectiveness. We believe that our proposal will capture your attention and focus this attention favorably on our technologies. GeoDecisions looks forward to serving you on this important initiative. If you have any questions or need further information, please contact me at (314) 770-9090 ext. 3180 or through e-mail at dhosking@geodecisions.com.

Sincerely,

GEODECISIONS
A DIVISION OF GANNETT FLEMING, INC.

David J. Hosking
Vice President of GeoDecisions

DJH/amc

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Executive Summary

GeoDecisions is pleased to submit a response to the Mine Safety and Health Administration (MSHA) Request for Information (RFI) for Underground Mine Rescue Equipment and Technology. It is understood that MSHA is seeking new ideas and methods, and non-traditional technologies, which may serve to maximize mine rescue responses and miner survivability in the wake of mine accidents. GeoDecisions has developed a suite of software systems for law enforcement, military, and homeland security agencies, and we believe that these solutions can be applied in a novel manner to improve the safety of mining operations. Accordingly, the following proposal to MSHA is predicated on the idea of leveraging a mine's traditional mapping and engineering data by migrating those data into our commercial off-the-shelf software products to support mine rescue operations.

GeoDecisions is a full-service information technology (IT) company specializing in geographic information systems (GIS). Our company's mission is to help our customers harness the power of location-based information for decision-making. We are experts in digital mapping, database design, software development, and data capture for a broad range of customers, including the military, law enforcement, and mining, transportation, and government agencies. We provide consulting, software development, data integration, and data collection services to government and private sector customers. Our clients include Arch Coal, Ohio Geological Survey, Boeing, Department of Homeland Security, United States Transportation Command (Intelligence Directorate), various state and local law enforcement agencies, SBC Corporation, and many of the country's state transportation agencies. For example, GeoDecisions was contracted by the Ohio Department of Natural Resources (DNR) to develop its Abandoned Underground Mine (AUM) GIS. The project integrated all disparate data sources into a single data warehouse, and included applications for AUM GIS and Overburden Calculations.

GeoDecisions has developed and implemented several GIS-based technologies for the military, law enforcement, and homeland security. We are confident that two of our technologies can be easily applied to the mining industry to vastly improve the safety of mining operations. These two systems are SCOUT and IRRIS.

1) SCOUT is a mobile "intelligent" mapping system designed to protect people and critical infrastructure during crises such as rescue missions, terrorist attacks, and natural or man-made disasters. SCOUT's mapping software provides first-responders with rapid access to accurate, highly detailed, digital floor plans of the interior of buildings. Also, SCOUT's underlying intelligent database gives access to the inventory of each room's contents. Features such as doors, windows, electrical/mechanical equipment, safety equipment, and hazardous materials, are illustrated on the digital floor plans and are described in detail within the linked database. Additionally, because SCOUT is based on GIS technology, the system also integrates exterior mapping data, including aerial photography, topographical maps, vegetation cover, land ownership, road access, and global positioning system (GPS) positions of assets for the entire mine site.

2) IRRIS is GeoDecisions' patented technology developed for the U.S. military to track, coordinate, and manage sensitive shipments through an interactive mapping interface. Based on a simple Web browser, IRRIS is a real-time, GPS-based GIS that provides up-to-date information about vehicle locations, shipment status, road conditions, weather conditions, and a vast range of other decision-support information. The application was used extensively for the Iraq war, and to coordinate military logistics during the 2005 Hurricane Katrina disaster recovery efforts.

In 2001, GeoDecisions recognized a rising demand at all levels of military and law enforcement for the specialized and expanded services of our core GIS business. In response, we leveraged our skill sets, client base, and experience within the expanding market to focus on the domain of public safety and law enforcement, domestic and international anti-terrorism, and natural or man-made disasters. The result was the development of SCOUT.

SCOUT was originally designed as a tactical response management system to aid in the rescue of hostages inside a building. We believe that SCOUT's original design purpose, along with its accurate location-based information, can be extrapolated to serve mine rescue operations very well. SCOUT would provide a digital model of a mine site, thereby enabling rescuers to virtually "see" inside an underground mine and gain rapid access to a database of its physical attributes. SCOUT would provide unprecedented levels of location-based information to mine rescue personnel by co-locating belowground and aboveground information within a common geographical reference framework.   SCOUT is ideally suited for mine rescue operations by providing the following capabilities to mine operators and emergency response personnel:

- Response Planning and Preparedness
- Detection and Communication
- Response and Mitigation
- Post-mission incident Evaluation and Training.

Our response to MSHA's RFI is centered mainly on our SCOUT technology; however, we would also like to suggest that our IRRIS system may, in certain circumstances, also enhance mine rescue operations by enabling rescue teams to track, in real time, the transportation of specialized rescue equipment from any location in the world to the disaster site.

It is important to note that GeoDecisions does not just provide SCOUT software. We are also highly skilled in compiling the data needed by SCOUT to build the virtual model of a facility, such as a mine. Our staff is experienced in conducting site-surveys, converting computer-aided drafting (CAD) blueprints and maps, and in other data collection processes. In fact, the comprehensive data needed to operate SCOUT effectively is equally, if not more, important than the software itself. Our staff understands the nature of mapping and technical engineering data and possesses the skills needed to build SCOUT's underlying GIS database.
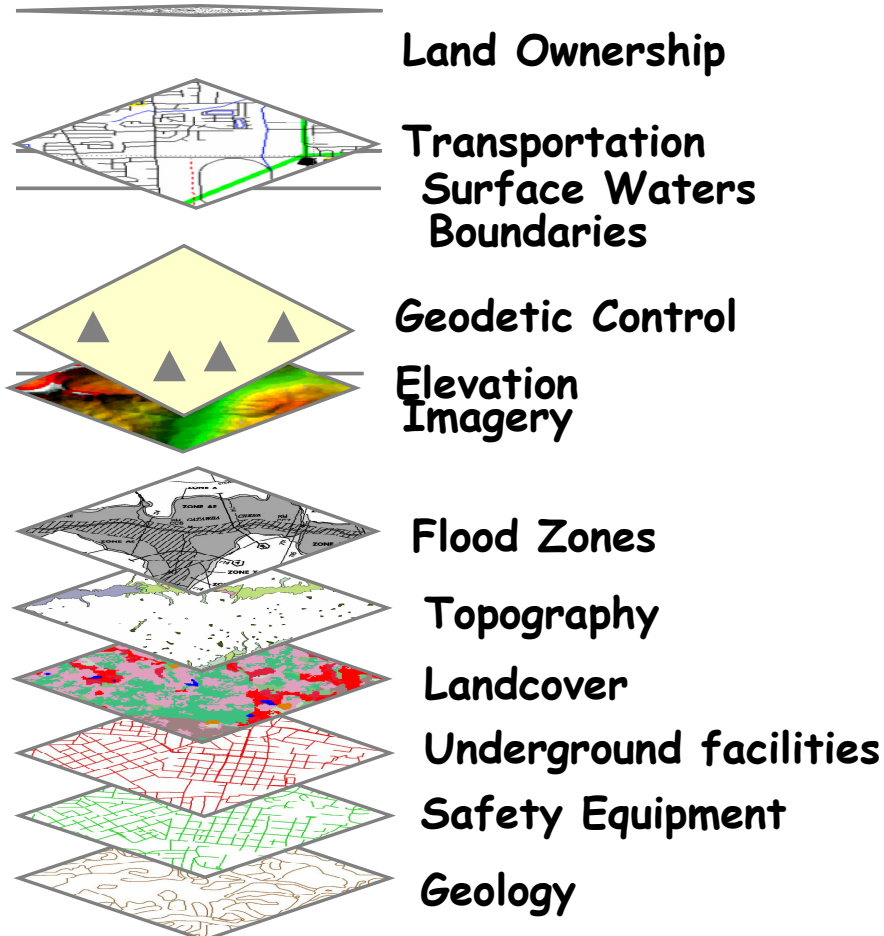
Suggestions for New Legislation

It is our opinion that new legislation should be implemented to require mine operators to apply GIS technology like SCOUT to map all underground mining operations. Even more important is legislation to make certain that the validity and timeliness of the GIS data meets new standards established by the legislation. Common data standards across the industry would be of critical importance. For example, we see a clear parallel between a legislated mandate to install and maintain fire extinguishers in a building and the mandate to install and maintain a GIS-based mapping system for every mine. Certainly, the legislation would have to address issues such as the frequency of data updates, but most mining operations keep their data up-to-date for production purposes (e.g. production statistics).

Enhancing Mine Rescue Operations with SCOUT

With the release of our SCOUT system, tactical response commanders, first-responders, and military assault teams now have the capability to pre-plan tactical response operations by pre-viewing the interior of at-risk buildings and their surrounding campus. Based on GIS technology, SCOUT is an enabling technology that provides unprecedented, detailed information to Tactical Response Teams (TRTs) about the interior and exterior of critical infrastructure. The effective use of SCOUT increases the probability of successful operations and provides enhanced protection for response personnel.

