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## **Emergency Communications: The Emergency Alert System (EAS) and All-Hazard Warnings**

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# Emergency Communications: The Emergency Alert System (EAS) and All-Hazard Warnings

## Summary

The Emergency Alert System (EAS) is one of several federally managed warning systems. The Federal Emergency Management Agency (FEMA) jointly administers EAS with the Federal Communications Commission (FCC), in cooperation with the National Weather Service (NWS), an organization within the National Oceanic and Atmospheric Administration (NOAA). The NOAA/NWS weather radio system has been upgraded to an all-hazard warning capability. Ways to improve the NOAA network and the broader-based EAS are underway or are being tested. Much has been accomplished in recent years but the current hodgepodge of warning and alert systems is inadequate for fully alerting the public about terrorist attacks or natural disasters, or for providing information on how to respond. As was demonstrated on September 11, 2001, after the southeast Asian tsunami on December 26, 2004, and again when Hurricane Katrina struck the Gulf Coast, the ability to communicate *after* a disaster also has a critical role in saving lives.

EAS is built on a structure conceived in the 1950's when over-the-air broadcasting was the best-available technology for widely disseminating emergency alerts. The Intelligence Reform and Terrorism Prevention Act (P.L. 108-458) has addressed the possibility of using advanced telecommunications and Internet technologies for emergency notification by requiring two projects for completion in 2005. Bills introduced in the 109<sup>th</sup> Congress that would improve emergency alert systems, domestically and internationally, include S. 50 (Senator Inouye) and H.R. 396 (Representative Menendez). These bills were prompted by the tsunami disaster but include measures that also apply to the need for a better all-hazard warning system in the United States. Others — such as S. 34 (Senator Lieberman); S. 361 (Senator Snowe); S. 452 (Senator Corzine); H.R. 499 (Representative Shays); H.R. 882 (Representative Boehlert); H.R. 890 (Representative Pallone); H.R. 1584 (Representative Weldon); and H.R. 1674 (Representative Boehlert) — are concerned with tsunami detection and the initial stages of notification.

This report summarizes the technology and administration of EAS and the NOAA/NWS all-hazard network, and some of the key proposals for change. It will be updated.

## Contents

EAS Administration .....	2
Broadcaster Participation .....	3
EAS Technology .....	3
NOAA Weather Radio .....	4
All-Hazard Warning Technology .....	4
Call Centers .....	5
Department of Homeland Security .....	5
Other Technology Initiatives .....	6
Proposals and Progress .....	7
Recent Legislation .....	8
Emergency Alerts and the 109 <sup>th</sup> Congress .....	9
Tsunami Warnings .....	9
Planning for the Future .....	12
Other Federal Emergency Warning Systems .....	13
National Warning System (NAWAS) .....	13
Federal Emergency Management System (FEMIS) .....	13
Homeland Security Advisory System (HSAS) .....	14
Advanced Weather Information Processing System .....	14
Emergency Managers Weather Information Network (EMWIN) .....	14
NOAA Weather Wire Service (NWWS) .....	14

## List of Tables

Table 1. Federal Emergency Warning Systems .....	16
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# Emergency Communications: The Emergency Alert System (EAS) and All-Hazard Warnings

The two mainstays of the U.S. capacity to issue warnings are the Emergency Alert System (EAS), which relies primarily on broadcasting media, and the NOAA Weather Radio All-Hazards Network. The National Weather Service (NWS) of the National Oceanic and Atmospheric Administration (NOAA)<sup>1</sup> sends alerts through NOAA Weather Radio (NWR), now expanded to include warnings for all hazards. Several initiatives are underway within the federal government to improve, expand, and integrate existing warning systems. The most important of these — in terms of using, testing and developing leading-edge technology — is the Integrated Public Alert and Warning System (IPAWS), a public-private partnership in which the Department of Homeland Security (DHS) has a leadership role. Many communities, meanwhile, are installing local alert systems that send voice, text messages, and e-mail. Amber Alert<sup>2</sup> systems exist in most states to aid primarily in the recovery of abducted children.<sup>3</sup> Amber Alerts are currently supported by a number of different technologies, including a quasi-national network based on the Internet. Amber Alert messages also can be sent through the Emergency Alert System and the NOAA Weather Radio All-Hazards Network. Many agree that the long-term goal for emergency alerts is to converge federal warning systems into an integrated network that can interface with localized warning systems and also call centers, such as those used for 911 and 211 calls.<sup>4</sup>

*The 9/11 Commission Report* discusses the effectiveness of emergency alerts at the World Trade Center on September 11, 2001, with a focus on communications

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<sup>1</sup> The National Oceanic and Atmospheric Administration (NOAA) is an agency of the Department of Commerce.

<sup>2</sup> Named after Amber Hagerman, kidnaped and murdered in 1996; also referred to as the AMBER Plan, for America's Missing: Broadcast Emergency Response. Websites with additional information include [<http://www.amberalertnow.org>], [<http://www.amberalert911.org>] and the site of the National Center for Missing and Exploited Children [<http://www.ncmec.org>]. All sites visited August 8, 2005.

<sup>3</sup> See CRS Report RS21453, *Amber Alert Program Technology*, by Linda K. Moore. The program and policy issues are discussed in CRS Report RL31655, *Missing and Exploited Children: Overview and Policy Concerns*, by Edith Cooper.

