# XV. MITRE Corporation

## A. General Information

The MITRE Corporation, established in 1958, is a not-for-profit organization which conducts work in systems engineering, information technology, operational concepts, and enterprise modernization.  MITRE was originally formed by several hundred employees from the Massachusetts Institute of Technology's Lincoln Laboratories who came together to create new technology for the Department of Defense. The company expanded in 1963 after the Federal Aviation Administration gave the company systems engineering responsibility for the projected National Airspace System. Over the years, the company has continued to evolve to meet the public interest by providing top-notch engineers and scientists experienced in a wide range of technologies. MITRE has 5,700 scientists, engineers and support specialists who work on hundreds of different projects across the company. MITRE has headquarters in Bedford, Massachusetts, and McLean, Virginia, with more than 60 sites around the world. MITRE manages three Federally Funded Research and Development Centers (FFRDCs) in addition to its own independent research and development program that explores new technologies and their uses.

For More Information on  FFRDCs Please Click HERE

## B. MITRE's Recommendations to NTIA

In 1999 the National Telecommunications and Information Administration, an agency of the U.S. Department of Commerce and the Executive Branch's principal voice on domestic and international telecommunications and information technology issues, published *Saving Lives With an All-Hazard Warning Network.* This report made several important observations about the nation's warning system and the future needs for effective warnings. The following document is MITRE's official response.

## All Hazard Warning – Comment, Docket No. 000609173-0173-01

## Comments from Jim Chadwick, Darrell Ernst, and Jim Marshall of the MITRE Corporation

### 1.0 Introduction

As the technology for new broadcast and personal communications systems advances, there are many opportunities for substantial enhancements to emergency alerting systems. These new opportunities make it technically feasible to deliver hazard warnings of many types by a wide variety of media. However, there are a number of obstacles to actual deployment of advanced all-hazard warning systems. Some of these obstacles are technical in nature, while others are economic, administrative, jurisdictional, or legal in nature. This document briefly addresses some of the technical considerations and obstacles and provides some recommendations for changes in public policy that would facilitate overcoming these obstacles.

### 2.0 Technical Considerations

#### 2.1 System of Systems

Providing effective emergency alerting for all areas of the nation will require a system made up of multiple systems. This will be required because of the wide variety of hazards, sensor systems, cognizant administrations, available delivery media, intended recipients, desired actions, timeliness requirements, etc. In many different ways, the requirements for emergency alerting are widely diverse. Consequently, no one system will fill all needs. As a result, one of the main technical challenges will be to make multiple existing and future systems work together effectively.

## 2.2 Broadcast Media

An effective emergency alert system must be composed of many parts. One of the most important of these is the "last mile" message delivery component. Many media alternatives are being used, or have been suggested for this part, including:

- Broadcast radio and TV
- Cable TV
- Internet
- Cellular and digital Personal Communications Service (PCS) phones
- Broadcast satellite
- Pagers
- Standard telephone
- NOAA Weather Radio (NWR)
- Mobile Satellite Service (MSS)

Of the alternatives listed above, many are wireless in nature. These wireless methods of warning delivery are attractive for emergency alerting for several reasons. First, wireless delivery methods have the capability to deliver warning messages to people in all types of situations, depending on the receive devices. For example, people can be reached whether they are at home, driving in their car, or walking in a park. Other approaches, for example those based on landline technology, could not reach people on foot or traveling in a car.

Second, wireless media are inherently broadcast in nature. This is advantageous for emergency alerting because it scales well. A single alert message can reach all the people in a give area, whether there are many people in the vicinity, or few.

## 2.3 Multiple Media

While broadcast wireless media have many advantages for emergency alerting, they also have disadvantages. One important disadvantage is the lack of perfect RF coverage of any one system. As a result, the coverage and reliability of the "system of systems" must be enhanced by utilizing as many media as possible.

2.4 Forward Looking

Once enhanced emergency alert systems are deployed, it is important for these new systems to be as long-lived as possible. Accomplishing this will require the new systems to be compatible with emerging technologies and not directly dependent on older technologies that may have a limited remaining lifetime. In keeping with this idea, it is important for the new system to use digital message formats. In addition, the new systems must be flexible and expandable so future requirements can be accommodated.

2.5 Standard Message Sets

Given the use of many different digital, broadcast wireless media as delivery mechanisms for emergency alert messages, it should be clear that a standardized set of digital emergency messages should be developed. This new message set should be compatible with many different wireless media. It should incorporate the many important features of the existing Emergency Alert System (EAS) message sets, but should go beyond EAS and NWR in capabilities.

