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CORRECTING BLINDNESS IN THE NERVE CENTER: HOW TO IMPROVE SITUATIONAL AWARENESS

by

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December 2015

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Even though success or failure depends on it, situational awareness in emergency operations centers is often poorly prioritized. These centers depend on situational awareness to manage information, coordinate resources, and support executive-level decision making. Having limited or poor situational awareness forces emergency responders to act without all the information needed to make good decisions, leading to poor coordination and ineffective response.

In order to identify opportunities for improving situational awareness, this thesis used a qualitative case study approach to examine the level of importance situational awareness plays in the emergency operations center during disasters, and to identify both good and poor practices. Examining four case studies through an organizational-change analytic framework revealed that situational awareness is a system of interconnected elements that include task, structure, people, and technology.

This thesis concludes that situational awareness in the emergency operations center can be improved by employing an emergency operations center situational awareness organizational model. Investments must be made in improving all elements of the organization. The research determined that the intelligence process is an ideal model for defining how situational awareness can be established, maintained, and shared.

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CORRECTING BLINDNESS IN THE NERVE CENTER: HOW TO IMPROVE SITUATIONAL AWARENESS

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LIST OF ACRONYMS AND ABBREVIATIONS

AAR	After Action Report
COP	Common Operating Picture
CPG	Comprehensive Preparedness Guide
DHS	Department of Homeland Security
EOC	Emergency Operations Center
ESF	Emergency Support Function
FDNY	New York Fire Department
FEMA	Federal Emergency Management Agency
HSIN	Homeland Security Information Network
HSPD	Homeland Security Presidential Directive
ICS	Incident Command System
MACS	Multiagency Coordination System
NIMS	National Incident Management System
NJ ROIC	New Jersey Regional Operations and Intelligence Center
NRF	National Response Framework
NYPD	New York Police Department
OIG	Office of Inspector General
OODA	Observe, Orient, Decide, Act
PPD	Presidential Policy Directive
SA	Situational Awareness
SEOC	State Emergency Operations Center

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is that this work will help improve our capabilities, making life easier in the bunker for the years to come.

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I. INTRODUCTION

In the National Football League, quarterback Tom Brady of the New England Patriots is considered one of the all-time great quarterbacks. Football experts claim that Brady's ability to instantaneously read and anticipate what the opposing defense intends to do, align personnel to the offense's advantage and play with a deep sense of his surroundings has made him one of the best quarterbacks of all time. When the ball is snapped, it is not Brady's athleticism or arm strength that distinguishes him from other quarterbacks; rather, it is his ability to step back in the pocket, interpret and fully understand what is going on around him, and execute accordingly that gives his team the best chance for success.

In an emergency operations center (EOC), obtaining a comprehensive understanding of an emerging or ongoing emergency is called situational awareness (SA).Emergency managers, like Brady, must understand the extent of impacts, availability of resources and assessment of progress, shortfalls and challenges to effectively facilitate an emergency response. Where Brady's failure can result in the loss of a first down or even cost his team the game, an emergency manager's failure to recognize and appreciate an incident's complexity and the consequences of decisions can result in catastrophic fallout, including the loss of life.

A. BACKGROUND

Major disasters, incidents and large-scale, pre-planned events have shown that effective emergency response requires involvement from all levels of government, as well as private and non-government support. Response and recovery efforts rely heavily on coordination and collaboration to respond effectively to the consequences of such complex events.SA and a shared common operating picture (COP)[1] enable first responders on scene to be in sync with supporting entities, including local or state

[1] According to the *National Incident Management System*, the common operating picture is defined as: "An overview of an incident created by collating and gathering information—such as traffic, weather, actual damage, resource availability—of any type (voice, data, etc.) from agencies/organizations in order to support decision making." See Department of Homeland Security, *National Incident Management System* (Washington, DC: Department of Homeland Security, 2008), 23.

emergency operations centers, area hospitals, fusion centers, and federal coordination centers. By collecting information, assessing all the variables—including impacts, needs, environment, resources, among others—emergency managers rely on SA to make critical response decisions. In its simplest form, SA is knowing what is going on around you.[2]

Over the last several years, SA has been identified as a key area of needed improvement for response coordination.[3] In 2005, the response to Hurricane Katrina showed just how critical SA is and how devastating the consequences can be when it is poor.[4] In *Managing Crises, Responses to Large-Scale Emergencies,* Howitt and Leonard of Harvard University explain the lack of SA in Katrina resulted in the "failure to expedite the evacuation of New Orleans sufficiently in advance of the storm, failure to anticipate the substantial number of individuals who could not self-evacuate…slow or inadequate response to the breach of the levees, and lack of awareness of the conditions faced by people sheltered in the New Orleans Superdome and the convention center."[5] In the aftermath, the general public and media questioned the government's response, demanding to know why so many had to suffer and why response efforts were not better.

At the federal level, poor SA led to ineffective support to the impacted states. One of the lessons learned, and a subsequent recommendation, was to create a national operations center as a means to "coordinate the National response and provide situational awareness and a common operating picture for the entire Federal government."[6] More locally, the *Federal Response to Hurricane Katrina Lessons Learned* report noted that "officials from national leaders to emergency responders on the ground lacked the level of situational awareness necessary for a prompt and effective response to the

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[2] Mica Endsley and Debra Jones, *Designing for Situation Awareness: An Approach to User-centered Design*, 2nd Edition (Boca Raton, FL: CRC Press, 2012), 13.

[3] The need to improve situational awareness was noted in after action reports for the 1995 Glendale, California train accident, 2001 September 11 terrorist attacks,2005 Hurricane Katrina, 2008 Northeast U.S. ice storm, 2011 Christchurch, New Zealand Earthquake, 2012 Hurricane Sandy, etc.

[4] Hereafter referred to as "Katrina."

[5] Arnold Howitt and Herman Leonard, *Managing Crises: Response to Large-Scale Emergencies* (Washington, DC: CQ Press, 2009), 8.

[6] The White House, *The Federal Response to Hurricane Katrina Lessons Learned* (Washington, DC: The White House, 2006), 36, http://library.stmarytx.edu/acadlib/edocs/katrinawh.pdf.

catastrophe."[7] The report goes on to conclude that "the lack of communication and situational awareness had a debilitating effect on the Federal response."[8] This report also cites the cascading effects of poor SA where resources, commodities and key decisions such as evacuations were negatively impacted, which resulted in the loss of life, difficult sheltering operations and prolonged displacement of the impacted community. Katrina is not the only example of how poor SA can negatively impact effective response; a number of after action reports (AAR), articles and news stories point to the critical importance of SA.

B. PROBLEM STATEMENT

In essence, emergency response SA is the assessment and understanding of the situation at hand. Having limited or poor SA forces emergency responders to act without the information needed to facilitate an effective response. In the emergency operations center (EOC),SA is distinctly complex; it involves understanding a complicated situation from a remote location, and refining and sharing that understanding by information collection, analysis and dissemination. EOCs play a critical role during an incident by serving as centralized interagency coordination points where one of the key responsibilities includes obtaining good SA and providing COP to the multidiscipline response effort.SA is extremely important to decision making during high-stress, time-constrained conditions. One of the common points of EOC failure is maintaining SA.[9]

Federal homeland security and emergency management doctrine on EOC SA lack a common definition. Despite SA's criticality in EOC, there is no clearly defined process or framework for establishing and maintaining SA throughout an emergency. This thesis demonstrates emergency management organizations do have clearly defined processes to establish and maintain SA, but the literature primarily focuses on the challenges and consequences. Most emergency response policies and procedures at the local, state and

[7] Department of Homeland Security, *The Federal Response to Hurricane Katrina*, 41.

[8] Ibid., 50

[9] FEMA, *EOC Management and Operations* (G775 Resource Guide) (Washington, DC: Department of Homeland Security, 2012), 5.4, https://www.preparingtexas.org/Resources/documents/TDEM%20Training/RG_COMPLETE_Dec2012.pdf.

federal levels indicate that SA is essential during emergency response, but the policies lack guidance on how to plan, organize, train, exercise and evaluate developing and maintaining SA.

Many incident AARs suggest improving SA; without guidance or best practices, however, many organizations are left to speculate how this elusive concept should be addressed. Further, corrective action plans that address this problem also lack detail and clarity for guided improvements.

C. RESEARCH QUESTION

EOCs serve as centralized coordination points, sometimes referred to as nerve centers, where multi-agency, multi-discipline and multi-jurisdiction coordination and decision making supports on-scene response.SA in the EOC is the process of understanding evolving, and in many cases complex, situations and refining that understanding by information gathered through intelligence analysis and reporting. The focus of this research is to obtain an understanding of SA in EOCs in order to guide best practices and improvements.

The primary question for this study is:

- How can SA in the EOC be improved?

Without sound SA, officials at all levels cannot effectively meet their goals and missions. Whether it is deploying resources, providing information to the public or coordinating response activities, SA is critical to success for emergency responders.

In asking, “How can SA in the EOC be improved?” many other questions surface. Additional questions that helped refine and focus the research included:

- What is the policy of SA in the EOC?
- What are the challenges or barriers that impede SA in the EOC?
- How can best practices or other models improve SA in EOCs?
- Could the intelligence process model be used to address challenges with SA in the EOC?
- What is the relationship between technology and SA in the EOC?