<sup>4</sup> 911 calls go to Public Safety Answering Points (PSAPs). 211 calls typically go to municipal call centers. The role of call centers in providing warnings and information in emergencies is discussed in CRS Report RL32939, *An Emergency Communications Safety Net: Integrating 911 and Other Services*.

systems.<sup>5</sup> Recent, major studies of warning systems have concluded that the United States needs a more robust emergency alert system. Recommendations for improvement include using all available means of communication, providing a standardized alert protocol, and developing infrastructure for notification to geographically-specific locations and virtual communities.<sup>6</sup> A virtual community in the context of emergency communications refers to the technical ability to give immediate, simultaneous alerts to the appropriate community of responders and affected residents. Before its towers collapsed, the World Trade Center might have benefitted if virtual community or geo-targeted alert technology had been in place and activated.

## **EAS Administration**

EAS currently sends emergency messages with the cooperation of broadcast radio and television and most cable television stations. It was created as CONELRAD (Control of Electromagnetic Radiation) in 1951, as part of America's response to the threat of nuclear attack. In 1963, the system was opened to state and local participation. Through most of its existence, the alert system was known as the Emergency Broadcast System. The name was changed in the 1990's when the technology was upgraded and automated.

Congress has placed responsibility for civil defense measures that include the present-day EAS with the Director of the Federal Emergency Management Agency (FEMA)<sup>7</sup> now part of the Department of Homeland Security (DHS). The Federal Communications Commission (FCC) has been designated by FEMA to manage broadcaster involvement in EAS. The FCC currently provides technical standards and support for EAS, rules for its operation, and enforcement within the broadcasting and cable industries. FEMA works with the emergency response officials who, typically, initiate an EAS message for a state or local emergency. Non-federal EAS operational plans are developed primarily at the state and local level, often with the participation of FEMA and other federal agencies. The FCC provides rules and guidelines for state EAS plans and many, but not all, states have filed FCC-compliant EAS plans. FEMA advisors often help to integrate EAS usage into emergency alert plans. The decentralized process contributes to uneven planning; for example, procedures for initiating a message and activating EAS differ from state to state. In comments filed with the FCC, DHS has proposed that FEMA and DHS "should be the primary point of contact" and act as the "Executive Agent" in managing alerts

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<sup>5</sup> Final Report of the National Commission on Terrorist Attacks Upon the United States, Official Government Edition, 2004 pp. 286-287; 295; 306.

<sup>6</sup> These recommendations, and others, were affirmed at a Senate Hearing, "All-Hazards Alert Systems," Committee on Commerce, Science and Transportation, Subcommittee on Disaster Prevention and Prediction, July 27, 2005.

<sup>7</sup> P.L. 103-337, National Defense Authorization Act for Fiscal Year 1995, Title XXXIV - Civil Defense, Sec. 603 (42 U.S.C. § 5196), amending the Federal Civil Defense Act of 1950 (64 Stat 1245).

and warning information. The FCC would continue its regulatory role for broadcasting and wireless communications.<sup>8</sup>

Umbrella organizations that participate in EAS planning and administration include the Media Security and Reliability Council (an FCC Advisory Committee), the Primary Entry Point<sup>9</sup> Advisory Committee, and associations such as the National Association of Broadcasters and state broadcasting associations. States and localities organize Emergency Communications Committees whose members often include representatives from broadcasting companies or local TV and radio stations. These committees agree on the chain-of-command and other procedures for activating an emergency message through radio and television. The constraints of the EAS technology, as specified by the FCC, limit an EAS message to no more than two minutes. Emergency alert agreements with broadcasters, therefore, usually provide for both EAS warning messages and follow-up broadcast programming.

**Broadcaster Participation.** The participation of broadcast and cable stations in state and local emergency announcements is voluntary. The FCC has designated over 30 radio stations as National Primary Stations that are required to transmit Presidentially-initiated alerts and messages. Their broadcasts are relayed by Primary Entry Point stations to radio and television stations that rebroadcast the message to other broadcast and cable stations until all stations have been alerted.

The FCC requires broadcast and cable stations to install FCC-certified EAS equipment as a condition of licensing. Radio and television broadcast stations, cable companies and wireless cable companies must participate. Cable companies serving communities of less than 5,000 may be partially exempted from EAS requirements. Direct broadcast satellite companies are among those communications services not required to participate. For the broadcast of non-federal emergency messages, the FCC has ruled that the broadcasters, not a state or local authority, have the final authority to transmit a message.<sup>10</sup> Historically, the level of cooperation from the broadcasting industry has been high. For example, because state and local governments are not required to upgrade to EAS-compatible equipment — and therefore may lack direct access to the technology — broadcasters often volunteer to manage the task of EAS message initiation.

**EAS Technology.** EAS technology uses coders and decoders to send data signals recognized as emergency messages. Almost any communications device can be programmed to receive and decode an EAS messages. In manual mode, an EAS alert is sent to a broadcaster, either over an EAS encoder-decoder or by other means, such as a telephone call. Where agreements have been put in place with broadcasters, EAS messages can be created and activated by state or local officials

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<sup>8</sup> Letter dated November 5, 2004 from Michael D. Brown, Under Secretary, Emergency Preparedness and Response, Department of Homeland Security, FCC, EB Docket 04-296.

<sup>9</sup> The Primary Entry Point (PEP) system consists of a nationwide network of broadcast stations connected with government activation points through designated National Primary Stations.