SCOUT is based on GIS technology. A GIS combines layers of spatial information to support analyses that simply cannot be achieved with traditional paper maps or CAD systems. Often referred to as "mapping software", a GIS links attributes and characteristics of an area to its geographic location. It is used in a variety of applications, including infrastructure management, urban planning, environmental modeling, vehicle tracking, transportation logistics, and map making.

GIS Information Layers

Land Ownership

Transportation
Surface Waters
Boundaries

Geodetic Control

Elevation
Imagery

Flood Zones

Topography

Landcover

Underground facilities

Safety Equipment

Geology

Most mining operations have been employing CAD technology for years to create, organize, and maintain engineering maps and technical drawings of their mines and facilities. CAD systems, such as AutoCAD or MicroStation, are most commonly used, but the benefits of CAD technology are highly limited when compared to GIS technology. CAD systems are designed to manage drawings, whereas a GIS is designed to analyze and manage an organization's assets. To further contrast the two technologies, a GIS is often referred to as an "intelligent mapping system" as opposed to a "dumb" CAD system.

SCOUT will create an "intelligent" digital model of a mine's interior. For example, the model can depict the entire mine layout, including shaft locations, and illustrate the location of:

- Up-to-date locations of daily mining activities
- Escape routes
- Mining crews
- Safety equipment (breathing, first-aid, rescue pods)
- Hazardous equipment
- Fresh air and communication shafts
- Communications and video equipment
- Pumps and other machinery.

By accurately and instantly knowing where all these and other important items are located within a mine, both miners and rescue personnel stand a greater chance of success following an accident.

For example, following an underground explosion, miners may find themselves trapped inside a mine. Traditionally, rescue crews spend a considerable amount of valuable time trying to locate and retrieve engineering drawings and mine maps to help them plan the rescue operations. These paper-based maps are often out of date; but even more important is the fact that the maps and drawings cannot be easily integrated with other crucial decision-support information.

With SCOUT's GIS foundation, the location of the trapped miners, along with knowledge of their access to safety equipment, would be known with a greater degree of certainty than without SCOUT. Instant access to other critical information would enable rescue teams to quickly formulate their rescue plans. Additionally, aboveground rescue crews may plan to drill a rescue shaft from the surface, hoping to reach the miners in time. With SCOUT's ability to correlate normally disparate data layers, rescue crews may quickly evaluate the optimum location to drill the shaft. Moreover, they could quickly determine if road access exists to the desired drilling spot and whether or not a drill rig can actually reach the spot. With SCOUT, the rescue crews can quickly determine if the slope and vegetation cover would allow a drill rig to reach the desired spot.

Enhancing Mine Rescue Operations with IRRIS

Following an underground accident, IRRIS can track specialized mine-rescue equipment that must be shipped from distant locations to the disaster site. For example, we understand that jet engines have been used to inert underground fires, but that only two of these engines are available to the mining industry, one in Pittsburgh and the other in Holland. With IRRIS, rescue personnel can track the progress of these shipments in real-time from the moment they leave to the moment they arrive on-site. IRRIS can track shipments by air, truck or rail, and it can dynamically calculate the optimum route and arrival time for those shipments. If bad weather or traffic conditions threaten to delay a shipment, IRRIS can be used to communicate re-routing instructions back to the driver. With IRRIS, rescue personnel will know with precision when, and if, the equipment will arrive as needed. Please visit www.irris.com for more detailed information.

Overview of SCOUT

SCOUT is a mobile Command and Control software application designed to support first responders during crises such as hostage-rescue missions, terrorist actions, and HazMat accidents that occur within critical infrastructure. These include schools, power plants, gas plants, courthouses, embassies, capitol buildings, water treatment plants, public arenas, sports complexes, airports, subways, telecommunication centers, and urban warfare training facilities.

Based on GIS technology, SCOUT is an enabling technology that provides unprecedented, detailed information to TRTs first-responders about the interior and exterior of critical infrastructure. The effective use of SCOUT also increases the probability of successful rescue operations and provides enhanced protection for response personnel.

The basic purpose behind SCOUT is to enable the tactical commander responding to a crisis to retrieve, display, and analyze valuable data either on a laptop in the field or within a command post. The commander can then use the tool as a detailed and interactive map to guide all tactical operations.

SCOUT uses powerful GIS, relational database, and digital mapping technologies that allow the user to efficiently visualize the exact layout of the exterior and interior of buildings. SCOUT is an application that integrates:

- Aerial photography.
- Digital floor plans of each building.
- Video surveillance cameras and wireless streaming video.
- Various types of alarm sensors.
- Still digital photos.
- 360° IPIX photography (appears as a rotating fish-eye lens) raster images (e.g., technical/engineering drawings, spec-sheets, DRGs).
- CAD drawings which are vector overlays of technical data for each building, including HVAC, plumbing, electrical wiring, fiber optic cabling, and similar assets.
- An underlying relational database containing detailed attributes of each room's physical assets, including but not limited to:
  - Safety equipment (fire extinguishers, defibrillators, decontamination)
  - Hazardous materials
  - Door composition and the direction of door openings
  - Hinge types
  - Window glass types
  - Occupant lists
  - Room phone numbers
  - Computer equipment

➢ Machinery.
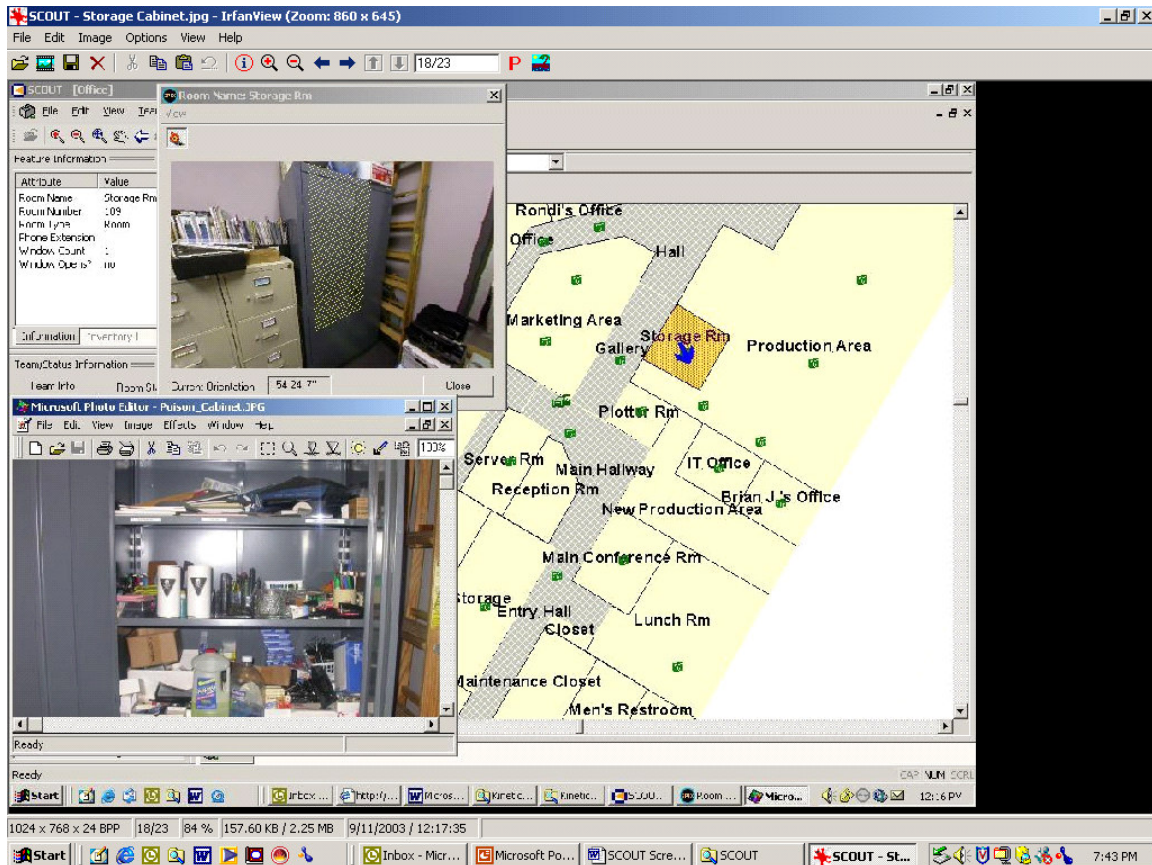
SCOUT also enables the tactical commander to track multiple response teams as they operate inside a building by monitoring two-way radio communications between the Tactical Commander and the first responders. With SCOUT, each tactical response team can make rapid decisions about rescue or response missions. The system stores, retrieves, displays, and records information about the building, its occupants, and its contents, and it also tracks the activities of first responders within the building. The system enables the commander to guide tactical teams by tracking rooms that have been cleared or secured, illustrating what each room looks like exactly, and then providing information about each room's physical assets. SCOUT also enables the user to view wireless or wired live-video images to see, in real-time, what is going on inside a room. During a crisis, SCOUT provides a high degree of intelligence to crucial decision-making even before a team enters the building, and it is immensely helpful to responders who are unfamiliar with the building.