D. SIGNIFICANCE OF RESEARCH

Recommendations in the aftermath of the September 11, 2001, terrorist attacks and more recent catastrophic events continue to highlight the need for improved situational awareness at all levels of government in response to devastating events. In the *9/11 Commission Report*, numerous references indicate that too many silos existed within local, state and federal agencies and departments, and that situational awareness limited a coordinated and interagency response.[10] Four years later, in Katrina, SA was again identified as a key challenge to improving emergency response coordination. The tens of thousands of victims and survivors of Katrina and September 11th alone demonstrate how critical it is for emergency managers to be able to perform their jobs at a high level. Situational awareness during emergency response is critical to decision making and enables multi-agency response coordination.SA allows emergency managers to assess the situation, understand impacts and organize a response to meet the challenges at hand.

The following chapter provides context for the research problem; the emergency management discipline, emergency operations center and situational awareness are explored. It is with this understanding that the reader can fully appreciate the problems associated with this study, the complexities at hand and the importance of addressing poor SA in EOCs.

[10] National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report* (New York: W. W. Norton, 2004), 321.

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II. BACKGROUND

In order to answer the first thesis question—about how SA in EOCs can be improved—one must first understand the tenets of emergency management, be able to recognize the critical role of the EOC during a disaster and appreciate SA's importance. It is with this understanding that the reader can begin to have an appreciation for the complexities and nuances of this study. This chapter provides a synopsis of the government's role during emergencies, discusses emergency management and reviews emergency operations centers.

A. ROLE OF GOVERNMENT

When a disaster strikes, people look to the government for aid and assistance. Firefighters, police officers, emergency medical technicians and other emergency responders plan and train to respond in a systematic manner.[11] Community agencies are the first to respond to a threat or hazard, and they "depend on the leadership and engagement of local government, civic leaders, and private sector businesses and organizations" during times of duress.[12] The public wants to know what to do before, during or after a disaster, what assistance is available and how their government is there to serve and protect them.

Emergency managers at the local or jurisdictional level work to develop community plans and capabilities to prepare for, respond to and recover from emergencies and disasters with an all-hazards approach. For larger incidents, communities may activate their EOC to assist on-scene incident responders with acquiring and tracking additional resources, providing incident information and facilitating executive-level decision making. As resources are exhausted at the local level and mutual aid cannot keep up with the demands of the response, local agencies and departments may look to state resources for support.

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[11] George Haddow, Jane Bullock, and Damon P. Coppola, *Introduction to Emergency Management*, 5th edition (Oxford, UK: Butterworth-Heinemann, 2014), 181.

[12] FEMA, *Developing and Maintaining Emergency Operations Plans* (CPG 101, Version 2) (Washington, DC: Department of Homeland Security, 2010), 2–3.

Each state has a dedicated emergency management office that is responsible for state-level support and coordination. As a result of the Federal Civil Defense Act of 1950 and the Cold War, each state is now mandated to form a civil defense agency in case of enemy assault.[13] The mission and focus of emergency management has since evolved to include preparation and coordination for all hazards, incidents and planned events. For example, the Massachusetts Emergency Management Agency is "charged with ensuring the state is prepared to withstand, respond to, and recover from all types of emergencies and disasters, including natural hazards, accidents, deliberate attacks, and technological and infrastructure failures."[14] For widespread emergencies, the state may activate its state EOC (SEOC) to coordinate a multi-agency, multi-discipline response. The SEOC provides support to incident commanders by assisting with identifying, acquiring and tracking additional needed resources, maintaining situational awareness of current response actions and forecasting progress, and facilitating executive-level decision making. The SEOC serves as a coordination point where many incident commanders and community EOCs can work with a centralized location for support.

At the federal level, the Federal Emergency Management Agency (FEMA) is responsible for coordinating the federal government's response efforts prior to and during a disaster. On April 1, 1979, President Jimmy Carter signed Executive Order 12127, which created FEMA and merged a number of disaster-related responsibilities of various agencies and departments.[15] Today, FEMA's mission is "to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards."[16] The statutory authority that gives FEMA "the responsibility for coordinating government-wide disaster relief efforts" is the Robert T. Stafford Disaster Relief and Emergency Assistance Act, which was signed into law (Public Law 100–707) on

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[13] Wilbur Cohen and Evelyn Boyer, "Federal Civil Defense Act of 1950: Summary and Legislative History," *Social Security Bulletin* (April 1951): 11–16.

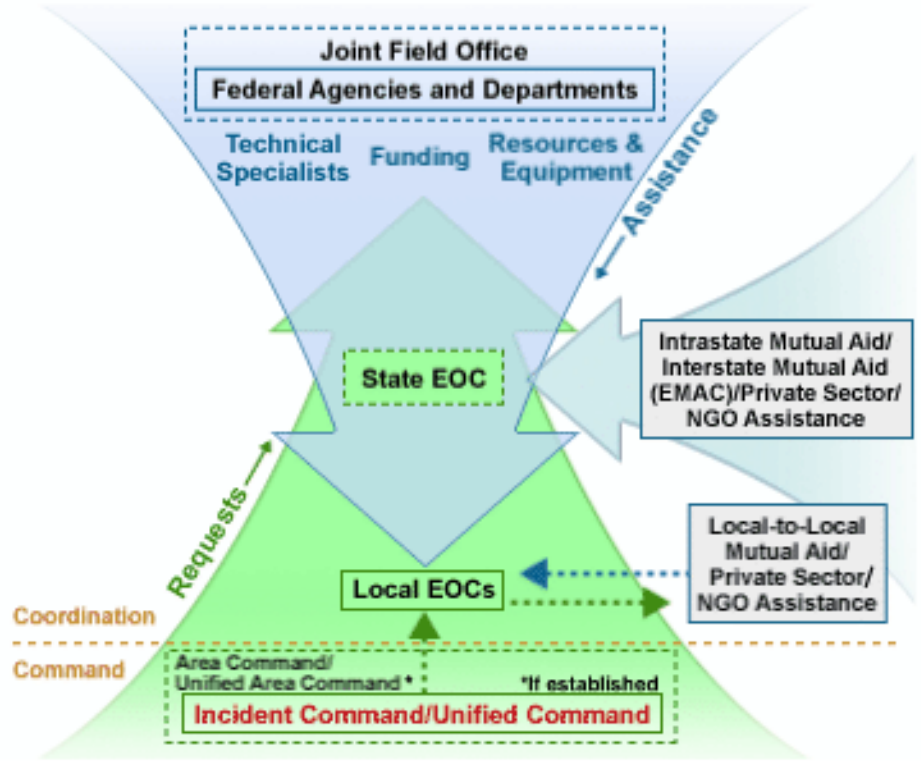
[14] "MEMA Mission," Massachusetts Emergency Management Agency, accessed December 10, 2015, http://www.mass.gov/eopss/agencies/mema/mema-mission.html.

[15] "About the Agency," FEMA, accessed December 10, 2015, http://www.fema.gov/about-agency.

[16] "About the Agency," FEMA.

November 23, 1988.[17] The Act is intended to provide "an orderly and continuing means of assistance by the Federal government to State and local governments carrying out their responsibilities to alleviate the suffering and damage which result from such disasters."[18] As states anticipate or overwhelm their capabilities and need federal assistance, FEMA activates its National Response Coordination Center and applicable regional response coordination centers.[19] These national EOCs serve as coordination centers for deploying federal support to large-scale emergencies. Figure 1 provides a visual representation for the flow of assistance during these large-scale emergencies.

Figure 1. Flow of Assistance during Large-Scale Incidents



Source: Department of Homeland Security, *National Incident Management System* (Washington, DC: Department of Homeland Security, 2008), 36.

[17] "About the Agency," FEMA.

[18] FEMA, *Robert T. Stafford Disaster Relief and Emergency Assistance Act, as amended, and Related Authorities as of April 2013*, Pub. L. 93-288, as amended, 42 U.S.C. 5121 et seq. (2013).

[19] FEMA, *FEMA National Incident Support Manual* (Washington, DC: Department of Homeland Security, 2011), 4–7.

While many definitions exist within the literature, this thesis uses FEMA's established definitions, as emergency management organizations at all levels look to FEMA for guidance and program consistency. According to FEMA, emergency management is:

> Organized analysis, planning, decision-making, and assignment of available resources to mitigate (lesson the effect of or prevent), prepare for, respond to, and recover from the effects of all hazards. The goal of emergency management is to save lives, prevent injuries, and protect property and the environment if an emergency occurs.[20]

More succinctly, FEMA defines emergency management as, "the managerial function charged with creating the framework within which communities reduce vulnerability to hazards and cope with disasters."[21] Both definitions are helpful to understand emergency management as a discipline and the role emergency managers play before, during and after an emergency.