<sup>10</sup> FCC, *Report and Order and Further Notice of Proposed Rule Making*, Released December 9, 1994, FO Docket Nos. 91-301 and 91-171, 10 *FCC Record* 1786.

and transmitted automatically to the public without the intervention of broadcasting staff. These messages use computer-generated voices. All EAS messages carry a unique code which can be matched to codes embedded in transmitting equipment; this authenticates the sender of the EAS message. To facilitate the transmittal of emergency messages, messages are classified by types of events, which also are coded. These event codes speed the recognition and re-transmittal process at broadcast stations. For example, a tornado warning is TOR, evacuation immediate is EVI, a civil emergency message is CEM. When a message is received at the broadcast station, it can be relayed to the public either as a program interruption or, for television, as a “crawl” at the bottom of the TV screen. The installed technology limits messages to two minutes; emergency managers and station operators have pre-scripted message templates that have been timed to fit this constraint; specific information is added to the text at the time of the emergency. When new event codes are added, broadcasters must upgrade their equipment to recognize the codes. To use EAS in a more flexible manner, with messages longer than two minutes, for example, also would require broadcasters to upgrade existing equipment.

## **NOAA Weather Radio**

Digitized signal technology for EAS is the same as that used for the NOAA Weather Radio (NWR). Widely recognized as the backbone of public warning systems, NWR broadcasts National Weather Service forecasts and all-hazard warnings for natural and man-made events. The compatibility of the signals makes it possible for EAS equipment used by the media to receive and decode NWR messages automatically. Special weather radios are tuned directly to NWR channels. Many can be programmed to receive only specific types of messages — for example, civil emergency — and for specific locations, using Special Area Message Encoding (SAME). Weather radios can sound an alarm or set off a flashing light. Similar technology is available to provide NWR messages by satellite TV and over the Internet as messages or as e-mail. Technically, the special weather radios available to the public to receive NWR alerts can also receive any EAS message. In reality, broadcast and cable stations rarely program their EAS technology to transmit voluntary state or local messages over the NWR channels. NOAA has improved, and continues to upgrade, its technology to support an all-hazard warning system. It is encouraging public safety officials to notify them as well as their EAS broadcast contacts regarding non-weather-related emergencies so that they may be rebroadcast on NWR. The eventual inclusion of warnings and alerts from the Department of Homeland Security will bolster these efforts.

## **All-Hazard Warning Technology**

Given the advanced state of other communications technologies, especially the Internet and wireless devices, the reliance on delivering EAS warnings by radio and television broadcasting seems out-of-date. Some states and communities are pioneering alert systems that utilize other infrastructures. In particular, many communities participate in programs with e-mail or Internet alerts and some issue mass alerts by telephone. Among the best developed of these warning programs are those used for Amber Alerts, providing noteworthy examples of public-private partnerships. Recently, for example, more than 15 states reportedly have launched or

are preparing to launch Internet technology customized for Amber Alerts. It is hoped by its developers that this system might become the backbone for an expanded all-hazards warning system that would extend the reach of emergency alerts to all types of communications media.<sup>11</sup>

**Call Centers.** Some of the technological solutions for disseminating alerts and providing information rely on call centers, including 911 emergency call centers (also referred to as Public Safety Answering Points, or PSAPs). *The 9/11 Commission Report*<sup>12</sup> describes the often inadequate response of 911 call centers serving New York City.<sup>13</sup> The report's analysis of the 911 response recommends: "In planning for future disasters, it is important to integrate those taking 911 calls into the emergency response team and to involve them in providing up-to-date information and assistance to the public."<sup>14</sup> Such a solution would require a common infrastructure that would support a number of communications and warning needs. Many recommendations have encouraged the development of greater end-to-end connectivity among all types of emergency services.

**Department of Homeland Security.** In June 2004, the National Oceanic and Atmospheric Administration (NOAA) and the Department of Homeland Security's Information Analysis and Infrastructure Protection Directorate signed an agreement that allows DHS to send critical all-hazards alerts and warnings, including those related to terrorism, directly through the NOAA Weather Radio All-Hazards Network. Under the agreement, DHS will develop warning and alert messages that will be sent to NWR for broadcast to radios and other communications devices equipped with SAME technology.<sup>15</sup>

DHS is in the process of exploring ways to develop a comprehensive digital emergency alert system.<sup>16</sup> A pilot to test the implementation of digital technologies and networks is ongoing in the National Capital Region and is being expanded to

<sup>11</sup> "Signing of 9/11 Bill to Bring the Emergency Warning System into the Digital Age; NASCIO will lead in developing a National All Alert System." National Association of Chief Information Officers Press Release, January 5, 2005 available at [<http://www.nascio.org/pressReleases/050104.cfm>]. Viewed August 8, 2005.

<sup>12</sup> Final Report of the National Commission on Terrorist Attacks Upon the United States, Official Government Edition, 2004 (referred to as *9/11 Commission Report*).

<sup>13</sup> *9/11 Commission Report* pp. 286-287, 295, and 306.

<sup>14</sup> *Ibid.*, p. 318.

<sup>15</sup> Department of Homeland Security, Press Room, "Homeland Security Leverages NOAA All-Hazards Network for Alerts and Warnings," June 17, 2004, at [<http://www.dhs.gov/dhspublic/display?content=3724>]. Viewed August 8, 2005.