2.6 Location Specific Precision

One important feature of any new emergency alert message set, should be its ability to provide precise geographically specific alert regions. These regions might be of any size or shape. This ability to precisely warn specific areas is essential to prevent the problems of over-warning the public. With the proliferation of Global Positioning System (GPS) technology, and the ability to send digital messages, sending warning messages that contain precise geographic coordinates of the threatened area is feasible. These messages could be broadcast to all receivers in the coverage area of the various transmitters. The receivers would filter the messages based on the location of the receiver. Only those inside the threatened region would alarm the user to the danger. In this way, only the people with a need to be alerted are notified of the danger by the receiving device. People who do not need to be alerted will not be needlessly disturbed by unnecessary alarms. This technique for prevention of "over warning" would improve the effectiveness of the system in several ways. First, the "cry wolf" effect would be minimized. People would not become frustrated and skeptical about the system because they were frequently warned about hazards that did not apply to them. Second, minimizing over warning helps prevent situations where people think they are fleeing a particular danger, but are actually fleeing into some sort of danger. Messages could tell, not only where the danger is, but also suggest safe places to go. Finally, minimizing over-warning helps prevent roads clogged with people who do not need to flee, obstructing those who really do need to leave an area.

Besides being precise geographically, standard emergency alert messages should not rely on man-made boundaries, such as counties, zip codes, telephone area codes, or voting districts. Alerting based on man-made regions has several problems. First, the boundaries of these regions can change. This can result in significant configuration control problems and ultimately can cause dangerous confusion. Second, and more importantly, many of the people being warned may not know which region (for example, which county) they are in. This is clearly a dangerous issue. It is especially significant for tourists, or others traveling in an unfamiliar area. Finally, man-made regions may not be the correct size and shape for any particular emergency threat. Again, this can result in over-warning the public. In summary, emergency alerting should be done based on alert regions described in terms of latitude and longitude. Mobile RX will need GPS and fixed receivers need to have their location entered in some way.

## 2.7 System Architecture

There are significant administrative, jurisdictional, and legal obstacles and pitfalls associated with emergency alerting. Some of these can be minimized by developing a system that provides alert message injection direct from the people monitoring the "sensor" that provides data on the hazard. In this way, administrative decision layers are bypassed, jurisdictional issues tend to be avoided, and time is saved.

Such an architecture would need to address the distribution of all types of messages all the way from the sensor to the public. Alerting should be considered for: earthquakes, fires, tsunamis, tornadoes, hazardous materials (HAZMAT) situations, terrorism, biological warfare, floods, ice storms, hurricanes, disease outbreaks, volcanoes, lahars, high winds, cold snaps, animal attacks, lightning storms and others.

# 3.0 Questions

## 3.1 Is it technically feasible?

Yes, it is technically feasible to deliver emergency alert messages to many of the devices described in the request for public comment. Pagers are already being used for weather information and emergency alerting. Digital cellular systems have a broadcast channel that might be used for such messages. Messages could be provided over the Internet, but most current internet technology uses information pull, not information push. Broadcast TV, radio, and cable systems are already used for EAS messages, although these messages should be enhanced. Other emerging technologies could also be used. New digital broadcast services could be especially effective for emergency alerting. However, to be useful, these new services would need an ancillary data channel that could be made available for emergency alerting.

3.2 What are the trade-offs among systems?

Digital wireless broadcast media are generally better for emergency alerting applications. These technologies are scalable for alerting large populations quickly. They are also well suited for "information push" instead of "information pull. Finally, they have the capability to reach people wherever they are. Global coverage broadcast systems, such as those using geosychronous satellites, would be well suited for alerts that need to go to the whole nation. On the other hand, they may not be well suited for delivering alerts for many different local emergencies over a continental area. More local broadcast systems such as broadcast TV or radio cover a more suitable area for local emergencies. Individual cell sites cover too small an area, but this can be overcome by using many cell sites in a cellular or PCS system. In addition, cellular phones provide a good means for reaching people in many different situations and locations. The use of standard telephone systems has the advantage of high reliability. In addition, the public is very familiar with its use, so no training is needed. On the other hand, it is not scalable for alerting large populations, and will not work for reaching people on the move.

3.3 What are the economic impediments?

The sensing, identification, message generation, and message delivery needed for emergency alerting requires money. These expenses are required both in terms of initial investment, as well as ongoing operation and maintenance. Funding for such a system must come from somewhere. Possibilities include government subsidies, additional services fees (such as the E-911 fee charged to cellular customers), subscription fees, and advertisements. An open question is whether the public would be willing to pay a subscription fee to improve their safety in the case of an unlikely hazardous event.

A good economic model for the whole system should be developed, but here is one possibility:

a. The federal government mandates that all new digital broadcast wireless media have an ancillary broadcast data channel. This channel could be used for revenue bearing data traffic, such as subscription data services or digital advertisements. However, the channel must also be available for emergency alert messages, on a priority basis.
b. The wireless system operators use the ancillary data channel for revenue bearing traffic most of the time. Equipment manufacturers will build RX to process this data, as long as it has a perceived value to the public and an economic value to the system operator. Full time use by this revenue bearing traffic, ensures that the system is always up and running.
c. Emergency alert messages could be generated and injected into the commercial system when the need arises. These messages would take priority over other messages.
d. Government agencies would bear the cost of generating the message, but not for delivering the message or for the equipment that receives it. These costs are borne by the wireless system operator and by the public respectively.

3.4 What are the legal impediments?

MITRE has no comments on this question at this time.