B. EMERGENCY OPERATIONS CENTERS

During large-scale or escalating incidents and events, EOCs support on-scene response and recovery efforts. NIMS provides guidance and structure when it comes to Multiagency Coordination Systems (MACS) to include EOCs.[22] In FEMA's EOC Management and Operations training course, an EOC is defined as "a central location from which government—at any level—can provide interagency coordination and executive decision making in support of incidents or disasters."[23] At an EOC, agency representatives train and operate according to emergency operations plans and procedures, leverage available technologies to meet the tasks at hand and support on-scene responders. They can provide this support by enhancing SA, coordinating

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[20] FEMA, "Introduction to Emergency Management Course," 1995, Visual 10.2.

[21] FEMA, "Emergency Manager: An Orientation to the Position"(IS-0001a), accessed December 10, 2015, https://emilms.fema.gov/is1a/index.htm.

[22] Multiagency Coordination System (MACS) are defined by NIMS as: A system that provides the architecture to support coordination for incident prioritization, critical resource allocation, communications systems integration, and information coordination. MACS assist agencies and organizations responding to an incident. The elements of a MACS include facilities, equipment, personnel, procedures, and communications.

[23] FEMA, *EOC Management and Operations*, 2.5.

resources, executing executive-level decision making and providing information to the public.

In order for the EOC to operate to its fullest potential, SA must be established and maintained throughout the event. Federal doctrine defines SA as:

- "The ability to identify, process, and comprehend the critical elements of information about an incident."[24]
- "Information gathered from a variety of sources that, when communicated to emergency managers and decision makers, can form the basis for incident management decision-making."[25]
- "The ability to identify, process, and comprehend the critical information about an incident. More simply, it is knowing what is going on around you. Situational awareness requires continuous monitoring of relevant sources of information regarding actual incidents and developing hazards."[26]
- "An overview of an incident created by collating and gathering information—such as traffic, weather, actual damage, resource availability—of any type (voice, data, etc.) from agencies/organizations in order to support decision making."[27]

Because of the multi-disciplinary composition and use of ICS, EOCs play a critical role in maintaining SA. They are well positioned to collect, analyze and disseminate information that provides a better holistic understanding of the event or incident. Incident commanders can rely on EOCs to provide this information or SA, which is the foundation of providing effective response. Therefore, when activated, EOCs play a critical role during emergency response, where on-scene incident commanders can rely on the EOC to facilitate multiagency coordination. Whether it is providing essential incident information, coordinating mutual aid, organizing and tracking resources or providing information to the public, the EOC provides first responders with an essential capability. Of the EOC's many benefits, however, without SA, the EOC's impact can be limited.

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[24] FEMA, *EOC Management and Operations*, Unit 1 Appendix.

[25] *Homeland Security Act of 2002*, Pub. L. No. 107-296, 116 Stat. 2135 (2002).

[26] Department of Homeland Security, *National Response Framework*, 48–49.

[27] Department of Homeland Security, *National Incident Management System*, 23.

C. CHAPTER SUMMARY

This chapter provided a basic understanding of emergency management, the critical role the EOC plays during emergencies and the importance of SA. By providing this context upfront, the reader understands how these terms and concepts are used in this work and how they relate to one another, and recognizes the inherent challenges and the significance of this thesis research. The following chapter serves as a literature review for relevant works on emergency response situational awareness. This chapter offers a broad view for what currently exists in the literature both from an academic and practitioner perspective.

III. LITERATURE REVIEW

This literature review illuminates SA's definition, academic study and related technology. It centers on studies, news stories, hearings, incident AARs and journal articles relative to emergency response SA. The review begins by examining existing literature related to events that have shown major SA deficiencies, which provides the basis for the research problem. Next, federal and military doctrine defining SA is reviewed; emergency response officials often use this doctrine to guide policy, procedure and planning when preparing for future response actions. Then, a broader academic review is discussed to provide context and a wider understanding of SA from other communities of practice and domains. Finally, as EOCs depend on a wide variety of technologies to support SA activities—and since it is almost impossible to discuss SA in the EOC without referring to technology—literature that helps explain the role of technology in enhancing SA is discussed. The chapter concludes by illuminating gaps found within the literature.

A. POLICY

In an effort to build emergency response capabilities, a number of policy directives, frameworks, goals, and strategies have been developed that serve as strategic vision for national preparedness. These frameworks provide guidance for all levels of government responsible for preparing, mitigating, preventing, protecting, responding to and recovering from all-hazards. When roles and responsibilities for all levels are defined, coordination and collaboration efforts are maximized.

Over the last 15 years, a number of emergency response-related presidential directives have been issued under Presidents George W. Bush and Barack Obama. Homeland Security Presidential Directive (HSPD)-5, *Management of Domestic Incidents*, issued on February 28, 2003 by President Bush, is a key directive relevant to this thesis.HSPD-5, one of the policy directives issued as a result of lessons learned from 9/11, required the development and implementation of the National Incident Management

System (NIMS).[28] NIMS "provides a systemic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size location, or complexity, in order to reduce the loss of life and property and harm to the environment."[29] SA in NIMS falls under Component II: Communications and Information Management, and it contains an important component called the Incident Command System (ICS).According to NIMS, "ICS is a widely applicable management system designed to enable effective, efficient incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure."[30] Within the literature, ICS is a proven system that is widely accepted and utilized. First responders use ICS for all types of emergencies, but especially for larger, multi-agency responses.

Additional literature relevant to policy implications centers on national preparedness. To strengthen the United States' security and resilience, President Obama signed Presidential Policy Directive (PPD)-8, *National Preparedness*, on March 30, 2011.[31] Through systemic preparedness for all hazards, the directive establishes the National Preparedness Goal and the National Preparedness System. Together, the Goal and the System provide agencies and departments at all levels with strategic guidance to build consistent capabilities in preventing, protecting, mitigating, responding to and recovering from all-hazards.

Issued in May 2013, the National Response Framework (NRF), one of five national planning frameworks, provides guidance on federal response to emergencies and

[28]George W. Bush, *Management of Domestic Incidents* (HSPD-5) (Washington, DC: Department of Homeland Security, 2003), 1.

[29] Department of Homeland Security, *National Incident Management System*, 1.

[30] Ibid., 45.

[31] Barack Obama, *Presidential Policy Directive 8:National Preparedness* (PPD-8) (Washington, DC: Department of Homeland Security, 2011), http://www.dhs.gov/presidential-policy-directive-8-national-preparedness.

disasters that can be "built on scalable, flexible, and adaptable concepts."[32] SA's importance is consistently referenced in the NRF when the framework speaks to building and maintaining core capabilities.

B. DEFINING SITUATIONAL AWARENESS

One of SA's most fundamental issues as it relates to emergency response and recovery is the lack of a common definition or common understanding. Analysis of federal doctrine and military guidelines on SA provides background on current policy. When reviewing federal doctrine, two fundamental problems exist. First, SA definitions vary and are often given different meanings across the related policy documents. Second, the term is often used in concert with common operating picture (COP), but no description of the terms' relationship is provided. For example, varying definitions of SA can be found in the *Homeland Security Act of 2002*, NRF and NIMS.[33] The 2013 (or second) edition of the NRF, assumes that a common understanding exists, as neither definitions nor references are provided. Definitions and references can only be found in the first edition of the NRF, released in 2008, in which a considerable amount of guidance highlights its importance; this edition also suggests that SA is the first key action in emergency response, and that gaining and maintaining SA is essential to a more rapid multiagency response.[34] It is important to point out that, in the first NRF edition, the phrase "common operating picture" is referenced several times, but without definition. In looking at NRF editions, pictures and COP are not defined collectively in a single edition, nor is it described how they relate and support each other. More importantly, the current NRF minimizes situational awareness altogether. The NRF and NIMS are supposed to establish a common baseline, set of standards and set of terminology for emergency response. The lack of clear and consistent definitions is the baseline for examining how EOCs utilize SA.

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[32] Department of Homeland Security, *National Response Framework* (Washington, DC: Department of Homeland Security, 2013), i.

[33] *Homeland Security Act of 2002*, Pub. L. No. 107-296, 116 Stat. 2135 (2002).

[34] Department of Homeland Security, *National Response Framework*, 9, 48–49.

The military has perhaps the longest history with SA, making it a source of best practices information.[35] As a concept, situational awareness originates with John Boyd—a fighter pilot and arguably "one of the most influential military strategists of our time."[36] Of his many achievements, Boyd developed the "observe, orient, decide, act" (OODA) loop.[37] Boyd was concerned with how fighter pilots make decisions in combat and suggested that the quicker a pilot could observe, orient, decide and act in a given situation, the better chances he had to defeat the adversary. Today, Boyd's work helps describe SA as an approach to decision making in general.[38] Further, the military clearly defines SA and expands on its purpose and intent in the *Army Field Manual 1–02*, defining situational awareness as:

> Knowledge and understanding of the current situation which promotes timely, relevant, and accurate assessment of friendly, enemy, and other operations within the battlespace in order to facilitate decision making. An informational perspective and skill that fosters an ability to determine quickly the context and relevance of events that are unfolding.[39]

Though some defining commonalities exist, there are a number of differing definitions for SA, and in some cases current federal doctrine overlooks or ignores its importance altogether.