<sup>16</sup> Testimony of Michael D. Brown, Under Secretary of Homeland Security for Emergency Preparedness and Response, "Federal Emergency Management Agency," House of Representatives, Committee on Appropriations, Subcommittee on Homeland Security, March 9, 2005 and Testimony of Reynold N. Hoover, Director, Office of National Security Coordination, FEMA, Department of Homeland Security, "All-Hazards Alert Systems," Senate Committee on Commerce, Science and Transportation, Subcommittee on Disaster Prevention and Prediction, July 27, 2005.



other locations. The extended pilot is part of the Integrated Public Alert and Warning System (IPAWS). It is a joint effort of FEMA, the Information Analysis and Infrastructure Protection directorate at DHS, and the Association of Public Television Stations (APTS). It is testing digital media — including digital TV — to send emergency alert data over telephone, cable, wireless devices, broadcast media and other networks. If successful, the program will provide the base for a national federal public safety alert and warning system using digital technology.<sup>17</sup> The first phase of the program successfully tested the use of common standards for message formats and interfaces, Common Alerting Protocol (CAP).<sup>18</sup>

Another joint program under the IPAWS umbrella is a pilot with NOAA to test a geo-targeted alert system using “reverse 911.” Reverse 911 is a term sometime used to describe any calling system that places calls generated by a public safety call center to a specific audience.

A program component of IPAWS is to improve the robustness of the communications network to Primary Entry Point (PEP) radio stations by switching from dial-up to satellite distribution. The number of PEP broadcast stations is to be expanded to provide satellite communications capability to every state and territory. These steps are meant to assure the survivability of radio broadcast communications in the event of a catastrophic incident.<sup>19</sup>

**Other Technology Initiatives.** Among other methods being tested to expand broadcast capabilities for emergency alerts are equipping cell phones with NOAA Weather Radio receivers<sup>20</sup> and developing datacasting for digital broadcasting. Datacasting is a one-way broadcast transmission using Internet Protocols.<sup>21</sup> The broadcasts can carry voice and data, including videos, graphics, and text messages. In the D.C.-area Digital Alert Emergency System pilot mentioned above, datacasting is being broadcast to digital televisions and antennae linked to computer networks or directly to computers and laptops. Some advanced wireless phones and other portable devices can receive digital TV broadcasts, as is being demonstrated in several pilots. Satellite radio could also become part of the new era of digital signal alert systems. XM Satellite Radio will broadcast emergency alerts to the D.C. region through a link with the alert system of Arlington County, Virginia.<sup>22</sup> The Arlington Alert network is operated by Roam Secure, Inc, a company that provides text message alert systems to corporations and some

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<sup>17</sup> Testimony of John M. Lawson, President and CEO, Association of Public Television Stations, “Senate Hearing, July 27, 2005.

<sup>18</sup> Information on CAP at [[http://www.incident.com/cookbook/index.php/CAP\\_Fact\\_Sheet](http://www.incident.com/cookbook/index.php/CAP_Fact_Sheet)]. Viewed August 11, 2005.

<sup>19</sup> Testimony of Reynold N. Hoover, Director, Office of National Security Coordination, FEMA, Department of Homeland Security, Senate Hearing, July 27, 2005.

<sup>20</sup> Testimony of Christopher Guttman-McCabe, Assistant Vice President, Homeland Security & Regulatory Policy, CTIA-The Wireless Association, Senate Hearing, July 27, 2005.

<sup>21</sup> Testimony of John M. Lawson, Senate Hearing, July 27, 2005.

<sup>22</sup> “Arlington and XM Satellite Radio Partner for Emergency Alert Broadcasts,” Government Technology, August 3, 2005.

governments, including Arlington and Fairfax Counties in Virginia and the District of Columbia. XM Satellite Radio is also a participant in the IPAWS Digital Emergency Alert System pilot.

## Proposals and Progress

Advocates of all-hazard warning systems are seeking interoperability among warning systems, standardized terminology, and operating procedures in order to provide emergency alerts and information that reach the right people, in a timely manner, in a way that is meaningful and understood by all. In 1999, FEMA and the Departments of Commerce and Agriculture took the lead in a multi-agency working group to explore ways to create an all-hazard warning network.<sup>23</sup> Their recommendations included using NWR as the backbone for a national all-hazard warning system and the establishment of a permanent group to promote improvements in warning systems. The following year, the National Science and Technology Council at the White House sponsored a report that explored the types of technologies and systems that are used or could be used for emergency alerts.<sup>24</sup> Among its recommendations were: the creation of a public-private partnership that would bring all stakeholders together; one or more working groups to address issues such as terminology, technology, location-specific identifiers and cost-effective warning systems; system standardization; and increasing the number of communications channels for warnings. The report concluded that substantial improvements in early warning systems could be achieved through coordination and better use of existing technologies.

Also in 2000, a public-private, multi-disciplinary group was organized as the Partnership for Public Warning (PPW). In 2002, the group received funding<sup>25</sup> to convene meetings and prepare comments regarding the Homeland Security Advisory System (HSAS). Workshop findings were later expanded into recommendations in “A National Strategy for Integrated Public Warning Policy and Capability.” The purpose of the document was to “develop a national vision and goals” for improving all-hazard warning systems at the federal, state and local levels. PPW suggested that the Department of Homeland Security (DHS) take the lead in developing a national public warning capability. The PPW discussed the role of an alert system in public safety and homeland security and concluded that current procedures are “ineffective.” PPW’s recommendations centered on developing multiple, redundant systems using various technologies with common standards that would be “backward compatible” with EAS (including Amber Alert codes) and National Weather Service technologies.

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<sup>23</sup> National Partnership for Reinventing Government, “Saving Lives with an All-Hazard Warning Network,” 1999, at [<http://www.nws.noaa.gov/om/all-haz/all-haz1.htm>]. Viewed August 8, 2005.