Safety professionals frequently view the safeguarding or protection of people or infrastructure as a progressive series of events. SCOUT is a useful tool for each of these events or activities, as described on the following pages.

Response Planning and Preparedness

Certain facilities are considered to be a likely target for accidents, criminals, and terrorists, as well as being settings with a high probability for problems such as accidental chemical, biological, or radiological dispersion. Therefore, it is imperative to undertake advance planning for responding to crises in those facilities and preventing the criminal objectives from being accomplished.

Crisis response planning and emergency preparedness are activities that have become extremely important in the minds of public officials in light of growing concerns for the security of our homeland. SCOUT serves well as the core technology in support of an effective and comprehensive emergency response plan. The system consolidates a wide range of graphical and text-based information that would normally be found in separate documents or repositories, and which generally are difficult to obtain in a timely manner when crises erupt.

Detection and Communications

GeoDecisions has teamed with other companies to integrate their video surveillance and alarm equipment within SCOUT. When motion, a change in temperature or humidity, vibration, or the tripping of an alarm triggers a sensor within a building, a live video feed can be launched and directly displayed on the SCOUT screen.

Response and Mitigation

During a crisis where a team of first responders is required, SCOUT can focus a significant degree of intelligence on the crucial decision-making process before and after responders enter a building. The system then continues to be a valuable guide as the team proceeds within the facility.

SCOUT can speed response times. It can replace guesswork with facts and provide a margin of predictability and safety. SCOUT can help first responders make judgments, compute probabilities of critical circumstances, and help structure more synchronized teamwork. SCOUT can help first responders understand the building's layout, often as well or better than the perpetrators. SCOUT is an invaluable tool that could easily help to save the lives of those involved – innocent victims, bystanders, police personnel, and offenders.

Regarding the deaths and injuries in the Columbine school shootings, for example, it is understood that the police may have lost valuable time using outdated blueprints and information. If SCOUT had been available in such a setting, it may have provided the responders and on-site commanders with instantaneous, current data and afforded critical insight.

The subject-matter expert who helped GeoDecisions to design SCOUT is a retired, former Tactical Commander for the Illinois State Police. During his more than 30 year career in law enforcement, he negotiated nearly 200 hostage situations, and

directed many TRTs during a variety of mission scenarios. Consequently, the system has been tailored to provide knowledge that is crucial to the effectiveness and safety of law enforcement personnel, and to the successful outcome of operational missions.

Post-mission Evaluation and Training

The technology lends itself well to debriefing and follow-up analyses. With a very high degree of specificity, SCOUT can help officials chart the overall encounter and the sequence of events. Police work performed after a crisis is often the best prevention or preparation for the next crisis situation.

One of the key functions of SCOUT is its ability to digitally record and date/time-stamp each and every mouse click or keystroke entered by the user. These recordings provide an excellent means to playback the entire mission, or selected parts of the mission, for training, post-mission evaluation of tactics, and even for presentations in a courtroom.

A brief Flash demo of SCOUT can be seen by visiting the Virtual Trade Show page on the Web site of the National Tactical Officers Association at www.ntoa.org. However, a more detailed Overview of SCOUT is provided at the end of this proposal.

SCOUT Hardware and Software Requirements

This section provides a quick review of the software and hardware requirements to support the SCOUT deployment.

SCOUT operates very well on a laptop computer (Pentium IV with 256MB of RAM, although more RAM is recommended). The required hard disk space obviously depends on the volume of underlying data needed to define each building, but we have designed the system to operate on minimal files sizes. The operating system is Microsoft Windows 2000 or Windows NT. At this time, the underlying database is MS SQL Server although, just as easily, SCOUT can incorporate other databases such as Oracle. The choice of the DBMS engine would depend on the need to handle large volumes of data for complex structures. It may also affect the way in which SCOUT is deployed, such as whether a laptop or a desktop is used. As an Oracle Business Partner and a Microsoft Developer, GeoDecisions is capable of supporting any preferred DBMS foundation.

Depending on customers' needs, we intend to support the use of SCOUT over a secure Internet connection. Our company is very experienced in Web-based mapping applications as evidenced by our SafeCity Web site; Web-enabling SCOUT is our next logical step.

iPIX 360° Camera and Imaging

The camera that we generally use to create the SCOUT photos is the Nikon 900 digital camera that is equipped with a 185° fish-eye lens. Pointed in one direction, the camera takes a photographic image radiating 185° outward from the lens' optical center. The camera is then turned in the opposite direction to acquire the next image. Using special software, we then digitally "stitch" the two images together, with the seam occurring at the area of common overlap. This process forms one entire 360° "spherical image."

The Nikon 900 generates up to a 4 MB pixel image. The photographic quality of the images is excellent although the iPIX viewing software tends to degenerate the image resolution somewhat. Nevertheless, the resulting images are more than suitable for most anticipated applications of SCOUT.

The same camera is also used to acquire normal digital photos using a standard lens.

Video Cameras

In addition to static IPIX and digital images, SCOUT is able to access live video feeds from digital cameras located inside or around the building. The locations of digital video cameras will be shown on the building floor plan as a video camera icon. When the user clicks on this icon, a window showing the live video feed will be

displayed, including controls to operate the camera (pan, tilt, and zoom) if the camera is so equipped.

Panoscan

In some cases, we anticipate that a few customers may require images of extreme resolution. An even more sophisticated piece of camera equipment is available. Panoscan is a digital scanner that acquires a 360° image in a single pass. These images do not require "seaming" or stitching. The details of the images are grain free and exceptional in their clarity. The images captured by the Panoscan can be viewed as a static panoramic picture or as a virtual reality movie with any number of compatible players such as Quick Time, Zoomify, HotMedia, Live Picture, and others. With this technology, images can be captured and viewed as fully interactive movies within seconds. SCOUT is capable of incorporating Panoscan images if required.

Data Capture for SCOUT

SCOUT is predicated on the integration of various types of geospatial data sets, including architectural blueprints, features, and characteristics of building interiors, photogrammetric imagery and derived planimetry, and CAD overlays.

In addition to developing and implementing GIS software, GeoDecisions has the skills and resources to convert building floor plans into digital format and to acquire building asset data. Our parent company Gannet Fleming is a premier consulting engineering company with extensive experience in architectural design, engineering, and construction. As such, we are also very skilled in working with building blueprints, aerial photography, IPIX photography, and raster imagery. GeoDecisions is highly skilled in capturing or converting a wide variety of CAD format data, including MicroStation, AutoCAD, and GDS. The technological underpinnings of SCOUT data sets are a natural extension of our firm's primary strengths.

Our field data collection staff is prepared to visit a customer's site anywhere in the world to acquire facility and infrastructure data, including floor plans, inventories of building assets, and photography. GeoDecisions does not directly provide photogrammetry services or acquire aerial photography, although we work very well with many professional aerial mapping firms in the U.S.

The St. Louis, MO office of GeoDecisions has substantial experience in capturing and georeferencing physical asset data. For example, over a period of 18 months, our company captured in vector form more than 1.2 million miles of the fiber-optic cable for SBC Corporation throughout the entire 13-state operational area. We then georeferenced the data to a GDT land base. Also, as a subcontractor to ESRI on a defense mapping project for the National GeoSpatial Intelligence Agency (NGA), we operated our facility in strict compliance to National Industrial Security Program Operating Manual (NISPOM) security standards, so we were able handle our customers' sensitive data with due care.