C. CHALLENGES

As previously noted, responses to large-scale emergencies over the past several years have revealed that SA continues to be a recurring problem for emergency managers. Katrina exposed the devastating consequences of government officials, emergency managers and other organizations operating without good SA, which in this case impacted tens of thousands of people. Within the literature, this is a common

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[35] Mica R. Endsley, "Toward a Theory of Situational Awareness in Dynamic Systems," *Human Factors* 37, no. 1 (1995), 32.

[36] "John Boyd, the OODA Loop, and Near Real-Time Analytics," *TIBCO Blog*,July 11, 2013, http://www.tibco.com/blog/2013/07/11/john-boyd-the-ooda-loop-and-near-real-time-analytics/.

[37] "John Boyd, the OODA Loop, and Near Real-Time Analytics," *TIBCO Blog.*

[38] Ibid.

[39] Department of the Army, *Operational Terms and Graphics* (FM 1-02, MCRP 5-12A) (Washington, DC: Department of the Army, 2014), vii.

finding.[40] Additional major disasters that attribute poor emergency response to a lack of SA include the September 11, 2001 terrorist attacks, the 2008 Northeast U.S. ice storm, the 2011 Christchurch, New Zealand Earthquake, and 2012's Hurricane Sandy. This section analyzes literature on these events to help understand the challenges related to maintaining SA in the EOC.

During the September 11 terrorist attacks in New York City, the lack of situational awareness was caused by a culture of silos within response agencies and departments, leading to poor communication and coordination between responders.[41] This is further supported by then-Battalion Fire Chief Joseph W. Pfeifer of the New York Fire Department (FDNY)—the first FDNY fire chief to take command at the World Trade Center on 9/11. In numerous articles, books and testimony, Pfeiffer claims that individual departments' and employees' biases led to poor SA.[42] Pfeifer remains a champion of unified command systems to break down silos and personal biases, and very little literature exists to counter his claims.

The 2008 Northeast U.S. ice storm impacted several states and left millions without power. Literature indicates that technology, rather than organizational bias, was to blame for the lack of SA among emergency managers.[43] Data on utility outages, restoration and priority was not leveraged, and literature abundantly suggests that technologies could have assisted in collecting and displaying this critical information for decision makers.

In the response to the 2011 Christchurch, New Zealand Earthquake, it was lack of a clearly defined process that led to poor situational unawareness. A series of AARs and

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[40] For example, seventeen after action reports were examined in "Emergency Preparedness: Secondary Hazards Associated with Severe Winter Weather," FEMA, April 1, 2013, http://www.fema.gov/media-library-data/1428698658311-274e348a17a33766968e4d7acec8cb56/CE_TA_WinterStormsTrend_508cFinal_Revised_10Apr15.pdf. Difficulty of maintaining SA was a trend found in this analysis.

[41] National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report*, 321.

[42] Bongar et al. (eds.), *Psychology of Terrorism* (New York: Oxford University Press, 2007), 207.

[43] New Hampshire Public Utilities Commission, *After Action Review: December '08 Ice Storm Final Report* (Concord, NH: New Hampshire Public Utilities Commission, 2009), https://www.puc.nh.gov/2008IceStorm/Final%20Reports/PUC%20IceStorm%20After%20Action%20Report%2012-03-09.pdf.

articles reveal that critical information, while available in many cases, were not managed, shared or used by decision makers.[44] This resulted in unorganized response efforts that delayed relief for some of the most damaged parts of the city. As a result of the shortcomings, New Zealand changed its policy and doctrine to improve SA in the EOC by establishing a proven practice, such as the intelligence process.

Finally, the common theme found within the literature on New Jersey and New York's response to 2012's Hurricane Sandy was that organizational structure made the biggest differences in success and failure. In New Jersey, the literature indicates that SA in the EOC was a success—the New Jersey Regional Operations and Intelligence Center (NJ ROIC) utilized their structures and systems to collect and disseminate critical emergency information to stakeholders and provided decision makers the information they required.[45] In New York City, however, literature illuminates numerous issues with maintaining and sharing SA and associated consequences, though there is not sufficient evidence to explain why SA in the EOC was not as successful.

D. ACADEMIC STUDIES

When it comes to studying situational awareness over the last 25 years, one of the leading and founding authors on the topic is Mica R. Endsley. In her two articles, "Toward a Theory of Situation Awareness in Dynamic Systems" and "Measurement of Situation Awareness in Dynamic Systems," Endsley studies a number of human factors and links performance and decision making to situational awareness.[46] Endsley's work focuses on SA in the domains of aviation, transportation, power systems, and military, and defines situational awareness as "the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the

[44] Ian McLean et al., *Review of the Civil Defence Emergency Management Response to the 22 February Christchurch Earthquake* (Christchurch, New Zealand: Christchurch Migrant Inter-Agency Group, 2012), 40.

[45] Christian Schulz and Raymond Guidetti, "Fusion during Crisis: Aftermath of a Perfect Storm," *DomPrep Journal* 9, no. 5 (May 2013): 18.

[46] Endsley, "Toward a Theory of Situation Awareness"; Mica R. Endsley, "Measurement of Situation Awareness in Dynamic Systems," *Human Factors* 37, no. 1 (March 1995): 65–84.

projection of their status in the near future."[47] Endsley goes on to break down SA into three levels: perception, comprehension, and projection.[48] Maintaining that this theoretical framework considers human performance and cognition, which is critical in her theory of SA, Endsley also argues that situational awareness is not simply the collection of data; it is understanding this data and using it to predict outcomes. In most cases, Endsley's work is used as a foundation for other scholars in the field. For example, in a report for the Center for Naval Analysis, *Defining and Measuring Shared Situational Awareness*, Albert Nofi suggests that situational awareness is more of an art than a science because so many variables exist. Nofi describes common SA errors in three levels: failure of perception, inability to integrate or comprehend data, and lack of or incorrect information.[49] Here, Nofi follows Endsley's notion that situational awareness is more than just data collection, and that perception and comprehension is vital to its success. By applying this concept to the homeland security domain, policy makers and practitioners could develop strategies to avoid pitfalls when developing situational awareness.

E. TECHNOLOGY

Technologies that support emergency response SA are discussed abundantly in literature; there are hundreds of information technology systems, and their support is considered essential in managing and sharing incident information, and supporting decision making, communications, information sharing, notification, and damage assessment.[50] Today, SA is developed via several different modes. There are a variety of

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[47] Mica R. Endsley, "Designing for Situation Awareness in Complex System," In *Proceedings of the Second International Workshop on Symbiosis of Humans, Artifacts and Environment* (2001), 4.

[48] Endsley, "Designing for Situation Awareness," 4–5; Level 1:Perception of the elements in the environment, Level 2:Comprehension of the current situation, Level 3:Projection of future status.

[49] Albert A. Nofi, *Defining and Measuring Shared Situational Awareness* (Alexandria, VA: Center for Naval Analysis, 2000), 54–55; Level 1—failure of perception, person does not think it is part of SA, Level 2—inability to integrate or comprehend data, Level 3—lack of or incorrect information.

[50] For example, Virtual Alabama and Emergency Management Information Tracking System was highlighted and applauded during the Hearing before the House of Representatives Committee on Homeland Security, *Has the Department of Homeland Security Improved its Ability to Maintain Situational Awareness Since Hurricane Katrina?* (June 20, 2007), 42,

methods for achieving, maintaining and sharing situational awareness.[51] For example, at the federal level, the Department of Homeland Security (DHS) created the Homeland Security Information Network (HSIN) to provide situational awareness for officials at all levels. Measuring the effectiveness of SA technologies, however, is a challenge; despite spending an estimated $231 million on HSIN over nine years, information sharing across the homeland security enterprise has yet to be fully achieved.[52]

A common theme within the literature related to technology is the issue of information overload. SA can be adversely affected by the abundance of and reliance on technology today. Endsley supports this argument, suggesting that the information gap of "what you know" versus "what you need to know" is one of the most difficult to overcome.[53] The challenge of the information age is that there is simply more information than anyone can handle.

F. GAPS IN LITERATURE

While initial studies on SA generally began in the late 1980s, recent studies that break down SA before and during emergency response are much more limited. The literature speaks to SA's importance, but not how it should be established during emergency response, how policies and procedures should incorporate this important subject, or how it can be improved.

Examples and outcomes of poor SA in EOCs are well documented. The literature does not illuminate, however, how SA is similar or different to on-scene incident response and how it is established and maintained. A number of incident AARs and hearings indicate that poor SA led to ineffective decision making, but literature on best

[51] Virtual Social Media Working Group and DHS First Responders Group, *Using Social Media for Enhanced Situational Awareness and Decision Support* (Washington, DC: Department of Homeland Security, 2014), 8; tools to communicate SA include: radio, paper maps, landlines, email, cellular phones, satellite phones, mobile data, computer-aided dispatch for incident and unit status, crisis management systems crisis management systems (e.g., E-Team, WebEOC), traffic cameras, amateur radios, enhanced 911, reverse 911, mobile text alerts, global positioning services (GPS) for the location of response vehicles, geographic information systems (GIS), windshield assessments, and traditional media (e.g., television, radio).

