

EVALUATION OF THE APPLICATION OF MOBILE COMMUNICATION SYSTEMS IN CRISIS MANAGEMENT

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Abstract— For an effective crisis management, advanced communications are of great importance. Lack of communication, directly decreases the level of situation awareness of the senior managers and rescuers at place of the accident. Establishing and maintaining lines of direct contact between decision makers, both formal and informal rescuers, government officials and the general public, is a primary objective in all crisis management planning. This article, by applying advances in technology, which allows high dynamism and mobility in telecommunication systems, introduces a new level of flexibility in commanding and operational structures

Index Terms— communications, crisis management, Incident Command System, Emergency Operations Center

I. INTRODUCTION

Military command organization, which has been designed in incident command system and national crises management system, seems to be an acceptable solution for the management of the interface between the operational and emergency communications organizations. When all the contacting ways are destroyed the effective response against the crisis is largely reduced. Establishing and maintaining lines of direct contact between decision makers, both formal and informal rescuers, government officials and the general public, is a primary objective in all crisis management planning. To reduce tensions arising from future crises, extensive maneuvering of emergency communications is very important.

A. Emergency Operations Center

Emergency operations center (EOC) is as the central reference point in emergency communications infrastructures. In addition to synergy and crisis management, emergency operations center operates as communication pole with other governmental levels, the private sector and the general public. The center is a physical location at which the coordination of information and resources is happened. In many areas, emergency operations centers are as the central decision making group for the management of emergency operations.

Emergency operations center in Hawaii, in addition to placing telecommunication and radio systems for emergency, hospitals, police, fire, public institutions and governmental provincial and local agencies, has been also designed to establish operational measures. Existing centers and also support centers of great and complex events have been constructed in a very sturdy stable and central building. The establishment of the emergency operations center at a fixed location has several advantages. Keeping an appropriate distance from the accident site, that is often dangerous and disruptive, up to the headquarters staff, is a crucial issue. Also, at the places where the risk factors are at several areas, for the complex organizational structures, placement of emergency operations center in a relatively large space, for the convenience of representatives with the staff of various agencies, in order to adopt themselves with the local requirements, will be very useful. When the present emergency operations center, in the event of occurrence of incidents, act as a central command and monitoring group. Some obstacles are seen in the connection of decision-making processes to a fixed location at some distance from the scene of the incident. Emergency operations centers with the stations for all the participants with a single operation room pass through a long way to enhance collaboration between local agencies deployed in the room. But in the meantime, communication in the place is still a significant problem. Poor communication with rescuers, reduce the level of knowledge about the circumstances of the accident site the for command staff in the emergency operations centers. Such unfamiliarity with the site of the accident leads to poor decision makings. The problem, which had occurred during the operations of response to the hurricane in March 2000 in Texas, was the lack of a communication system between rescuers at the scene, and crisis managers in the operations center. After disperse of the storm, emergency operations center sent an urban rescue team to city center for starting the process of debris removing. Unfortunately, emergency operations center was not aware of dangerous conditions which were resulted from the fall of glass from tall buildings. Also, the emergency operations

center can be destroyed or become unusable because of an accident during the operation. During Katrina Hurricane in 2005, much of the emergency operations centers in the Gulf had suffered such a fate. Flood in New Orleans in the thirtieth of August, led to the cessation of water flow in the network of emergency operations center and left the municipality without any commanding power of local agents or guidance of federal and state supporters for two days after the storm. In the Waveland of Mississippi, despite the settlement of resources in several public buildings and countryside, winds generated by Katrina Hurricane, destroyed all the communications of command and control. In such cases, the lack of capacity of the direct reaction or disability of effective crisis management is involved.

B. Command of incidents and communication

During the operations, aid and support agencies, hardly rely on communications to support a comprehensive and complex crisis management system. To increase the level of communication between emergency operations centers and rescuers present at the site of the accident, incident management system has adjusted strategies for central headquarters and incident command post (ICP). This headquarter is located at the site of future events and crisis and operates under the instructions of plan in the incident command system. The central headquarter of incident command, in addition to distribution and dissemination of information to the employees of emergency operations crisis, acts as a place for the management and command of incidents at the professional level, in the accident scene. These headquarters have been established by commanders of incidents and following the establishment of these institutions, during the occurrence of events, commanders of incidents perform the following seven actions:

- Directing the initial assessment of the situation and subsequent reassessment.
- Setup, maintenance and control of communication
- Identification of strategies of crisis management, creating an operational plan and assignment of resources.
- Call for additional resources, including the application of emergency operations.
- Establishing an infrastructure of organizational command
- Regular inspections, evaluation and revision of plans of emergency operations and providing continuous commands that are transferable and ending.