<sup>24</sup> National Science and Technology Council, Working Group on Natural Disaster Information Systems, Subcommittee on Natural Disaster Reduction, “Effective Disaster Warnings,” November 2000 [[http://www.sdr.gov/NDIS\\_rev\\_Oct27.pdf](http://www.sdr.gov/NDIS_rev_Oct27.pdf)]. Viewed August 24, 2005.

<sup>25</sup> Funding came from FEMA, the National Science Foundation, the National Weather Service, the U.S. Geological Survey, and private sources

In June 2004, PPW published an overview of emergency alert and warning systems.<sup>26</sup> It subsequently scaled back its activities for lack of funding.<sup>27</sup> The FCC, however, acting on recommendations from PPW and the Media Security and Reliability Council, has issued a Notice of Proposed Rulemaking concerning EAS, seeking comment on how EAS can be improved.<sup>28</sup> The department of Homeland Security is advancing in the testing and probable nationwide deployment of a multi-media alert and warning system using digital technology as part of its Integrated Public Alert and Warning System (IPAWS) program, discussed above.

## Recent Legislation

The Intelligence Reform and Terrorism Prevention Act (P.L. 108-458) has requirements for a study about the use of telecommunications networks as part of an all-hazards warning system. The study is to be led by the Secretary of Homeland Security, in consultation with other Federal agencies, as appropriate, and participants in the telecommunications industry. Its goals are to consider the practicality of establishing a telecommunications-based warning system that would also provide information to individuals on safety measures that might be taken in response to the warning. The legislative proposal specifies that technologies to consider would be “telephone, wireless communications, and other existing communications networks . . .”.<sup>29</sup> The act also requires a pilot study using technology now being used for an Amber Alert network, to improve public warning systems regarding threats to homeland security. This is to be conducted by the Secretary of Homeland Security in consultation with the Attorney General, other federal agencies, the National Association of State Chief Information Officers, and other stakeholders in public safety systems.<sup>30</sup> According to testimony, FEMA is seeking to finalize an agreement with NASCIO to incorporate an Amber Alert web portal pilot into other, broader-based pilots. These pilots are being coordinated through FEMA’s Office of National Security Coordination as part of the IPAWS program.<sup>31</sup>

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<sup>26</sup> PPW, “Protecting America’s Communities: An Introduction to Public Alert and Warning,” June 2004.

<sup>27</sup> Memorandum to PPW Members, June 30, 2004.

<sup>28</sup> FCC, News, August 4, 2004, “Commission Seeks Comment on Rule Changes for the Emergency Alert System,” Headlines at [<http://www.fcc.gov>]. Notice of Proposed Rulemaking, EB Docket No. 04-296, available at the FCC website E-Filing/EDOCs link. Comments can be found by going to the E-Filing/ECFS. In ECFS, click “Search for Filed Comments,” insert “04-296” in the box marked “Proceeding,” and then search the file.

<sup>29</sup> Study Regarding Nationwide Emergency Notification System, Intelligence Reform and Terrorism Prevention Act, Title VII, Sec. 7403.

<sup>30</sup> Pilot Study to Move Warning Systems Into the Modern Digital Age, Intelligence Reform and Terrorism Prevention Act, Title VII, Sec. 7404.

<sup>31</sup> Testimony of Reynold N. Hoover, Director, Office of National Security Coordination, FEMA, Department of Homeland Security for the Senate Committee on Commerce, Science and Transportation, Subcommittee on Disaster Prevention and Prediction, “All-Hazards Alert Systems,” July 27, 2005.

## Emergency Alerts and the 109<sup>th</sup> Congress

There are at least three parts to a warning system: 1) detection of a problem and the communication of the danger to a warning system; 2) dissemination of the warning through communications networks; and 3) information about actions to take in response to the warning or in the aftermath of disaster. In a natural disaster where there is good predictive capability, such as a hurricane, emergency alerts work fairly well. In a man-made disaster, such as a terrorist attack or a chemical spill, the current warning systems in the United States are vulnerable to failure. Too often, the warning is not communicated to any alert system. Communications with people most in need of information and assistance after a disaster is constrained by inadequate systems and often complicated by damage to communications infrastructure. Due to insufficient planning and preparation, there is often confusion about responsibility, priorities, and needed actions. Some observers have noted that the most effective emergency alerts would be able to empower the “first” first responders, those on the site of the disaster when it occurs. Many have emphasized the need for better oversight and planning for an all-hazard warning system. Experts in public safety and communications have observed that it is both possible and desirable to coordinate the development of information networking technology for various types of emergency responses, maximizing the reach of any warning or alert.

**Tsunami Warnings.** The horrific devastation across the Indian Ocean from the tsunami of December 26, 2004 raised the level of awareness to the need for better systems for detection and warning, as well as the associated steps for preparedness and response. The Administration has announced plans to expand the U.S. tsunami detection and warning capabilities as a contribution of the Global Earth Observation System of Systems, or GEOSS — the international effort to develop a comprehensive, sustained and integrated Earth observation system. The plan commits a total of \$37.5 million over the next two years.<sup>32</sup> Congressional bills that have measures to improve all-hazard warning systems in the United States include S. 50 (Senator Inouye) and H.R. 396 (Representative Menendez). These two bills provide different perspectives on emergency alert planning, activation and response but they both recognize the need for aggressively advancing the development and deployment of warning systems. S. 34 (Senator Lieberman) would strengthen tsunami detection and warning systems worldwide but focuses on detection and communications among authorities and does not include provisions specifically for improving emergency alerts to the general populace.