[52] Department of Homeland Security Office of Inspector General, *Homeland Security Information Network Improvements and Challenges* (Washington, DC: Department of Homeland Security, 2013), 20.

[53] Endsley, "Designing for Situation Awareness," 1.

practices of SA in an EOC are fairly limited. One way of improving SA that is indicated in the literature is by identifying and developing ways to address and mitigate common challenges.[54] While a reverse engineering approach like this may enable emergency responders to avoid the pitfalls, clear and direct guidance is not offered on how to implement policy that improves SA in the EOC.

Additional research on decision making and SA may illuminate challenges, strategies, and approaches that are transferable to an EOC setting. Further, research on decision making and information processing theories may provide additional schools of thought on SA. Lastly, applying techniques such as the intelligence process may provide a way to address and improve SA in the EOC, as cited as a proven practice in both the New Zealand earthquake and Hurricane Sandy cases. Looking into these and other communities of practice may help the EOC understand SA's broader context and ways to address challenges.

G. CHAPTER SUMMARY

This literature review provided the state of knowledge related to emergency response SA to show that SA remains an unaddressed issue. The research indicates that there are a variety of reasons for poor SA, involving personnel historical bias, procedures and organizational structure, overreliance on technologies or utilizing data to limit data overload. The literature clearly shows what can happen with poor SA in EOCs and highlights its importance. However, the literature does not adequately provide guidance on how to utilize training or procedures to address issues.

The next chapter describes the research method and analytical framework used to examine the data collected.

[54] U.S. Coast Guard, *Team Coordination Training Student Guide: Situational Awareness* (8/98) (Washington, DC: Department of Homeland Security, 2014), 5–6, https://www.uscg.mil/auxiliary/training/tct/chap5.pdf.

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IV. RESEARCH DESIGN

This thesis examines the challenges of SA in the EOC during emergency response. In the previous chapter, SA in the EOC was described as a system, consisting of numerous interconnected elements including people, structures, procedures and technologies. This chapter describes the research design strategy that was employed, how data was collected and the method used to critically analyze the data.

A. METHOD

This thesis used a qualitative case study approach to examine the level of importance that SA plays in the EOC during disasters and to identify both good and poor practices. Positive practices are identified when a review indicates that good SA was accomplished and that this SA played a critical role in a successful emergency response. Practices that either cause or result in poor SA are categorized as negative practices if they negatively impacted emergency response. The case study method provides an analytic framework for collecting data and, according to Raya Fidel of the University of Washington, presents an opportunity to produce "findings of relevance beyond the individual cases."[55] Understanding both the causation and patterns of challenges will answer the research question concerning how situational awareness can be improved, and can help draw conclusions. In an article on analyzing qualitative data, Pat Bazeley suggests using a three-step process: describe, compare and relate.[56] Using this simple process, data on situational awareness practices is described, compared and related to other literature.

This study examines four cases: the 2001 September 11 terrorist attacks at the World Trade Center, the 2008 Northeast U.S. ice storm, the 2011 Christchurch, New Zealand earthquake, and the 2012 Hurricane Sandy. These cases were selected because they represent a diverse range of hazards and impacts over the last 15 years and due to

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[55] Raya Fidel, *The Case Study Method: A Case Study*, (Seattle, WA: University of Washington, 1984), 27,http://faculty.washington.edu/fidelr/RayaPubs/TheCaseStudyMethod.pdf.

[56] Pat Bazeley, "Analysing Qualitative Data: More than 'Identifying Themes,'" *Malaysian Journal of Qualitative Research* 2, no. 2 (2009): 9.

the availability of open-source materials specific to the research problem. The main sources of data used in this research include existing emergency operations center SA policy, AARs from incident response in EOCs, journals, government official hearings and testimony, official military and (U.S. and New Zealand) government doctrine, books and newspaper articles. Analyzing the responses to these events gleans qualitative data that can be studied to identify positive and negative practices.

B. ANALYTIC FRAMEWORK

The analytic framework for this study was Leavitt's Diamond, a respected and tested model for organizational change. Because SA in the EOC can be thought of as a system comprised of interconnected components, Leavitt's Diamond provides an ideal framework for collecting and organizing the data for causes and effects. Developed by American psychologist Harold J. Leavitt in 1965, Leavitt's Diamond argues that organizations are complex systems that have four distinct variables: task, structure, people and technology.[57] Leavitt states that it is important to understand how each of the components works with one another, as they all rely on each other in order for an organization to operate at its fullest ability.

In thinking about SA in the EOC as a system of components, understanding the system in its entirety is important. Donella Meadows, in her book, *Thinking in Systems: A Primer*, asserts, "A system is an interconnected set of elements that is coherently organized in a way that achieves something. If you look at that definition closely for a minute, you can see that a system must consist of three kinds of things: *elements*, *interconnections*, and a *function* or *purpose*."[58] Recognizing what produced the poor results can lead to effective changes for overall, system-wide improvement. Analyzing the case studies' SA through Leavitt's Diamond provides an opportunity to observe and

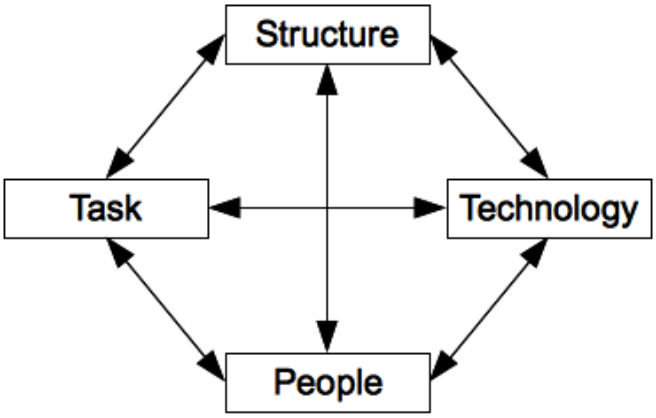
[57] Harold J. Leavitt, "Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches," in *Handbook of Organizations*, J.G. March (ed.), 114–1170 (Chicago: Rand McNally, 1965), 1144.

[58] Donella H. Meadows, *Thinking in Systems: A Primer* (White River Junction, VT: Chelsea Green, 2008), 10.

understand the components' relationships to help identify challenges and provide insight into new opportunities.

In design, Leavitt's Diamond is based on the premise that change rarely occurs in isolation.[59] Therefore, if one of the components were to undergo a set of changes, all of the other components must be changed as well to compensate. Figure 2 illustrates the dependencies and interconnectedness where task, structure, people and technology all rely on one another, as indicated by the arrowheads.

Figure 2. Leavitt's Diamond



Source: Meghan Vincent, "Who Is Harold Leavitt…And Why Should You Care?," Richard Levin and Associates, October 3, 2011, http://blog.richardlevinassociates.com/who-is-professor-harold-leavitt-and-why-should-you-care/.

In a piece titled "Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches," Leavitt qualifies each of the components shown in Figure 2, describing them as follows:

> *Task* in [Figure 2] refers, of course, to the industrial organizations' *raison d'être*: the production of goods and services, including the large numbers of different but operationally meaningful subtasks that may exist in complex organizations.

[59] Patricia Cichocki and Christine Irwin, *Organization Design: A Guide to Building Effective Organizations* (London: Conan, 2011), 29–30.

> *Actors* refers chiefly to people, but with the qualification that acts executed by people at some time or place need not remain exclusively in the human domain.
>
> *Technology* refers to direct problem solving inventions like work-measurement techniques or computers or drill presses. Note that both machines and programs may be included in this category.
>
> Finally, *structure* means systems of communication, systems of authority (or other roles), and systems of work flow.[60]

According to Leavitt's Diamond, for change to occur successfully, one cannot change factors in isolation, as experience has shown there will be problems.[61] For example, if a change is implemented for a task, people will have to be trained on the new task, structures may require assigning more skilled or qualified people to do the task and technologies would need to be modified to support the new task, structure and people involved. The research question in this thesis seeks to identify improvement opportunities; this organizational change model provides a complete framework. Further, if improving centers in EOCs were to include implementing a process—such as the intelligence process—what impacts on the system or organization would have to be considered and accounted for? For example, would the organizational structure have to change? Would people require additional training to acquire the necessary skills? And how would technology have to be adjusted to support implementing the intelligence process? Rather than examining one element for an ideal improvement, a more thorough investigation provides not only a more complete set of recommendations, but, according to Leavitt, it also maximizes the organization's ability to improve SA.

In Chapter V, the four cases are examined through Leavitt's Diamond. First, for each case, the reoccurring or underlying theme found within the literature is identified according to Leavitt's Diamond. The theme and case selection for each of the components is based on the availability of relevant sources; some cases were rich in information for one component, but not for others. For example, the literature on the

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[60] Leavitt, "Applied Organizational Change," 1144.

[61] Catherine Smith and Bob Norton, "Leavitt's Diamond and the Flatter Library: A Case Study in Organizational Change," *Library Management* 13, no. 5 (1992): 18–22.