Sample SCOUT Project

The following screen shots were taken from our participation in the ant-terrorist training exercise with the Indiana National Guard. The training scenario was based on a Governors' convention held in the building toward the right center of the campus. Al Qaeda terrorists captured the facility and held everyone hostage in the Lobby/Lounge. They wired various areas within the building with explosives. The Indiana National Guard and the State Police TRTs responded to the threat.
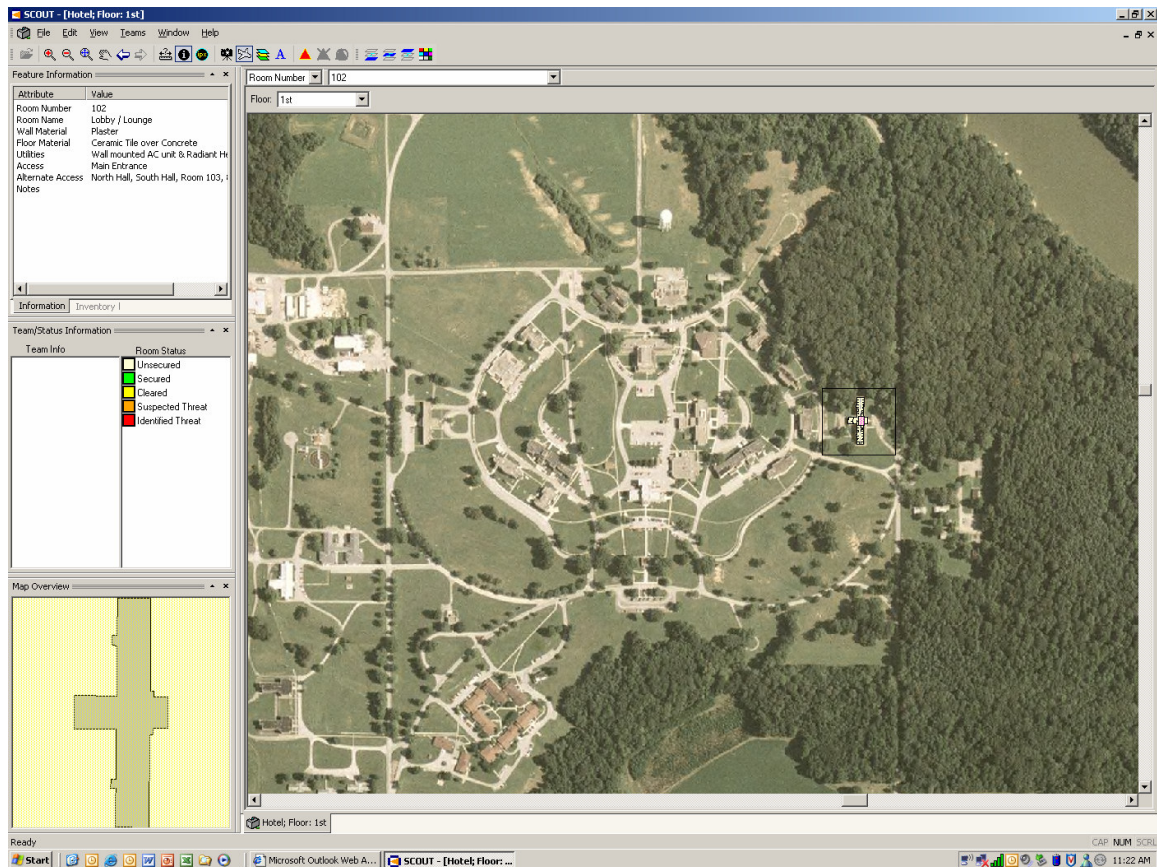