**S. 50.** The Tsunami Preparedness Act (Senator Inouye) builds on the Administration’s plan for an improved tsunami monitoring system. Additionally, the bill would improve federal coordination and would establish a task force of representatives of federal agencies, coastal states and territories.<sup>33</sup> The bill directs the Administrator of NOAA to maximize the effectiveness of detection and warning

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<sup>32</sup> Plans for An Improved Tsunami Detection and Warning Systems, Fact Sheet, [<http://www.ostp.gov/html/TsunamiFactSheet.pdf>], located on NOAA’s Tsunami Page at [<http://www.tsunami.noaa.gov/>]. Both sites viewed August 8, 2005.

<sup>33</sup> From Remarks by Senator Ted Stevens on the introduction of S. 50, *Congressional Record* for January 24, 2005, published January 25, 2005.

systems for U.S. coastal communities and to take actions to assist other countries in achieving similar goals. The main purposes of the bill are<sup>34</sup>

- Improve tsunami detection, forecast, warnings, notification, preparedness, and mitigation.
- Extend coverage of existing Pacific Tsunami Warning System to include other vulnerable areas such as the Caribbean, Atlantic Coast and the Gulf of Mexico.
- Increase efforts to improve forecasting, preparedness, mitigation, response and recovery, including education and outreach.
- Provide technical and other assistance to international efforts.
- Improve federal, state, and international coordination for tsunami and other coastal hazard warnings and preparedness.

System components covered in the bill include a number of provisions for detection and information sharing and require a communications infrastructure to alert communities vulnerable to the occurrence of a tsunami.<sup>35</sup> Program components include outreach, education, preparedness and risk management.<sup>36</sup> The bill authorizes a tsunami research program that includes communications technology.<sup>37</sup> The NOAA Administrator, in consultation with the Assistant Secretary of Commerce for Communications and Information<sup>38</sup> and the Federal Communications Commission, is to investigate the potential for improved communications systems for hazard warning networks.<sup>39</sup> Technologies mentioned include telephones, cell phones and other wireless devices, satellite communications, the Internet, automated alerts on television and radio, and technologies that might be suitable for reaching remote areas at a low cost. Provisions for assistance on a global level include technical assistance to international organizations in developing a global tsunami warning system. Also, the NOAA Administrator is to give priority in assisting vulnerable areas with needs such as planning, obtaining detection and reporting equipment, and establishing communications and warning units.<sup>40</sup> To achieve the various goals set forth in the bill, the Tsunami Preparedness Act authorizes \$35 million annually beginning with FY2006, through 2012.<sup>41</sup>

**H.R. 396.** The Early Warning and Rapid Notification Act (Representative Menendez) provides for the establishment of U.S. programs lead primarily by the Department of State and the United States Agency for International Development

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<sup>34</sup> S. 50, Sec. 2. (b).

<sup>35</sup> S. 50, Sec. 3 (b) (3) (F).

<sup>36</sup> S. 50, Sec 4 (c).

<sup>37</sup> S. 50, Sec. 5.

<sup>38</sup> Administrator of National Telecommunications and Information Administration (NTIA).

<sup>39</sup> S. 50, Sec. 5 (b).

<sup>40</sup> S. 50, Sec. 7.

<sup>41</sup> S. 50, Sec. 8.

(USAID),<sup>42</sup> to give technological and financial support to foreign countries for the development of all-hazard warning systems, and to strengthen existing lines of communication for the dissemination of information on disasters.<sup>43</sup> The bill centers on early warning systems, the work of organizations such as the International Early Warning Program,<sup>44</sup> and the contributions of USAID to international detection and warning programs. The Secretary of State is to lead a study that would evaluate the effectiveness of existing communications links and ways to improve them.<sup>45</sup> The bill provides for assistance, through the Department of State and USAID, for international programs that enhance effective public warning systems.<sup>46</sup> The bill would also expand the scope of American research on public warning systems by providing for sharing results, where appropriate, with the international community.<sup>47</sup> Specifically, it would broaden the scope of the Study Regarding Nationwide Emergency Notification System and the Pilot Study to Move Warning Systems Into the Modern Digital Age — required by the Intelligence Reform and Terrorism Prevention Act — to include a component for evaluating the applicability of various alert technologies to other countries.<sup>48</sup> The Secretary of State, cooperating with the Department of Homeland Security, the Federal Communications Commission and the Assistant Secretary of Commerce for Communications and Information (Administrator of the National Telecommunications and Information Administration), among others, is to lead these research activities.<sup>49</sup> Other responsibilities involve the study of evolving technologies that could be used in providing all-hazard warnings in the United States and abroad.<sup>50</sup> The named agencies are also to study the role of satellites, wireless technology and radio frequency assignments in providing emergency alerts, working with the World Radio Conference<sup>51</sup> and other international forums.<sup>52</sup> Authorizations for appropriations to

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<sup>42</sup> USAID is an independent federal government agency that receives overall foreign policy guidance from the Secretary of State. It provides economic and humanitarian assistance in over 100 countries [<http://www.usaid.gov/>].

<sup>43</sup> H.R. 396, Sec. 3.

<sup>44</sup> The International Early Warning Program, which has been planned for two years, is to be created by the United Nations to increase international cooperation in the development of warning systems and related programs.

<sup>45</sup> H.R. 396, Sec. 5 (a).

<sup>46</sup> H.R. 396, Sec. 6 (a).