2011 Christchurch, New Zealand earthquake had a significant amount of information on the lack of defined processes and plans (task) for SA, but lacked detailed and compelling evidence for structure, people and technology. A potential limitation of this approach includes the possibility of missing data and associated findings from a case for the other components. The case studies were assigned to one of the four Leavitt's Diamond components:

- Task: 2011 Christchurch, New Zealand earthquake
- Structure: 2012 Hurricane Sandy
- People: 2001 September 11 terrorist attacks, World Trade Center
- Technology: 2008 Northeast U.S. ice storm

Analyzing the issues in these cases helps to identify the real cause(s) of the problem and potential solutions.[62] Classifying and analyzing a case for each of Leavitt's components provides a comprehensive analysis that critically explores data in a controlled, unbiased and concise manner.

C. CHAPTER SUMMARY

This chapter described how a qualitative case study approach provides insight into how SA in the EOC can identify positive and negative practices. Analyzing one real-world crisis for each of the components of Leavitt's Diamond provides data that can be used to examine themes and trends. Analyzing SA in the EOC with this approach helps break down complex problems and narratives into a more manageable set of behaviors, issues and findings. These findings can then be used to identify areas of opportunity and ultimately answer the research question regarding how SA in the EOC can be improved.

The following chapter examines situational awareness in the response to a terrorist attack, ice storm, earthquake and hurricane. Each case study includes the background of the event, an analysis of the data that was collected and an outline of subsequent findings.

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[62] Bjorn Andersen and Tom Fagerhaug, *Root Cause Analysis: Simplified Tools and Techniques*, 2nd edition (Milwaukee, WI: ASQ Quality Press, 2006), 12.

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V. ANALYSIS

This chapter analyzes four events through the lens of Leavitt's Diamond, in which organizations are made of up four basic, interdependent components: task, structure, people and technology (see Figure 2 in Chapter IV). Examining practices and policy for effective and ineffective SA in the EOC helps explain why maintaining good SA continues to challenge emergency managers, and possibly helps identify ways this can be improved. For each component of Leavitt's Diamond, a case study analysis of an event provides deeper understanding of the issues and interactions with the other components.

A. TASK: 2011 CHRISTCHURCH, NEW ZEALAND EARTHQUAKE

Task, or process, looks at *what* you are trying to achieve and *how* you plan to achieve the associated goals. The 2011 Christchurch, New Zealand earthquake provides valuable insight for both the challenges experienced in the aftermath of an event and the best practices as a result of post-disaster reform. New Zealand and the United States have similar emergency management structures, hazards and culture; the following analysis provides enormous comparative insight into how and why SA in the EOC is a challenge, as well as a solution to consider.

1. Event

On February 25, 2011, Christchurch, New Zealand suffered catastrophic losses as a 6.3 magnitude earthquake killed 185 people and injured several thousand.[63] The earthquake violently rocked the city midday, with much of the population outside of their homes when buildings began to collapse. This tragic earthquake caused severe damage to thousands of homes, businesses and other critical infrastructure. In response, the New Zealand government "declared a state of National Emergency" to provide relief support to local agencies and departments.[64]

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[63] "Christchurch Earthquake Kills 185," New Zealand History.net, February 22, 2011, http://www.nzhistory.net.nz/page/christchurch-earthquake-kills-185.

[64] Ian McLean et al., *Review of the Civil Defence Emergency Management Response*, 31.

2. Analysis

At the national, regional and local levels, there were major gaps in emergency response protocols during this disaster that slowed response and recovery efforts. A series of after action reporting efforts highlighted the need to improve coordination across all levels of government through policy change. An independent review commissioned by the Ministry of Civil Defence and Emergency Management was published in 2012, and provided an extensive review of critical findings, issues, challenges and recommendations. The executive summary of the review identified poor SA as a critical finding, citing, "of significance was the failure to convert the large inflow of raw information into intelligence and a common situational awareness…A strategic plan for information collection and intelligence analysis was lacking and there was little development of a 'common operating picture.'"[65] The lack of situational awareness in the Christchurch Response Center had cascading effects, and is referred to as an issue in many other areas of the review. Response organizations had a difficult time with information management and broad awareness regarding impacts and damages among response officials was near non-existent therefore, hindering their ability to deploy response and recovery activities. As such, the negative practice in this case was the lack of a plan that provided officials with a process for collecting, analyzing and disseminating incident information.

EOCs at all levels were also unable to establish SA to support decision making and coordination. In assessing the performance of the EOC, the review found that, "late into the night there was a huge amount of information available to the EOC but they did not have good situational awareness. The information was not being adequately analyzed and that analysis was not informing controllers and agency commanders in order to make the best operational decisions."[66] Of the review's many recommendations, improved situational awareness in the EOC was highlighted several times, where it is advised that national, regional and local emergency management policies and incident management systems should address and emphasize the importance of situational awareness.

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[65] Ian McLean et al., *Review of the Civil Defence Emergency Management Response*, 14.

[66] Ibid., 40.

Today, emergency management in New Zealand has been revamped. According to the Minister of Civil Defence, it has significantly improved as a result of the 2011 Christchurch earthquakes.[67] New Zealand implemented significant policy changes as a result of the major earthquake to address EOC SA. For example, the interagency *Corrective Action Plan* for the Christchurch Earthquake, a subsequent report, recommended the development of an Emergency Management Information System (EMIS).[68] This new system was designed to improve information sharing and interoperability between agencies. The EMIS further emphasized exchanging liaison officers among EOCs to best maintain situational awareness.[69]

In working to implement the recommendations from the after action review and the corrective action plan, the Ministry of Civil Defence Emergency Management released the *Response Management, Director's Guideline for CDEM Group and Local Controllers* document in October 2014.This document goes to great lengths to address and improve the many challenges experienced in the Christchurch earthquake, including EOC situational awareness. The document establishes a clear purpose for the EOC: "to provide a central location from which key response organizations can provide interagency coordination and decision making."[70] The guide goes on to provide extensive direction on EOC SA, and emphasizes the need for key functions, including "information management, which is the collection, evaluation, collation, analysis and dissemination of information, both internally and externally."[71] In designing and developing the EMIS and refining SA policy in the EOC, New Zealand now utilizes the intelligence model, a clear and concise structure and methodology that provides EOC personnel with a clear understanding of how to establish, maintain and distribute SA.

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[67] Nikki Kaye, "Christchurch Earthquake Lessons Completed," Scoop, October 20, 2015, http://www.scoop.co.nz/stories/PA1510/S00333/christchurch-earthquake-lessons-completed.htm.

[68] Ministry of Civil Defence & Emergency Management, *Corrective Action Plan—Following the Review of the Civil Defence Emergency Response to the 22 February 2011 Christchurch Earthquake* (Wellington, New Zealand: Ministry of Civil Defence & Emergency Management, 2012), 5.

[69] Ministry of Civil Defence & Emergency Management, *Corrective Action Plan*, 13.

[70] Ministry of Civil Defence & Emergency Management, *Response Management: Director's Guideline for CDEM Group and Local Controllers* (Wellington, New Zealand: Ministry of Civil Defence & Emergency Management, 2014), 36.

[71] Ministry of Civil Defence & Emergency Management, *Response Management*, 37.

3. Findings

Critically examining the issues seen in the Christchurch earthquake exposes the causes and results of poorly defined policy and processes for SA in the EOC. At each level of government, emergency responders did not have a clearly defined set of processes or tasks that provided guidance and direction on how critical information was to be collected, analyzed, shared and utilized in supporting response operations. This negative practice resulted in poor response efforts at all levels and had cascading effects.

There was no available literature to help determine whether or not New Zealand's implementation of the intelligence model is a promising practice. To help make this determination, an expanded literature review, outside of New Zealand, was conducted and a number of findings were found in AARs from a 2014 Fusion Center and Emergency Management Collaboration meeting. Officials across the United States met to discuss the benefits and challenges of fusion center and emergency management collaboration. In discussing a major snow storm in the Boston area in 2013, the use of a regional intelligence center and their processes enhanced the EOCs capability to provide critical resources based on the information provided by the intelligence center.[72] The report highlights the benefit of enhanced EOC capabilities around information management, analysis and dissemination when collaboration exists between the fusion center and the EOC. Here, the analysis and production of comprehensive information using the intelligence model in the EOC is a proven and positive practice for developing and maintaining SA.

Incident management systems' structure and EOC organization in New Zealand did not provide officials the platform to work with one another to establish SA. There was limited communication with other EOCs, command posts and response centers to develop situational awareness. To bridge this gap, EOC liaisons proved a positive practice. Additionally, the information that came into the EOC was not integrated with

[72] Department of Homeland Security, "Section Three: Engagement Overview and Best Practices," in *Fusion Center and Emergency Management Collaboration Meeting, After Action Report,* New Orleans, LA, March 25–26, 2014, 9.

technology systems. Officials indicated that graphically illustrating this information with technologies would have assisted with critical decisions made in the EOC.

B. STRUCTURE: 2012 HURRICANE SANDY

Structure provides both hierarchical organization and examines the relationships and communication and coordination between different levels, units and staff. The sheer size and widespread impacts of Hurricane Sandy provide an excellent case study for analyzing structures and the interdependencies between an organization's tasks, people and technology.