When it seemed that emergency operation center and central headquarter of incident command could be placed next to each other scientifically and theoretically, keeping a clear boundary between these two, was established in order to provide flexibility in the hierarchy of command and the hope to reduce the disconnection. For example, if an emergency action is required when the commanders of the incidents guide the rescuers at the accident scene, senior managers in crisis

management center can adopt logistical decisions such as providing emergency resources. In the incident of severe flooding of Tucson in 1993, following the actions of emergency operation center and incident command system, authorities and commanders sought to find a way to connect these structures to each other. In summary, the role of crisis management center is to focus on decisions of political measures of city, resource allocation, planning and operation of public information and at the same time, the role of incident command system is to assume responsibility of commanding and control of events occurring in the city.

C. Command and mobile communications

In small accidents, the central headquarter of incident command can act as a crisis management center. A telecommunications center in place provides apparent advantages for conducting sensitive and often dangerous operations, due to high awareness of the conditions. Mobile control command was used successfully on a large scale, in the event of the World Trade Center in 2001. During the terrorist attacks on the World Trade Center, crisis managers, along with the mayor, applied a mobile operation unit to establish command of evacuating the surrounding area of the accident site, which was becoming increasingly dangerous. Industrial developments make rescuers equipped with disposable instruments at fixed operations centers. Commanders of accidents should not rely on fixed emergency operations center in another location in order to achieve maps and searching databases for finding necessary and critical information for the operation of rescue. For example, new technologies that have been widely used in the Northridge earthquake rescue operation consist of computers, cordless phones, geographic information systems, satellite communications and video conference calls. Many of the areas do not have access to the latest computer software and hardware, and telecommunications technologies to deal with national disasters or terrorist attacks. Equipping all emergency operations centers with the latest telecommunication technologies and spatial analysis tools, may be economically inefficient or even infeasible. Such requirements require a rapid and low-cost set of expansion files, for the communication of commanders of incidents with the local agencies and official authorities of crisis at the state and federal level. In such cases, for the regional authorities, supporting a quick solution of expansion files will be a priority for communication and data collection in the event of an accident.

D. Mobile Communication Technology

Transferability of new technologies would be the newest flexibility in the command chain, which as a high level of telecommunication equipment, can be transferred almost to all of the areas by vehicles. Today, employees are able to reach a similar level of communication skills, which in the past was possible only at traditional and fixed crisis center. Combination with a suitable vehicle, simultaneous wireless

voice capability and data transmission, can be expanded almost anywhere, including areas adjacent to the site of crisis. Today, wireless communication technology has become an important part of emergency communications infrastructure that this issue is not only because of its portability, but in general, due to the low cost and the ability to function independently from the vulnerable and fixed wire channel, to send and receive information. Mobile communications, broadly, have increased the quality of information that can be sent by incident command center, spatial data and mapping through wireless networks, from the site of accident to laptops and computers of employees, can be transferred in almost every place. Satellite phone and internet phone systems, broadly, increase the communication on the earth. A satellite phone is a wireless device that uses mobile satellite service to send voice and data. Internet phone systems (internet protocol), convert audio signals and telephone control signals to internet protocol packets and by applying to data networks, operate like traditional phone systems. Employees of crisis management agency of Mississippi, had a system of mobile satellite radios for communication and after the Katrina disaster, it was the only operational mode of communication in this state. Portable satellite phones that were purchased during the Katrina hurricane are now part of the expansion set of the crisis management team of Mississippi State and can assist local authorities as a support system in the event of accidents. Interoperability with each other is often seen as a technical solution for the coordination of emergency operations, especially in the national agencies from different areas. Innovation in interoperable radio system provides the possibility of communicating in a wide range of frequencies for separate systems. This capability can be crucial, since the rescuers at the local level or in rural areas, often work in different frequencies of state agencies and even neighboring areas. For example, during Hurricane Floyd evacuation, aid workers from various state agencies, expressed their helplessness in making a direct connection with national agencies. Personnel of emergency operation center of Department of Transportation of South Carolina, faced difficulty in establishing a communication with state police and other employees of the field, because these agencies used separate radio systems. Advocates of this theory argue that interoperability of radio system could lead to a future that no one will suffer or die because the available information cannot be propagated and dispersed. When industrial developments can improve the status of emergency communications, the possibility of failure of the telecommunications infrastructure may cause the dysfunction of complex equipment. Hurricane Katrina showed that rescuers can never completely rely on satellite telephone and radio systems in the face of disaster. During Hurricane Katrina relief operations, staff of emergency operations, found that almost all forms of communication, such as cordless phones, landlines and satellite phones are deactivated and also the police station of Louisiana State had been disabled due to the frequency that it worked by users. All telecommunications infrastructures of Mississippi Gulf were

destroyed and systems in other parts of the state became unusable and it was while the operational systems were forced to overtime. Many people admire satellite phones especially for emergency communications. Anyway, evidences obtained from Hurricane Katrina suggest that satellite phones may not be the best solution for communicating. It seems that problems of satellite phones may not be stemmed from themselves or via the satellite network, but a combination of user error and buildings and other objects that block the satellite signal path can cause this problem.