Above is the view of the campus at the Muscatatuck MOUT Training Facility operated by the Indiana National Guard.
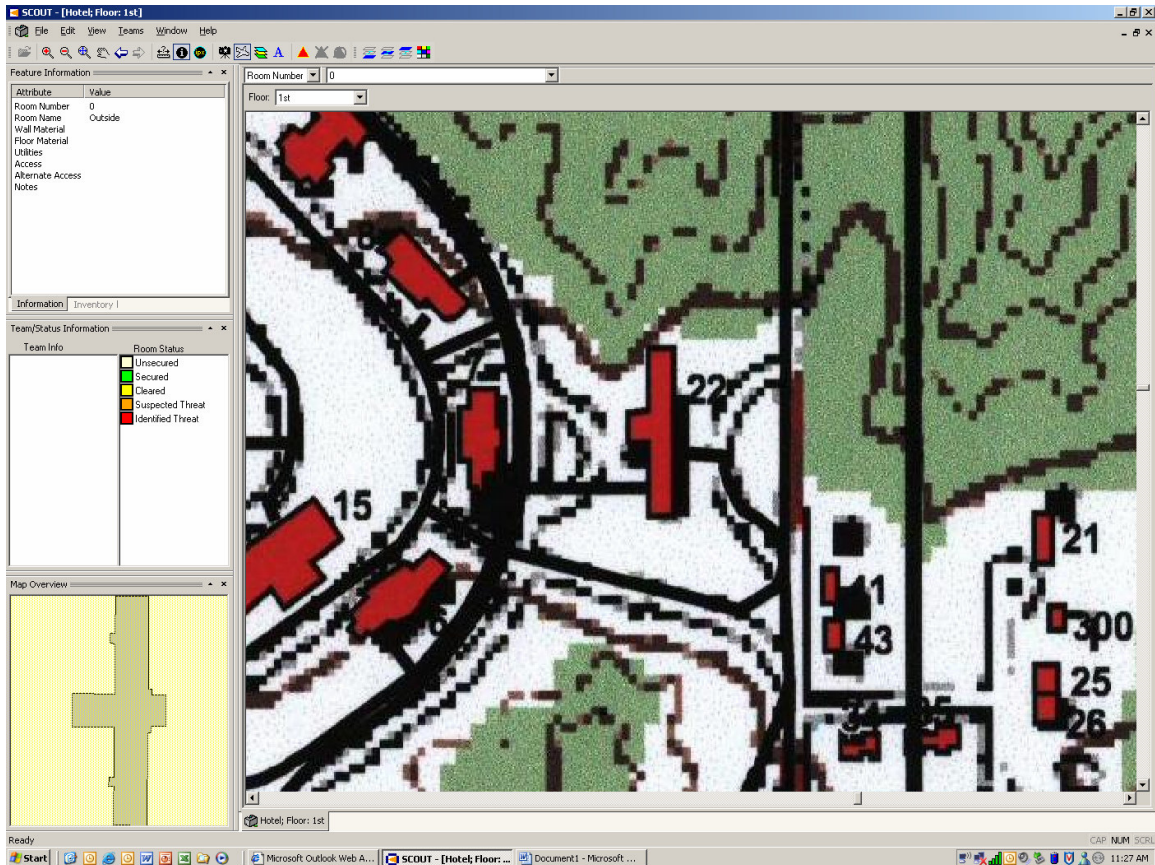
By turning on or off various georeferenced layers, SCOUT can illustrate an overlay of DRG USGS Quad Topo Map data. This is useful to gain an understanding of terrain relief from the elevation contours. Other data layers that can be georeferenced by SCOUT may include street centerlines, utilities, pre-defined inner/out perimeters, location of staging areas and decontamination sites, etc.
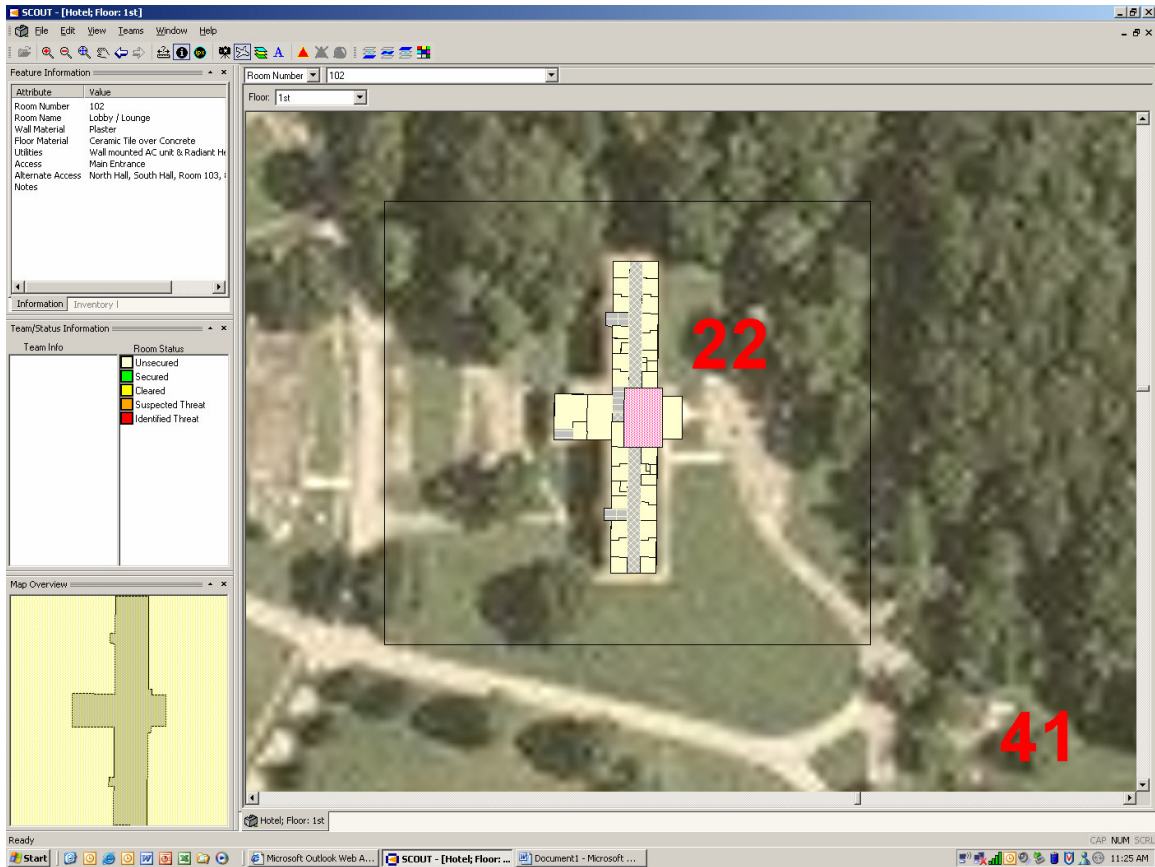
Above is the view of Building 22 where the anti-terrorism training was held in February 2005.
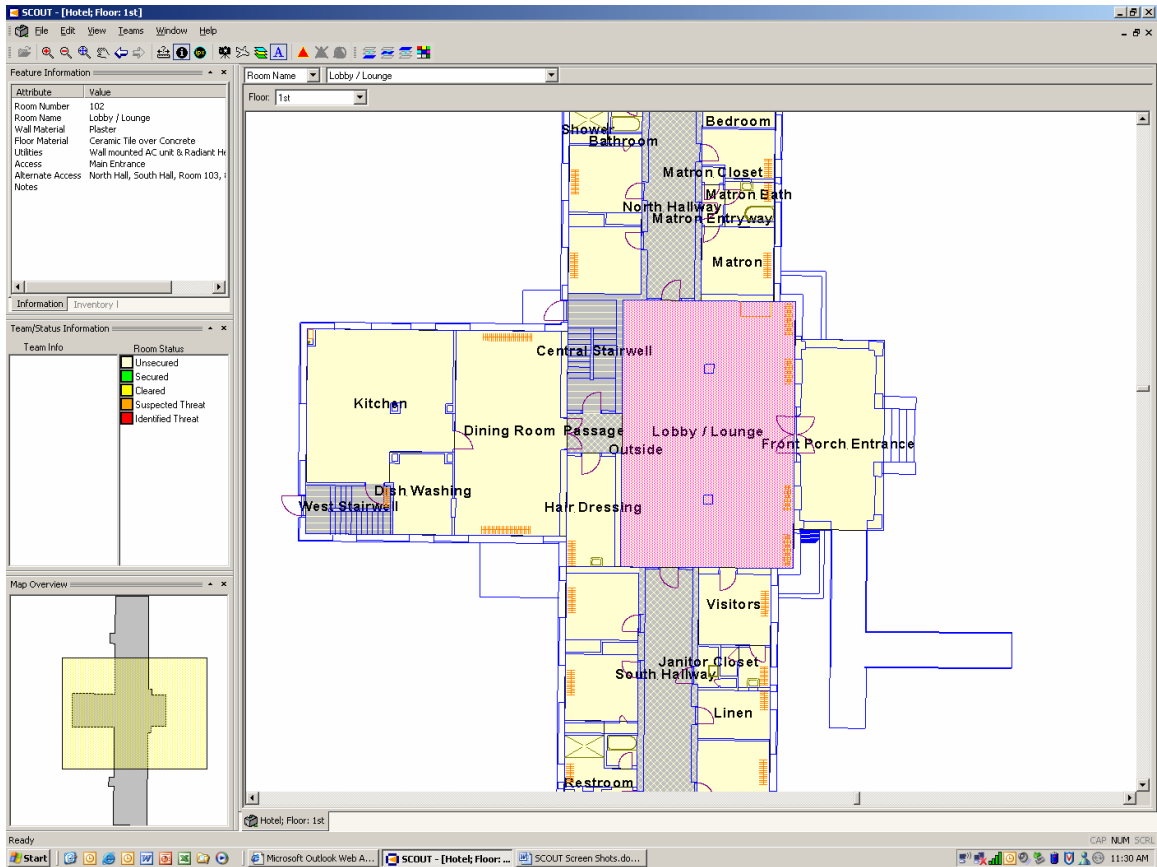
Above is the view showing detailed floor plan of the training building. Note the pink-shaded room's attributes listed in the database report in the upper left of the screen.
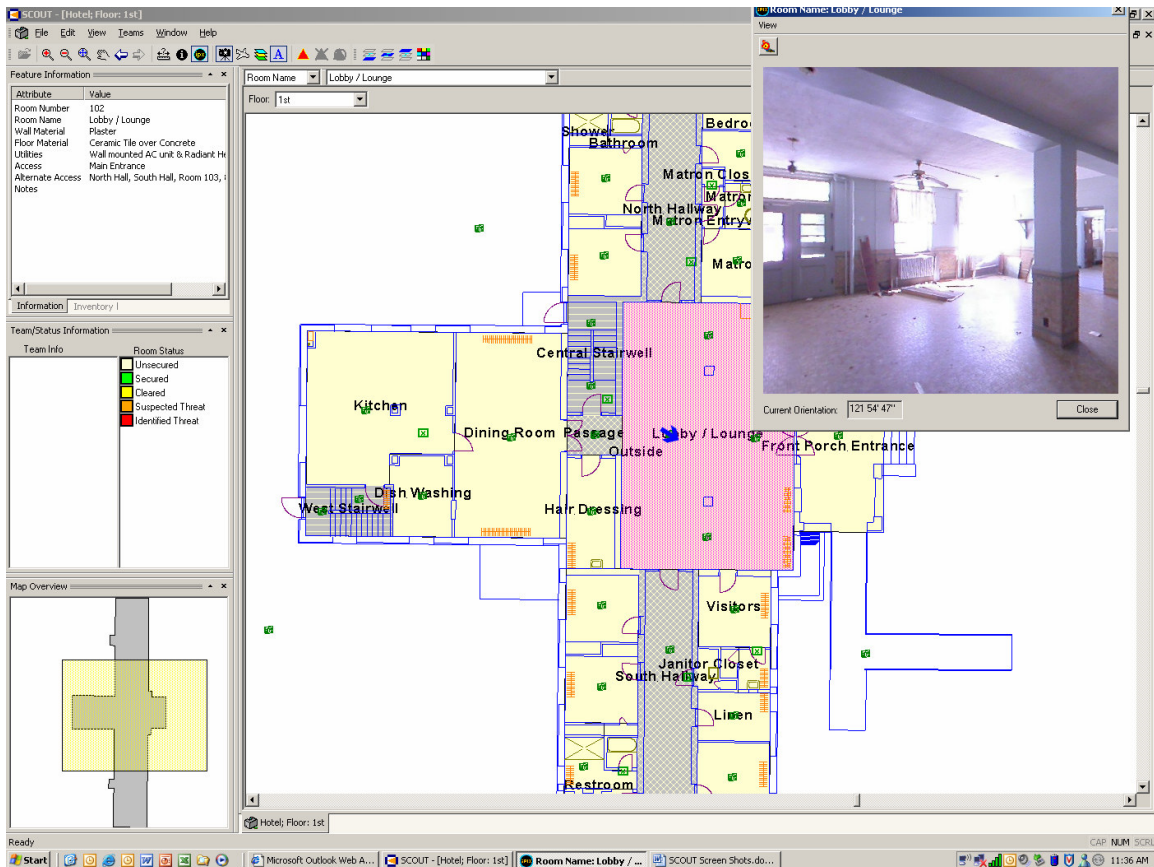