1. Event

Hurricane/Post Tropical Cyclone Sandy began in the Caribbean Sea on October 22, 2012, moving northerly over the Atlantic Ocean along the U.S. Eastern Seaboard, making landfall near Brigantine, New Jersey at approximately 7:30 p.m. on October 29.[73] While most of Sandy's major impacts occurred in New Jersey and New York, much of the northeastern United States felt its wrath, as its size, intensity and direction made for a disastrous super storm. Due to the extreme size of the storm, the largest tropical cyclone on record, catastrophic storm surge inundated the New Jersey and New York coastlines.[74] Record-setting storm surge combined with massive waves and hurricane force winds of up to 80 miles per hour left these coastlines battered and many communities in ruins.

The impact to life and property was catastrophic. The National Hurricane Center reported that Sandy caused as many as 147 direct deaths, damaged or destroyed approximately 650,000 houses and resulted in about 8.5 million customers without power.[75] In addition to extreme flooding along the Atlantic Coast from Florida to Maine, Sandy also produced blizzard-like conditions in the Appalachian Mountains and extreme winds and localized flooding as far inland as West Virginia, Ohio and Indiana, affecting

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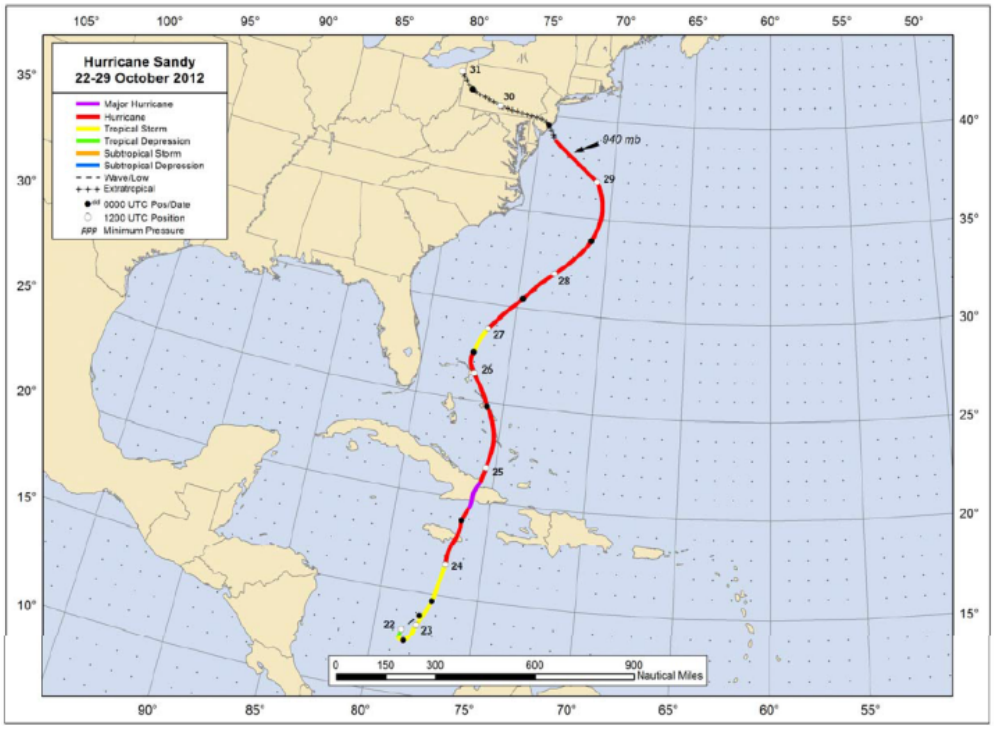
[73] Hereafter referred to as "Sandy."

[74] Eric S. Blake et al., *Tropical Cyclone Report, Hurricane Sandy* (AL182012) (Miami, FL: National Hurricane Center, 2013), 1.

[75] National Weather Service, *Service Assessment: Hurricane/Post-Tropical Cyclone Sandy, October 22–29, 2012* (Monterey, CA: U.S. Department of Commerce, 2013), iv, http://www.nws.noaa.gov/os/assessments/pdfs/Sandy13.pdf.

24 states in total.[76] Figure 3 illustrates the trajectory of the storm as it moved through the Caribbean and approached the northeastern United States.

Figure 3. Best Track Positions for Hurricane Sandy, 22–29 October 2012



Source: Eric S. Blake et al., *Tropical Cyclone Report, Hurricane Sandy* (AL182012) (Miami, FL: National Hurricane Center, 2013), 127.

With a direct hit to the most populated region of the country, Sandy caused massive damage to critical infrastructure. The combined effects of wind and storm surge widely damaged electrical power transition and distribution To make matters worse, just a few days after Sandy made landfall another major storm, the November 2012 Nor'easter, caused an additional 150,276 additional outages, making restoration extremely difficult.[77] Outages peaked on October 30, 2012, and restoration of 95 percent

[76] FEMA, *Hurricane Sandy FEMA After-Action Report* (Washington, DC: Department of Homeland Security, 2013), 4, http://www.fema.gov/media-library-data/20130726-1923-25045-7442/sandy_fema_aar.pdf.

[77] Office of Electricity Delivery & Energy Reliability, *Hurricane Sandy-Nor'easter* (Situation Report #13) (Washington, DC: Department of Energy, 2012), http://www.oe.netl.doe.gov/docs/SitRep13_Sandy-Nor'easter_120312_300PM.pdf.

was not achieved until after 10 days.[78] Sandy forced thousands into shelters, taxed the resources and capabilities of state and local governments and necessitated more than $60 billion for emergency spending from the federal government.[79] Sandy was a historic storm from which communities are still recovering and rebuilding today.

2. Analysis

New York City's AAR on Hurricane Sandy cited, when referring to restoring power to health care facilities, that "uneven overall situational awareness limited the City's ability to deploy generators to particular locations quickly."[80] In its executive summary, the report boils down 59 recommendations into seven groups, one of which includes improving SA, concluding that improved SA would have certainly led to better response and recovery efforts.[81] Other recommendations from the report identified SA as a core issue, highlighting how important awareness sis across all levels of emergency response. While New York City experienced numerous challenges and subsequent consequences of poor SA in the EOC, the analysis did not reveal why this occurred, what contributed to inefficient SA or what could be done to improve it.

In New Jersey, the lessons learned relative to SA in the EOC from Sandy shed a different light. In analyzing several AARs, journal articles, books and news sources, SA in EOCs was either heralded as a success or not mentioned at all when discussing lessons learned. This does not necessarily illuminate if SA in the EOC was effective; the lack of evidence for why things worked or did not creates a knowledge gap. However, it is just as important to analyze the successes, as evidenced within the literature, to determine why SA was claimed to have been a success, and to evaluate the broader implications as possible opportunities for improving SA in the EOC.

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[78] Office of Electricity Delivery and Energy Reliability, *Comparing the Impacts of Northeast Hurricanes on Energy Infrastructure* (Washington, DC: U.S. Department of Energy, 2013), 11.

[79] Steven Bucci et al., *After Hurricane Sandy: Time to Learn and Implement the Lessons in Preparedness, Response, and Resilience* (Special Report #144 on Homeland Security) (Washington, DC: The Heritage Foundation, 2013), 2.

[80] Linda Gibbs and Caswell F. Holloway, *NY City Hurricane Sandy After Action Report and Recommendations to Mayor Michael R. Bloomberg* (New York: The City of New York, 2013), 11.

[81] Gibbs and Holloway, *NY City Hurricane Sandy*, 5.

At the state level, New Jersey activated their State Emergency Operations Center (SEOC), where officials encountered two primary challenges relative to SA:"(a) the limited availability of validated 'official' information needed to influence crucial lifeline decisions; and (b) the state's relatively low capability to disseminate helpful information both quickly and effectively."[82] To address this issue, the state leveraged the New Jersey Regional Operations and Intelligence Center (NJ ROIC), which was seasoned at collecting, analyzing and disseminating information. According to an article written by then-commanding officer of the ROIC, Christian Schultz, "The sheer magnitude and force of the storm's aftermath underscored the importance of the information dissemination and intelligence sharing essential to help the state emergency operations center in its response and recovery efforts."[83] The ROIC was charged with managing SA in the SEOC and disseminating vital information to its stakeholders; this was an enormous responsibility, but the experienced staff was successful.

SA in the EOC, including the impacts, response actions and progress, is often provided to senior executives responsible for overseeing response and recovery operations and communicating with the public. The ROIC produced this vital information via disaster intelligence reports and daily briefings. This helped the necessary authority figures understand impacts and the status of response efforts, which facilitated good decision making.[84] In addition, assessing storm damage provided key information on impacts, progress made and assists with developing plans and strategies for managing future resources supporting the disaster. To assist with damage assessments, the ROIC personnel were deployed into the field to collect assessments on critical infrastructure and key resources.[85] The collection, aggregation and analysis helped SEOC officials prioritize their response actions.

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[82] Schulz and Guidetti, "Fusion During Crisis," 16.

[83] Ibid., 18.

[84] Schulz and Guidetti, "Fusion During Crisis," 19.