3.5 What legal measures should be taken to foster the delivery of messages?

MITRE has no comments on this question at this time.

3.6 What policy measures should be taken to foster dissemination of warnings?

The development of an effective emergency alert system would be facilitated if the accessibility of an ancillary data channel for emergency alert messages was mandated for all broadcast wireless media.

## 4.0 Recommendations

We make the following recommendations associated with national and local emergency alerting in the future.

a. The All Hazard Roundtable should initiate a working group to define a standard set of messages for delivery of emergency alerts on digital broadcast wireless media. This message set must be flexible enough to work with a variety of wireless media and capable of being used for a wide range of hazards. It must allow for growth and evolution of the alert messages. It should provide geographically specific alert regions, based on the vertices of geographic polygons, and described in terms of latitude and longitude. It should be capable of providing some encrypted messages, not decodable by the public, but accessible to emergency managers.

b. The Federal Communications Commission (FCC) should mandate that an auxiliary digital broadcast channel should be made available in all new digital broadcast wireless media. This channel could normally be used for a variety of data traffic including digital advertisements, but must be accessible to alert providers when the need arises. The FCC should further mandate that an ancillary broadcast data channel on new PCS systems be made accessible for emergency alert messages. This channel should be incorporated into third generation cellular systems. Facilitating this addition will require participation in the international standards bodies. A Roundtable sponsored working group should find a way to get messages to proper cell sites and should address the issue of using multiple cell sites to cover a large area.

c. The All-Hazard Roundtable should study and recommend a system architecture for getting alert information from the "sensors" to the public. The architecture must provide for local, as well as regional or national injection of alert messages, where appropriate. The architecture must address both technical connectivity and organizational and administrative issues. This system must minimize the number of administrative obstacles that might slow important messages. The group must also consider economic issues and recommend funding mechanisms to support the complete system. The group must also consider liability and other legal issues associated with the architecture.

Click here for the link to this document online.

## C. Federally Funded Research and Development Centers (FFRDCs)

### 1. Introduction

A Federally Funded Research and Development Center (FFRDC) is a unique organization that assists the United States government with scientific research and analysis, development and acquisition, and/or systems engineering and integration. FFRDCs address long-term problems of considerable complexity, analyze technical questions with a high degree of objectivity, and provide creative and cost-effective solutions to government problems. Working in the public interest, FFRDCs operate as long-term strategic partners with their sponsoring government agencies. In order to ensure the highest levels of objectivity, FFRDCs are organized as independent entities with limitations and restrictions on their activities. This unique standing permits special access to government information and a long-term perspective. Since FFRDCs are prohibited from manufacturing products, competing with industry, or working for commercial companies, industry and government confidently provide them with sensitive information. As private entities, FFRDCs have greater flexibility than the government in recruiting and managing a highly skilled technical workforce. Sponsors conduct comprehensive reviews of their FFRDCs every five years to ensure the quality, efficiency, and appropriateness of the work program. FFRDCs commonly transfer the practical results of their work to the public through such methods as cooperative research and development, technology licensing, open source participation, and contributions to industry standards. MITRE's three FFRDCs are:

**2. C3I: The Department of Defense FFRDC**

In 1958 the MITRE DOD C3I FFRDC was created to support the development and fielding of electronically-based air defense systems. In 2006, the C3I FFRDC supports a varied set of sponsors within the Department of Defense and the Intelligence Community. These include the military departments, defense and intelligence agencies, the combatant commands, and elements of both the Office of the Secretary of Defense and the Office of the Joint Chiefs of Staff. The system engineering activities for these sponsors cover a wide range from concept development through the acquisition and fielding of advanced capabilities.

For More Information on the DOD C31 Please Click Here
http://www.mitre.org/about/ffrdcs/c3i.html

**3. Center for Advanced Aviation System Development (CAASD): Federal Aviation Administration FFRDC**

Since MITRE's inception in 1958, the corporation has helped the Federal Aviation Administration (FAA) address the nation's most crucial aviation issues. In recognition of this long-standing and productive relationship, the FAA designated MITRE's aviation program as a Federally Funded Research and Development Center in 1990. The new entity was called the Center for Advanced Aviation System Development (CAASD). In addition to supporting the FAA, CAASD works with civil aviation authorities around the world, all of which face similar challenges.

For More Information on the CAASD Please Click Here
http://www.mitre.org/about/ffrdcs/caasd.html

**4. Center for Enterprise Modernization (CEM)**: **Internal Revenue Service FFRDC**

In the fall of 1998, the Internal Revenue Service chose The MITRE Corporation to operate a new FFRDC to assist it in its ongoing effort to modernize systems for tax administration. Today, that FFRDC, now known as the Center for Enterprise Modernization (CEM), advances enterprise modernization within the IRS and across government, working with other government agencies—including the Bureau of Customs and Border Protection, the Coast Guard, other Treasury agencies, the Department of Veterans Affairs, and the Peace Corps—on their modernization programs.

For More Information on the CEM Please Click Here

http://www.mitre.org/about/ffrdcs/cem.html