SCOUT has the ability to open 360° fish-eye photographs of each room. The blue arrow in the shaded room provides the orientation of the photograph – it points in the direction of the photo's center as the user pans around the room. The user can also see 90° upward to the ceiling and downward to the floor.
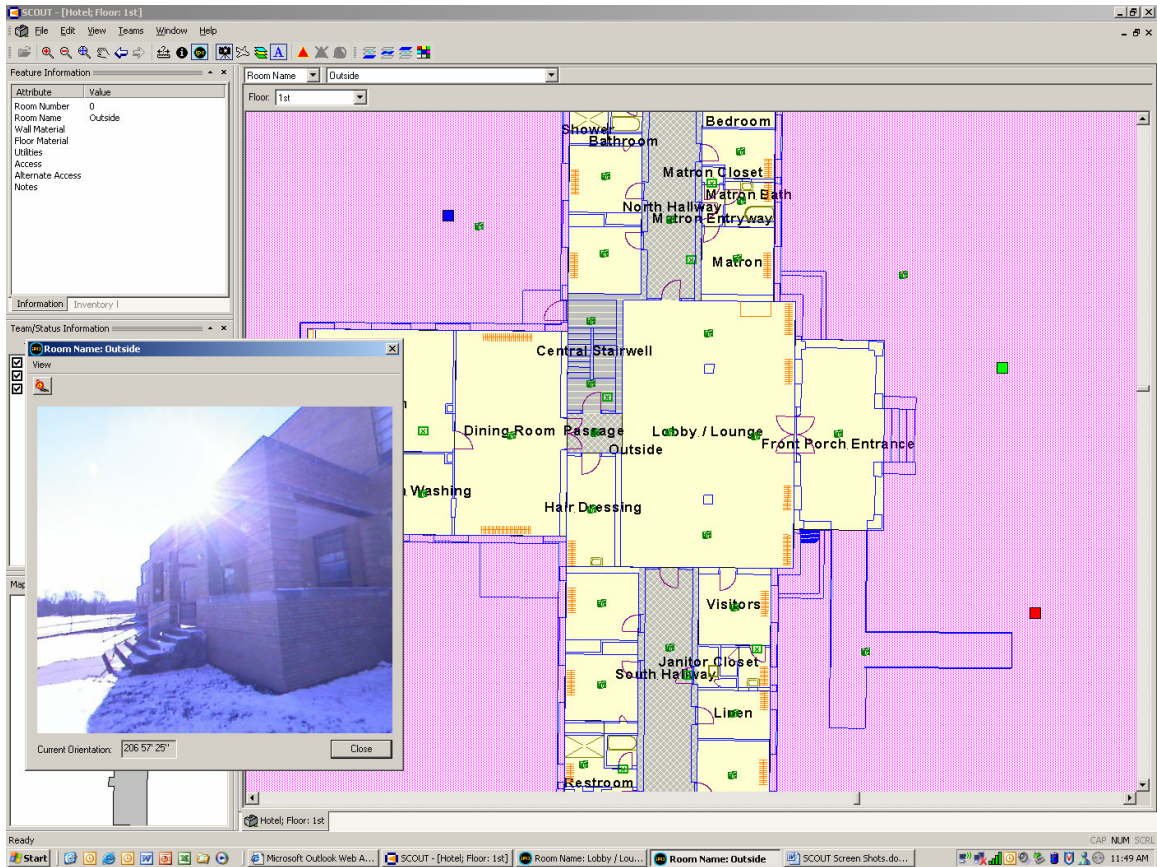
SCOUT can track the location of TRTs during rescue operations. The green and red squares to the right, and the blue square in the upper left, represent three teams. The user simply moves the squares as each team reports its position.
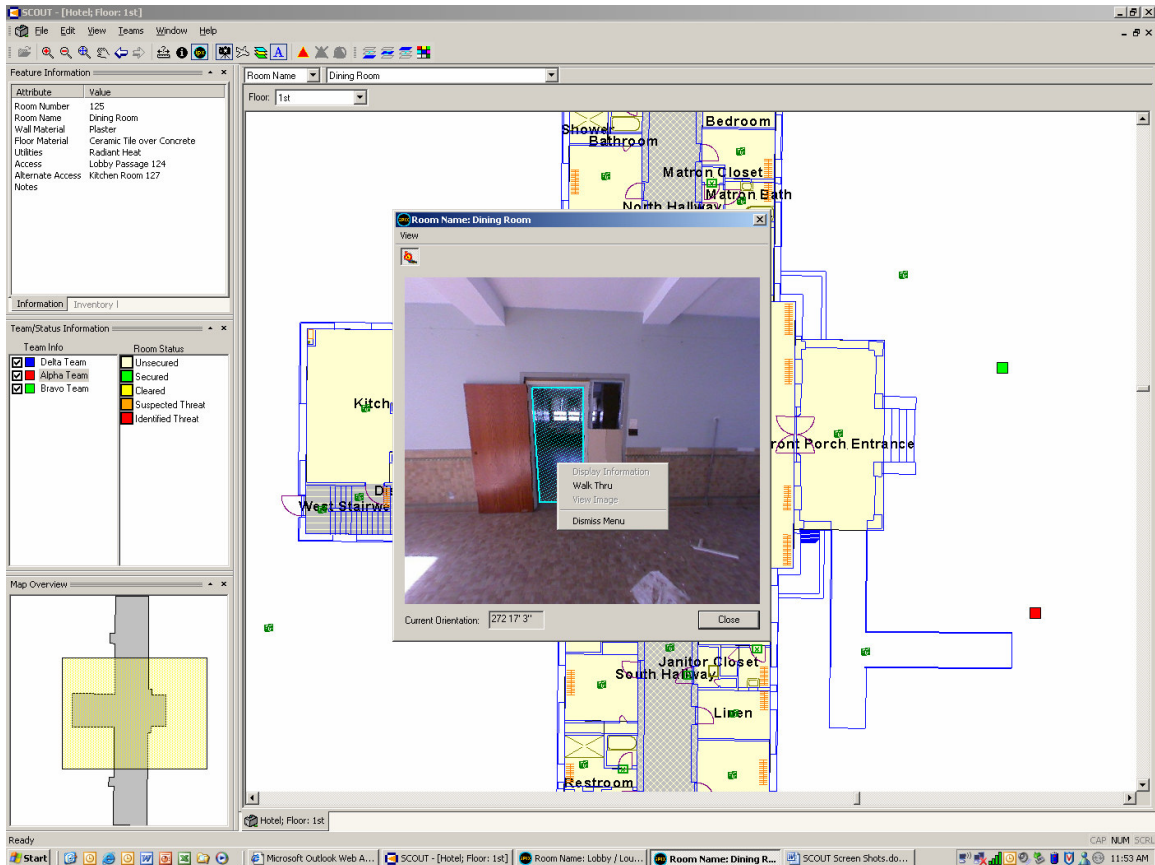
The "Hot Spot" button in the upper left of the photo produces a shaded area over doors, windows, and other assets of interest. By clicking on the shaded area, the user can conduct a virtual walk-through of the building, or view the details of a feature such as an electrical control panel.
