

2009 BFRL Project Description

Project Title: Decision Aids for Wildland/Urban Interface Firefighters

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Co-Investigator(s):

BFRL Program: Reduced Risk of Fire Spread in Wildland-Urban Interface Communities

Objective: To aid firefighters operating in wildland/urban interface (WUI) fires by providing proven measurement techniques for the evaluations of decision support tools to improve the real-time strategic and tactical information available to incident commanders and supervisors, focusing particularly on the location and intensity of the fire in relation to crews, equipment, and structures.

Problem:

What is the problem? In order to effectively and safely fight WUI fires, firefighters need timely information about the specific site they are working, such as fuel loading, terrain, meteorological data, human use patterns, potential safety zones and escape paths. It is difficult for supervisors to get current views of the whole situation¹. Additionally, communication between firefighting teams and strategic or tactical decision-makers is frequently inadequate due to lack of compatible equipment, low transmission quality and confusion regarding the division of responsibilities at WUI fires². Decision support tools are beginning to become available to the WUI fire service but there is no existing standardized method of assessing their performance and interoperability, and therefore evaluating their usefulness.

Why is it hard to solve? The technology for transmitting and displaying large batches of information, such as topographic, meteorological, and infrared and visible imagery is just starting to become available from the military. Some of this technology may be adaptable to WUI firefighting applications. The conditions in which this technology is used varies widely from event to event, both with regard to the bandwidth of the electromagnetic environment and the physical barriers to high quality signal transmission. Stakeholders are interested in defining scenario-specific and physical obstacle-specific challenges to evaluate proposed decision support tools, but are divided in their approaches and are therefore far from consensus.

How is it solved today, and by whom? WUI fires typically initiate in the wildlands and spread into the interface. Fire fighting efforts may include any number of the five federal

¹ Wildland Firefighter Safety Awareness Study Phase 1. TriData Corporation, 1996.

² Technology Assessment: Protecting Structures and Improving Communications during Wildland Fires, GAO Report to Congressional Requesters, 2005.

agencies having responsibility for WUI firefighting equipment (the Forest Service, National Park Service, Bureau of Land Management, Bureau of Indian Affairs, and the Fish and Wildlife Service³) as well as State and local departments. Information is gathered from whatever source they have available at the time they need it. This may be paper topographic maps with hand-drawn approximations of crew and fire locations, and information transmitted verbally by aircraft crews. Communication between teams, especially in WUI fires, is accomplished using radios that may not be capable of sending or receiving information of sufficiently high quality to be understood and may also not be compatible without the use of audio switches, repeaters, or console-to-console patches. Established methods of evaluating the performance of electronic decision aid tools do not exist

Why NIST? The Firefighting Technology group has worked with the fire service to develop standards for advanced technologies that provide information similar to that which is needed by WUI firefighters. Specifically, existing research on firefighter locator devices, thermal imaging cameras, and smart building systems⁴ may provide insight into the application of these technologies to non-structural firefighting. NIST researchers are also familiar with the standards development process. This project promotes U. S. innovation and competitiveness by meeting the technological needs of WUI firefighters and creates a solution-enabling tool that benefits the fire service and general public by evaluating the performance of decision support tools that aid firefighters in protecting life and property from WUI fires.

Approach:

What is the new technical idea? Develop evaluation technology for decision support tools that deliver critical information to WUI fire incident commanders and supervisors to enhance their situational awareness and enable them to make stronger strategic and tactical decisions. These tools would ultimately incorporate at least two types of information: location-based, such as topography, fuel loading, meteorological, crew location, human use patterns and fuel history; and biometric, such as personnel heart rate, blood pressure, activity level, and exposure to toxins. It may also be feasible to include audio and video communications in this technology. The evaluation methodology will be made available in phases, beginning with firefighter locator technology. The user interface provided by the decision support tool will be required to be presented in a manner acceptable to the fire service, using a standardized selection of icons and symbols. If locator technology is successfully implemented, then further work will be done to incorporate other technologies.

Why can we succeed now? Some parts of this technology exist in the military and are starting to be made available to the public. NIST's recent work with fire service technology applied to structural firefighting, particularly personnel locators, can be leveraged into this new application with relative ease and potentially high impact.

What is the research plan? First, a thorough literature search will be conducted. Contacts will be established with stakeholders such as members of the five federal agencies listed above, military personnel that are familiar with the technology of interest, people that have firefighting

³ Wildland Firefighter Safety Awareness Study Phase 2. TriData Corporation, 1997.

⁴ Smart building systems are designed with sensors that provide firefighters with information about fire location, existing hazards, floor plans, etc... the AFST Program had a project on this subject in the past.

experience in wildland and WUI fires, manufacturers of decision support tools, and potential funding organizations. A workshop will be hosted by NIST to elicit information regarding the research needs of the stakeholders, including desired performance requirements. The results of the workshop will be used to determine the feasibility of developing advanced decision support tools for WUI applications, the performance requirements for each of the technologies, and the priority of implementing the technology.

Beginning with firefighter locator devices, an examination will be made of the types of operating environments and their possible effects on locator signal propagation. Selected potential locator technologies will be used for proof-of concept testing. Preliminary testing with an incident command post laptop that has electronic topographic maps overlaid with locations of personnel in the field will be done to compare projected locations with performance requirements. If this method proves successful, beta tests using WUI firefighters will be conducted. The evaluation approach will be modified as necessary based on feedback received. This process can then be repeated to add more information to the system, in a modular manner, according to the prioritized list developed by stakeholders during the workshop.

Recent Results: This is a new project.

Standards and Codes: There are potentially two NFPA technical committees that are responsible for standards related to this work: Wildland Fire Fighting Protective Clothing and Equipment (FAE-WFF), and Electronic Safety Equipment (FAE-ELS). Francine Amon is a member of the FAE-ELS and will apply to the FAE-WFF if this project is funded.