<sup>47</sup> H.R. 396, Sec. 6 (b) (1).

<sup>48</sup> H.R. 396, Sec. 6 (b) (2).

<sup>49</sup> H.R. 396, Sec. 6 (b).

<sup>50</sup> H.R. 396, Sec. 6 (b) (3). Specific technologies mentioned are “broadcast media, wireline and wireless telephones, other wireless devices, instant messaging via computer, and electronic bulletin boards.”

<sup>51</sup> The World Radio Conference is the forum for the negotiation of international agreements that coordinate and enable global telecommunications. It is held under the aegis of the International Telecommunication Union (ITU), a specialized agency of the United Nations.

<sup>52</sup> H.R. 396, Sec. 6 (b) (4).

cover the programs would be \$10 million for each fiscal year from 2006 through 2010.

***Tsunami Detection.*** The Global Tsunami Detection and Warning System Act (S. 34, Senator Lieberman) deals almost exclusively with provisions for improving detection of tsunamis and the earthquakes that generate them. Programs that would include identifying deficiencies in existing systems worldwide, increasing the number of sensors for detecting tsunamis, and improving predictive capabilities and communications infrastructure would be the responsibility of the Secretary of Commerce, working with the Secretaries of State and of the Interior, where appropriate.<sup>53</sup> The bill provides the sense of Congress that the President of the United States should convene an international conference on global tsunami detection and warning.<sup>54</sup> The Secretary of State, working with the Secretary of Commerce, is to prepare and implement a strategy that would provide for a global network for detection and warning for tsunamis.<sup>55</sup> This strategy is to include a “warning communications system involving telephone, Internet, radio, fax, and other appropriate means to convey warnings as rapidly as possible to all potentially affected nations.”<sup>56</sup> Authorizations provide for \$30 million for FY2005 and \$7.5 million for each FY2006 through 2014.<sup>57</sup>

***Other Bills.*** A bill comparable to S. 34 has been submitted in the House (H.R. 499, Representative Shays). Other bills include S. 361 (Senator Snowe); S. 452 (Senator Corzine); H.R. 882 (Representative Boehlert); H.R. 890 (Representative Pallone); H.R. 1584 (Representative Weldon); and H.R. 1674 (Representative Boehlert) — are concerned with tsunami detection and the initial stages of notification.

***Planning for the Future.*** Shortcomings of public safety warning systems in the United States include

- Limited distribution channels (e.g., EAS uses broadcast and cable, NWR is closely linked to radio).
- Limited interoperability among separately administered networks (e.g., EAS messages provide some commonality but there is no coordination for activating all networks with the same alert).
- Insufficient clarity regarding the responsibility for transmitting alerts.
- Limited flexibility in responding to new types of emergencies.
- Limited ability to identify levels of danger and provide direction for actions to be taken by the general public; there are shortcomings

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<sup>53</sup> S. 34, Sec. 2 (a).

<sup>54</sup> S. 34, Sec. 3 (a).

<sup>55</sup> S. 34, Sec. 4 (a).

<sup>56</sup> S. 34, Sec. 4 (a) (7).

<sup>57</sup> S. 34, Sec. 5.

both in the capacity of technology to relay detailed messages and in planning for consistency and coherence.

- Limited reach in distance, in time, and in culturally-aware communications.
- Insufficient solutions to reach the handicapped or impaired.
- Inadequate back-up and redundancy.
- Lack of contingency planning.
- Insufficient ability to define, recognize and contact virtual communities.
- Insufficient attention to the deployment of new technologies and the encouragement of public-private partnerships.

The reports to Congress from the Secretary of Homeland Security and the FCC process of rule-making for EAS will provide additional information for Congress about warning systems and may lead to additional legislative activity.

## Other Federal Emergency Warning Systems

Federal agencies administer numerous emergency notification systems. Briefly noted below are other warning systems that are used to warn the public and authorities.<sup>58</sup>

**National Warning System (NAWAS).** In 1957, the National Warning System (NAWAS) was established.<sup>59</sup> NAWAS, still in use as an operational warning system, is a dedicated telephone network that FEMA administers and uses to coordinate with national, regional, state, and local emergency management officials.<sup>60</sup> Today the system connects over 22,000 national, regional, state and local emergency management offices. NAWAS disseminates emergency information and instructions.<sup>61</sup>

**Federal Emergency Management System (FEMIS).**<sup>62</sup> FEMIS is an independent network of different communication devices that operate over various media (microwave, fiber optics, and wireline). The U.S. Army installs and operates the system and notifies state and local emergency management officials in the vicinity of chemical and biological weapon stockpiles designated for destruction of

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<sup>58</sup> The systems are described in detail in *Effective Disaster Warnings*, Report by the Working Group on Natural Disaster Information Systems, Subcommittee on Natural Disaster Reduction, National Science and Technology Council, Committee on Environment and Natural Resources, November 2002 [[http://www.fema.gov/pdf/rrr/ndis\\_rev\\_oct27.pdf](http://www.fema.gov/pdf/rrr/ndis_rev_oct27.pdf)]. Viewed August 8, 2005.

<sup>59</sup> Harry B. Yoshpe, *Our Missing Shield: The U.S. Civil Defense Program in Historical Perspective* (Washington: Federal Emergency Management Agency, 1981), p. 537.

<sup>60</sup> *Effective Disaster Warnings*, p. 52.

<sup>61</sup> Federation of American Scientists [<http://www.fas.org/nuke/guide/usa/c3i/nawas.htm>]. Viewed August 8, 2005.