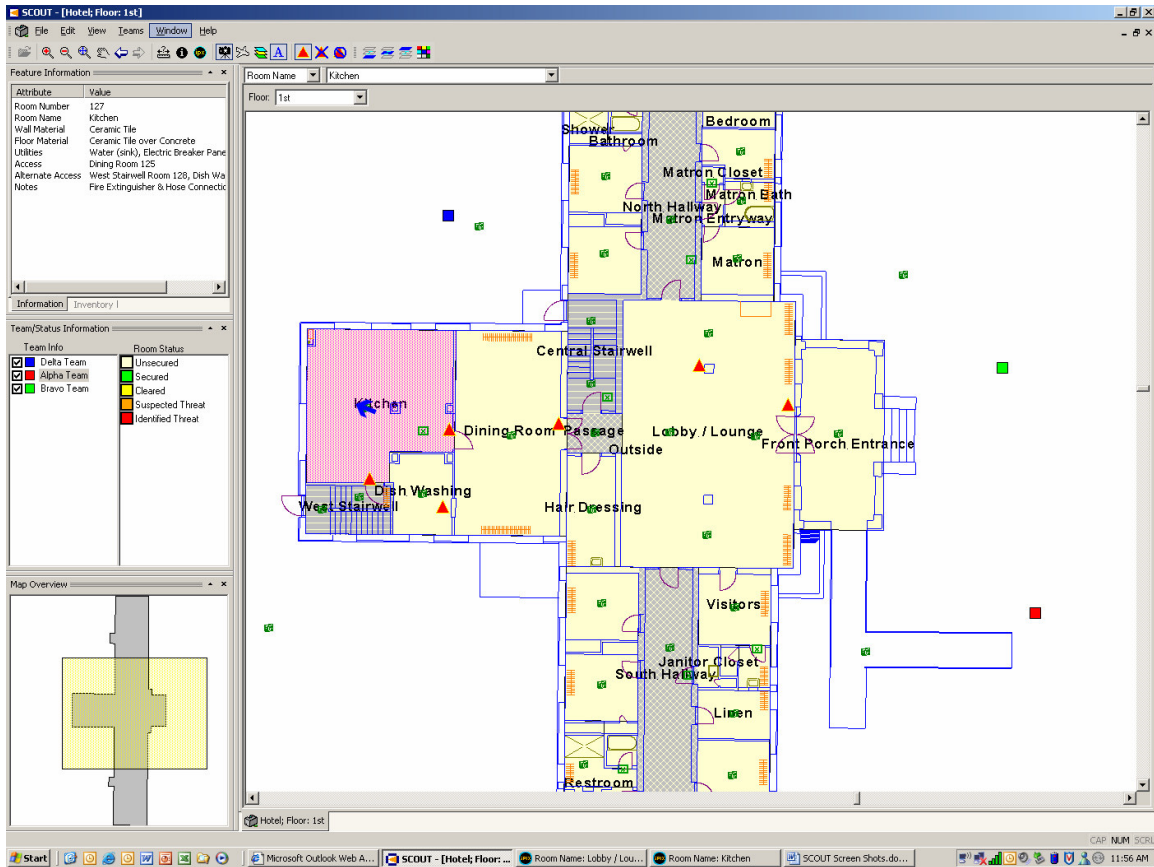
During the exercise, the terrorists used the Indiana National Guard's tactical robot to send out a video showing that key areas of the building had been wired with explosives. By comparing the video to SCOUT's fish-eye photographs, we were able to determine the location of all explosive devices within three to four minutes.
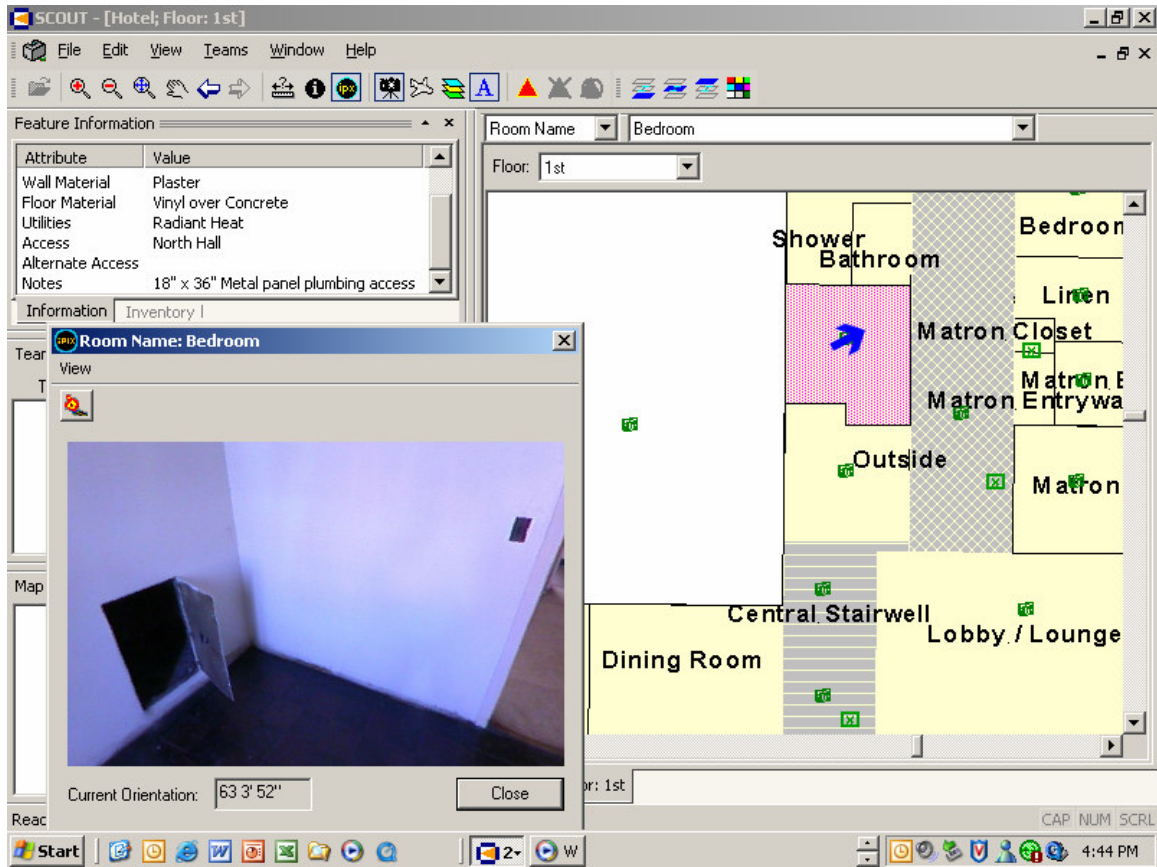
The IPIX image revealed a likely hiding place for a terrorist inside this room. When its door is shut, the hole is nearly invisible.
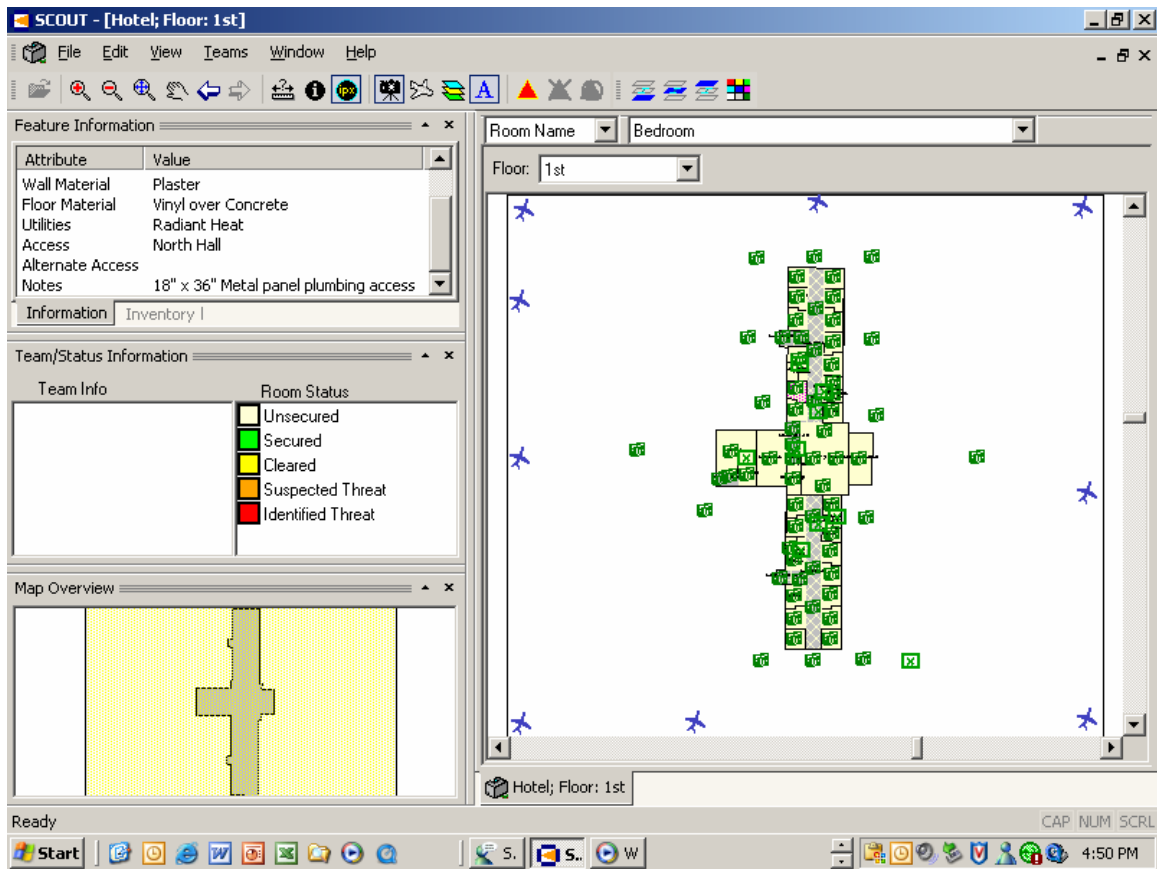
The green symbols indicate where IPIX images exist, and the blue airplane symbols represent the location where oblique aerial photos of the campus are available.
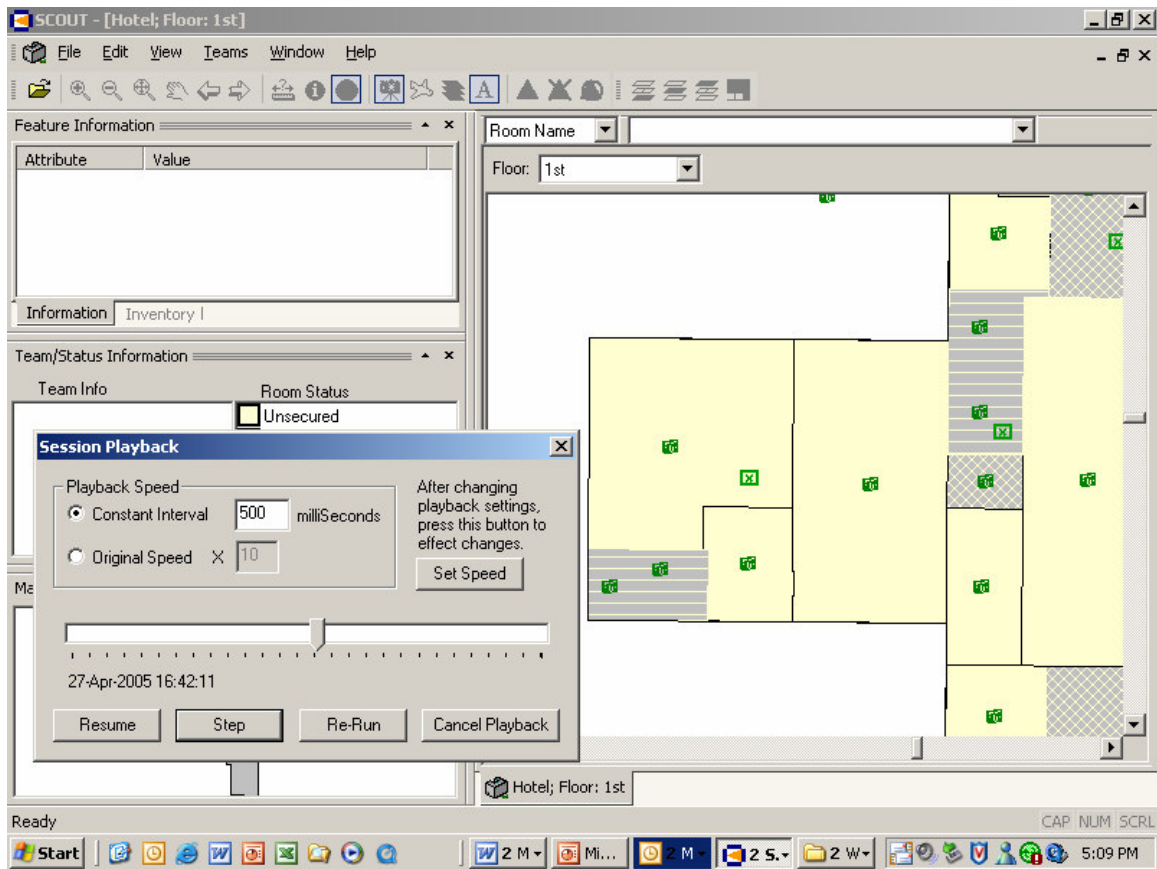
This screenshot illustrates the recording playback function of SCOUT. It allows the user to replay each step of the mission along with a time and date stamp.