E. Mobile operations centers

Federal crisis management agency of the United States preserves a collection of great mobile operating vehicles as part of the Mobile Emergency Response Support (MERS) that have been located separately in strategic areas of the United States. These vehicles have been developed for performing command and communications capabilities for operating teams of federal crisis management agency or to support the state and official authorities. The vehicle used for emergency operations, in mobile emergency response support unit of the federal crisis management agency of United States, has a length of 82 feet in a tug form and weight of 92000 pounds. Part of the sides of this vehicle can be developed to create a working environment with the possibility of living of 20 to 25 personnel of the emergency response team. Other constituent parts of the vehicle include mobile emergency response support operations and communications centers, reception, and a small office for the managers of team. Mobile operations centers, in the form of tug or automotive, create a space for several different agencies and commanders of relief. Also larger vehicles have the capability of transferring greater number of telecommunications equipment and other resources. A major drawback of the vehicles of mobile operations is difficulty in reaching to areas where it is hard to access. When there is a strong need for communication in place, the larger vehicles have a degree of mobility restrictions. When an accident occurs inside the city, larger operating vehicles have navigating difficulty for moving in damaged infrastructures. "Red October" is an instance of operational vehicles which was used by crisis management agency of United States in Hurricane Katrina relief operations. When the flood destroyed much of the city's command and control facilities, senior authorities of agency decided to use this vehicle and they required the provision of command and control in place for their rescue team and also help them to establish a communication with the National Guard zones in Louisiana Superdome. But ultimately, "Red October" was incapable of performing these duties due to its large size. Mobile emergency response support unit of the federal crisis management agency of United States includes a number of rapid response systems to conduct the training operations. This system is a device which consists of two differential vehicles and supports equipment such as satellite terminals, cordless phones, laptop computers, radio, food, water, batteries and generator. Researchers at the Hurricane Katrina raised the

question that" why the agencies did not use a smaller communicating vehicle, such as the rapid response system, when "Red October " faced difficulty in movement or why the agencies did not make any attempt to bring equipment for supporting emergency operations by aircraft?(especially satellite phones)

Commercial producers have supplied smaller communicating and command devices which have greater mobility. A common way of placing a portable telecommunications set in an automotive which is produced and maintained by state and local agencies. Another instance is a system that is placed in the cargo unit of an ordinary pickup truck. Some commercial vendors suggest portable system that can be used in covered truck and be commissioned by regional contractors. Cost of operating systems is economically appropriate for rural and regional areas. A research institute affiliated to the University of Kentucky works on the communication system which are financially acceptable. The purpose of the center of professional operations, which can be carried out by mankind, is to design, test, develop and evaluate a set of technologies of sound, video, data and portable mobile radio systems with the possibility of being transferred by a truck or helicopter. Researchers are looking for a strategy, as a lower-cost solution than equipping all areas with an expensive crisis operations center or command center. Cooperation of research institutions, by funding of the state, in the development of mobile emergency telecommunication systems reduce the costs as compared to systems that have not been created for profit making. Researches show the flexibility of mobile communications and command set. These units have been designed for supporting crisis management operations along with the command organization at accident site. Among the formation of vehicles with the multiple moving capability, to move on land and aquatic environments, units can be quickly created not only for command communications, but also for modeling a wireless weather station with connectivity features, wireless data and capabilities of launching wireless telecommunications networks. On the other hand, as an informal emergency operations center, mobile units can also act as command centers for special events. During the holding of horse racing in 2005, professional portable operations center was assigned to the Kentucky Regional Police, which was responsible for providing monitoring information and had a weather station at the site of this event. Similarly, the city of Chicago in Japan has recently created mobile communication in an important festival which has the capacity to host twenty crisis agencies for coordinating emergency preparedness and their operational potential.

II. CONCLUSION

A question, which is raised for researchers and crisis management agencies, is how to imagine command and mobile telecommunication systems. It seems that some governmental agencies and programs such as SAFECOM and national disaster management system and crisis management

agency of the United States had a satisfactory performance. Personal experiences and recommendations of an employee of professional crisis services indicate that areas of law enforcement, crisis management medical and fire services are valuable resources to develop a supporting strategy for mobile communications. Despite the operational solutions, command and mobile communications centers provide high levels of status information for crisis operations. Report from Hurricane Katrina admires the use of country's internal security fund for investment in the mobile communication device, which provides the possibility of establishing necessary connections between cities and senior officials at the state level. Researches that were conducted by the Senate of America about the operation of Hurricane Katrina, consider the development of regional networks of mobile communications teams to be necessary. The internal security organization of the country should strengthen and reinforce mobile crisis operation teams to provide telecommunication support in the event of accident. Also it must provide secure and mobile communications systems and equipment in mobile communication sets, in regional offices in order to be able to use them when landlines and typical mobile and radio system are damaged. Flexibility of command and mobile communications combines the possibility of optimal mutual balance between rescuers with an ability to act as a communication store to support activities and disseminate information to the general public. Therefore, flexible connections have a special importance for emergency operations. But communications, even wireless systems with the latest technologies, cannot be a useful factor for effective emergency operations. Disaster preparedness, during a series of practices, simulations and maneuvers, especially when new and untested technologies are used, should be considered as a crucial factor.

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