<sup>62</sup> Federal Emergency Management System [<http://www.pnl.gov/femis>]. Viewed August 8, 2005.



accidental, terrorist, or criminal release of the chemical and biological weapon stockpiles. The system provides digital image files of the contaminated geographical area.<sup>63</sup>

**Homeland Security Advisory System (HSAS).** HSAS, the system most recently established in response to the terrorist attacks of September 11, 2001, provides a color coded terrorist attack warning system to federal, state, and local authorities, as well as the public. At this date, Office of Homeland Security (OHS) manages HSAS, with guidance from the U.S. Attorney General. Daily advisories are posted on the Internet, and the Attorney General notifies the federal, state and local authorities of any change to the advisory color code. Public warnings, resulting in a change to the color code, are issued through statements made by the OHS through the media.<sup>64</sup>

**Advanced Weather Information Processing System.**<sup>65</sup> AWIPS is a telephone network administered by the Weather Forecast Office (WFO), which is part of NWS. This network is a dial-up telecommunications link, also accessible by an Intranet server, that provides for two-way exchange of severe weather information between the weather tracking and news industry and NWS.<sup>66</sup> This system is used primarily by the NWS to inform the weather tracking and news industry of severe weather, which is then reported to the public through the news media.<sup>67</sup>

**Emergency Managers Weather Information Network (EMWIN).**<sup>68</sup> EMWIN is a satellite communications network operated by NWS. EMWIN broadcasts severe weather information to a commercially marketed 1610MHz radio that provides weather warnings to the public and emergency management officials.<sup>69</sup>

**NOAA Weather Wire Service (NWWS)**<sup>70</sup>. NWWS is operated by NWS and transmits severe weather information to mass news disseminators and emergency

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<sup>63</sup> National Science and Technology Council, *Effective Disaster Warnings*, p. 51.

<sup>64</sup> "Homeland Security Advisory System," Department of Homeland Security Press Room [[http://www.dhs.gov/dhspublic/interapp/press\\_release/press\\_release\\_0046.xml](http://www.dhs.gov/dhspublic/interapp/press_release/press_release_0046.xml)]. Viewed August 8, 2005.

<sup>65</sup> Field Systems Operation Center [<http://www.nws.noaa.gov/ops2/>]. Viewed August 8, 2005.

<sup>66</sup> National Science and Technology Council, *Effective Disaster Warnings*, p. 33.

<sup>67</sup> Tim Putprush, Federal Emergency Management Agency, Mt. Weather Emergency Operations Center, telephone conversation with Shawn Reese, December 16, 2002.

<sup>68</sup> EMWIN Implementation Report, Computer Sciences Corporation, September 28, 2001 [<http://iwin.nws.noaa.gov/emwin/Report.htm>]. Viewed August 8, 2005.

<sup>69</sup> National Science and Technology Council, *Effective Disaster Warnings*, p. 50.

<sup>70</sup> NOAA Weather Wire Service [<http://www.nws.noaa.gov/nwWS>]. Viewed August 8, 2005.

management officials. The severe weather information is transmitted by weather satellites and then broadcasted to the public via NWR or EAS.<sup>71</sup>

The systems briefly described in Table 1, below, are intended to warn the public, federal officials, state and local authorities, or the weather tracking and news industry, of imminent danger to public health and safety.<sup>72</sup>

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<sup>71</sup> National Science and Technology Council, *Effective Disaster Warnings*, p. 32.

<sup>72</sup> Tim Putprush, Federal Emergency Management Agency.

**Table 1. Federal Emergency Warning Systems**

<b>Warning system</b>	<b>Type of threat</b>	<b>Primary administering agency</b>	<b>Warning recipients</b>	<b>Information issued</b>	<b>Required receiving equipment</b>
AWIPS <sup>a</sup>	Severe weather	NWS	Weather tracking and news industry	Satellite weather imagery	Satellite antenna receiver
EAS <sup>b</sup>	Any emergency	Operated by FCC, administered by FEMA	Public, news media	Voice message detailing information and instructions	AM or FM radio, television, or NWR
EMWIN <sup>c</sup>	Severe weather	NWS	Emergency managers, public	Digital message detailing severe weather	1610MHz radio receiver
FEMIS <sup>d</sup>	Chemical and biological weapons designated for destruction contamination	U.S. Army	State and local emergency managers	Digital image files of contaminated geographic area	Dedicated computer network
HSAS <sup>e</sup>	Terrorist attack	DHS	Public, media, and federal, state and local authorities	Color code characterizing terrorist attack risk and needed protective measures	Internet, news media
NAWAS <sup>f</sup>	Any emergency	FEMA	National, regional, state and local emergency managers	Voice message detailing information and instructions	Dedicated telephone network
NWR <sup>g</sup>	Severe weather or any emergency broadcast by EAS	NWS	Public, emergency managers	Voice warnings, watches, forecasts, and advisories	NOAA weather radio
NWWS <sup>h</sup>	Severe weather	NWS	Media, emergency managers	Digital images of severe weather	Satellite antenna receiver

**Source:** National Science and Technology Council, *Effective Disaster Warnings*, and Department of Homeland Security

a. Advanced Weather Information Processing System

b. Emergency Alert System

c. Emergency Managers Weather Information Network

d. Federal Emergency Managers Information System

e. Homeland Security Advisory System

f. National Warning System

g. National Oceanic and Atmospheric Administration Weather Radio

h. National Oceanic and Atmospheric Administration Weather Wire Service