Appendix B

Company Overview

GeoDecisions is a recognized leader in the spatial information technology industry. We have built a solid reputation by providing innovative consulting services and customized solutions in a timely and cost-effective manner. GeoDecisions' staff not only has a wealth of knowledge in the latest technology tools, but also understands the day-to-day operations of the markets that we serve.

GeoDecisions believes that all IT projects require vision and considerable leadership to be completed successfully, on time, and on budget. By championing a philosophy vested in partnering, collaboration, and shared goals, GeoDecisions' staff makes every effort to work with all parties who will use a system. We strive to recommend the best-fit solutions for our clients, based on the balance of available funding and personnel versus desired functionality. We pride ourselves on developing systems that meet current needs, provide an initial success, and accommodate future enhancements.

GeoDecisions employs more than 150 IT and GIS professionals operating out of 19 offices. Our staff is primarily engaged in IT consulting and in the design, development, and deployment of data repositories and GIS and Web-enabled information management systems. During the past 20 years, we have successfully completed more than 450 IT and GIS-related projects. In many cases, GeoDecisions has also provided customized training, systems integration, and digital map production, in addition to the sale and installation of hardware and software.

As a vendor-independent consulting firm, GeoDecisions focuses on developing solutions and applications that integrate diverse information technologies. We can therefore leverage the empowering nature of spatial information with existing legacy systems, allowing our clients to better achieve their business objectives, namely, service to their citizens and/or customers.

GeoDecisions operates as a division of Gannett Fleming, an international consulting engineering and construction management firm. Gannett Fleming has more than 1,900 employees in more than 50 offices, and has been providing transportation planning, environmental, and engineering services since 1915. GeoDecisions was founded in 1986, and since 1992, has been providing GIS and IT support to all of Gannett Fleming's divisions and entities. Because of this unique relationship, GeoDecisions' staff has significant expertise integrating IT solutions with all facets of transportation, environmental, planning, and engineering disciplines. GeoDecisions is ISO 9001-certified.

GeoDecisions serves the transportation, military, local government, and private/commercial markets. For each of these industries, we offer the following services:

Strategic Planning. GeoDecisions provides an innovative approach to strategic planning through the use of visionary workshops, educational workshops, and follow-up interviews. The result of these efforts is a road map of prioritized spatial applications that establish a plan for moving an agency towards its overall objectives.

GeoDecisions has an extensive working knowledge of ESRI, Intergraph, Oracle, DB2, SQL Server and other mainstream GIS and database software packages. We can therefore work with clients to develop and implement cost-effective strategic plans that make the most effective use of existing technology and client assets. With the rapid rate of change in information technologies, spatial IT projects must also evolve to keep pace. To prevent technological projects from being antiquated before they are completed, we develop realistic strategic plans to make certain that new technologies remain innovative.

Needs Analysis and Requirements Definitions. GeoDecisions works with our clients to clearly define their unique needs through Joint Application Design (JAD) sessions, interviews, and online surveys. The information gathered is used in conjunction with the experience gained from other successful projects to form the foundation on which a successful project can be completed. The requirements establish the core objectives that are tracked throughout the entire project life cycle.

Database Design and Development. Technology is a crucial component of an application, but it is the accuracy and consistency of the information provided that determines its success. Whether designing a data warehouse or integrating legacy systems, GeoDecisions provides industry-certified database administrators and GIS database professionals to manage enterprise data. In addition, spatial database components, such as Oracle Spatial, have been implemented in many of our client sites and in our Web-based applications.

Systems Integration. GeoDecisions has worked with many agencies to integrate data from their various legacy data sources. GeoDecisions has the expertise to provide solutions that ease access to information, regardless of data format.

Custom Application Development. GeoDecisions uses the latest software development tools and the most current programming techniques and object architectures to provide working solutions that meet the needs of each of our clients. The GeoDecisions business model includes completing the Software Engineering Institute's Capability Maturity Model Level 2 assessment in 2004. This will allow us to continue our mission of developing solutions that provide reliability, scalability, flexibility, and ease of maintenance.

GeoDecisions has capitalized on our knowledge of the GIS industry and the expansive possibilities created by the Internet to build numerous Web-based GIS applications. Our solutions allow more users to access data easily and quickly so that better decisions can be made.   Examples of the types of functions provided by GeoDecisions' applications include oversize and overweight truck routing, asset

management, integrated management systems, intelligent transportation systems, straight-line diagramming, and real-time applications.

Integration of Wireless Technologies. Wireless technologies are the fastest emerging market in the spatial information industry. GeoDecisions focuses on providing wireless and PDA solutions to our clients. Our developers have deployed data transfer, field analysis, data collection, and location-based solutions running on Windows CE and Pocket PC, as well as Windows 95/98/NT/2000. Using standard communication protocols such as cellular digital packet data and transfer control protocol/Internet protocol, GeoDecisions has enabled our customers to reap the benefits of location-based technology and to obtain the ability to access real-time information when and where it is needed.

Image Processing/Remote Sensing. Image processing and remote sensing are critical components to all of our planning and environmental assessment projects. GeoDecisions uses revolutionary satellite technology and advanced image processing tools to determine the extent of features, such as land use/cover, flood inundation, wildlife habitat, development and redevelopment potential, and pollution/containment extent. Assessment of the change-over-time of these features and three-dimensional renderings are examples of the products available from our vector and raster-based processes.

Linear Referencing System (LRS) Design and Implementation. Transportation and local government agencies have the unique challenge of using data that is often collected using different linear referencing methods. GeoDecisions has expertise with the LRS tools provided by the leading vendors, and can assist transportation clients in designing and implementing a linear referencing system that accommodates all of their collection techniques.

Web Design and Hosting. GeoDecisions offers a comprehensive, scalable set of services, including Web-design, hosting, and maintenance. Our Web design and graphics departments have collaborated in designing many large- and small-scale Web sites for client use. Many of our clients are publicly funded entities, and the Internet provides a fast and easy way for them to keep the public updated and involved throughout the life of a project. Project updates, schedule information, team information, and live construction feeds and video can be delivered via the World Wide Web. This is also a valuable way to gather feedback from the public in the form of online surveys, message boards, and other interactive methods of communication.

Custom Application Training. GeoDecisions employs professional and certified trainers that provide training on custom applications as well as on standard GIS products. Because we are a vendor-independent firm, GeoDecisions offers customized training and support on a variety of different software packages, including the major packages developed by ESRI and Intergraph. We also offer training services for computer aided design and drafting CADD software such as

AutoCAD and MicroStation. We can design and customize on-site training and include comprehensive manuals, online tutorials, and other site-specific materials.