[85] "2012 Fusion Center Success Stories," Department of Homeland Security, last modified July 28, 2015, http://www.dhs.gov/2012-fusion-center-success-stories.

In terms of structure, the SEOC used ROICs systems and processes to issue situation reports that, according to New Jersey State Police Colonel Rick Fuentes, "provided up-to-the-minute information about the locations of shelters for those evacuating their communities, road closures, the status of various types of transportation, and the overall state of the disaster."[86]

A report from the U.S. House of Representatives Committee on Homeland Security on the National Fusion Center Network supports these findings, saying that the ROIC played a significant role in New Jersey's ability to provide a common operating picture for those in the SEOC, and in sharing critical information with emergency responders and officials across the state. This report stated, "According to information provided by the ROIC, FEMA, and I&A, during New Jersey's Hurricane Sandy response the fusion center became more aligned with the EOC and the State leveraged the fusion center's established communications channels—including the FLO program—to distribute information from the EOC to law enforcement, first responders, public health, and State and local emergency managers."[87] The report goes on to state that the "ROIC disseminated over 700 situational awareness reports to over 9,000 customers in the three weeks immediately following the hurricane, on topics ranging from providing the location of operational gas stations, shelters, and food distributions sites, to gathering and analyzing information on storm-related criminal activities, with the goal of enabling a more effective deployment of resources."[88] The ROIC's expanded networks enabled the SEOC to broadly disseminate timely, detailed information, providing situational awareness to emergency responders coordinating and supporting response and recovery efforts.

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[86] Rick Fuentes, "Fusion Center Coordinates New Jersey Hurricane Sandy Disaster Response," Information Sharing Environment, February 5, 2013, https://www.ise.gov/blog/col-rick-fuentes/fusion-center-coordinates-new-jersey-hurricane-sandy-disaster-response.

[87] Committee on Homeland Security and Subcommittee on Counterterrorism & Intelligence, *Majority Staff Report on the National Network of Fusion Centers* (Washington, DC: U.S. House of Representatives, 2013), 45.

[88] Committee on Homeland Security and Subcommittee on Counterterrorism & Intelligence, *Majority Staff Report on the National Network of Fusion Centers*, 45.

3. Findings

This case study revealed that structure was a critical node in the success of EOC SA. New Jersey's use of the fusion center, along with its systems, capabilities and processes, worked and is supported by several sources as a best or positive practice. The literature focused on this type of collaboration, however, suggests a need to address two fundamental issues before relying on this type of partnership. First, plans and agreements between fusion centers and emergency managers should articulate information needs and expectations.[89] In Sandy, the ROIC provided much needed support in collecting, analyzing and disseminating disaster intelligence that was not in current plans and agreements. In fluid and dynamic situations, adaptation is a positive practice that benefited all involved. Second, EOCs often do not have secure information technology systems, meaning fusion center personnel may be left without a means to share various classified information.[90] This was not noted as an issue in New Jersey, but should be a consideration when contemplating this practice.

Utilizing the four steps suggested in the *Comprehensive Preparedness Guide* (CPG) *502*may be a perfect strategy for formalizing and cementing the relationship between fusion centers and EOCs.[91] CPG 502 provides guidance for fusion center and EOC coordination so that they "can work together to share information on an on-going basis" during normal blue sky days and times of emergency.[92] The four steps are: familiarize with capabilities, needs and requirements; establish partnerships; determine the process and provide training workshops and exercises. This approach could solidify information-sharing needs and collaboration expectations between the two parties.

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[89] Department of Homeland Security, *2013 National Network of Fusion Centers Final Report* (Washington, DC: Department of Homeland Security, 2014).

[90] Department of Homeland Security Office of Inspector General, *Relationships between Fusion Centers and Emergency Operations Centers* (OIG-12-15) (Washington, DC: Department of Homeland Security, 2011), 25.

[91] Department of Homeland Security and Department of Justice, *Considerations for Fusion Center and Emergency Operations Center Coordination* (CPG 502) (Washington, DC: Department of Homeland Security, 2010).

[92] Department of Homeland Security and Department of Justice, *Considerations for Fusion Center and Emergency Operations Center Coordination*, 2.

Finally, the study also revealed that AARs either did not cover SA at all or lacked sufficient information needed to identify positive or negative practices. The effects of poor SA in the EOC are certainly provided, but improved analysis would provide context for the needed corrective action. Debriefings—the collection of feedback from response stakeholders and subsequent AARs—needs to provide more comprehensive root cause analysis to better inform corrective action plans. Of the number of references to poor situational awareness seen in New York City's AAR, very little information is provided regarding how to improve. Asking "why" repetitively when an issue occurs can help explain if SA in the EOC was not optimal due to a lack of plans, procedures, organization, training, human behavior or technology.

C. PEOPLE: 2001 SEPTEMBER 11 TERRORIST ATTACKS, WORLD TRADE CENTER

In Leavitt's Diamond, "people" are defined as the employees of the organization.[93] Rather than simply viewing employees as managers or tacticians, it is important to examine their knowledge, skills and abilities to ensure they are put in position within the organizational structure, and can access and utilize available technologies to successfully carry out goals. In emergency response, human factors and social interactions may have an impact on successful operations. After all, SA in the EOC is socially constructed, which requires consideration of all factors when understanding individual and group behavior.

1. Event

On September 11, 2001, the United States of America suffered four coordinated terrorist attacks that killed 2,977 people.[94] It was a day the world will never forget. According to the 9/11 Memorial website, "19 terrorists from al-Qaeda, hijacked four commercial airplanes, deliberately crashing two of the planes into the upper floors of the North and South towers of the World Trade Center complex and a third plane into the

[93] Leavitt, "Applied Organizational Change," 1144.

[94] "FAQ about 9/11," 9/11 Memorial, accessed December 10, 2015, https://www.911memorial.org/faq-about-911.

Pentagon in Arlington, Va."[95] A fourth plane was brought down in western Pennsylvania by passengers who learned what was occurring, "about 20 minutes' flying time from Washington, DC."[96] As the world watched with horror, the heroic actions and bravery of first responders displayed that day and the hard days that followed will never be forgotten.

2. Analysis

The recommendations from the September 11, 2001, terrorist attack AARs highlighted the need for improved SA at all levels of government when responding to this overwhelming event. The *9/11 Commission Report* indicated several times that too many silos existed within local, state and federal agencies and departments, which resulted in limited situational awareness and hindered a coordinated interagency response.[97] This resulted in responders climbing and searching areas of the towers that had already been cleared.

The Office of Emergency Management and its headquarters, "which could have served as a focal point for information sharing, did not play an integrating role in ensuring that information was shared among agencies on 9/11."[98] As a result, "Information that was critical to informed decision-making was not shared among agencies."[99] The Report highlighted the consequences and concluded with several recommendations for improved information sharing relative to intelligence and response coordination.[100] Findings concluded that shared SA before and during the attacks would

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[95] "FAQ about 9/11," 9/11 Memorial.

[96] National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report*, 14.

[97] National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report*, 321.

[98] Ibid.

[99] Ibid.

[100] National Commission on Terrorist Attacks upon the United States, *The 9/11 Commission Report*, 393 recommendation for guidelines for information sharing among government agencies (intelligence and surveillance), 397 recommendation to adopt the Incident Command System, 417 recommendation for better information sharing procedures to promote shared knowledge.

have improved homeland security and emergency response officials' coordination and collaboration, which could have ultimately saved lives.

Examining the reflections of then-Battalion Fire Chief Joseph W. Pfeifer of the New York Fire Department (FDNY) provides insight into why silos existed, and into the human and organizational factors that contributed to officials' behavior during the response. Pfeifer was the first FDNY fire chief to take command and later led the post-collapse rescue and recovery efforts.[101] In a chapter of *Psychology of Terrorism* titled "Understanding How Organizational Bias Influenced First Responders at the World Trade Center," Pfeifer authors an account of his experiences on9/11, providing insight into his challenges. For example, while explaining the evacuation of first responders from the World Trade Center, Pfeifer suggests that organizational biases ultimately resulted in organizations not sharing critical information when there were signs and reports about the towers' potential collapse.[102] With New York Police Department (NYPD) helicopters in the air assessing the situation, police shared knowledge and potential implications within their department, but not with other agencies. In examining social group behavior, Pfeifer suggests that "the likelihood of sharing vital information at critical times during complex incidents becomes greater when groups that ordinarily are competing or acting independently are organized to act as an integrated group under a unified command, where all members are equally responsible for command-coordinated action."[103] In order for organizations to fully integrate with one another, Pfeifer suggests that these cultural biases must be overcome. Years of organizational bias, he argues, coupled with the organizations generally working independently, is a recipe for disaster—with these biases, there is less willingness to share vital information during incidents.

As a way of analyzing organization bias, Pfeifer offers that social identity is critical node to understanding emergency response coordination and cooperation; he states, "First, it creates a positive in-group bias toward those who are part of the same

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[101] Joseph Pfeifer, "First Chief on Scene," Fire Engineering, September 1 2002, http://www.fireengineering.com/articles/print/volume-155/issue-9/world-trade-center-disaster/volume-i-initial-response/first-chief-on-the-scene.html.

[102] Bongar et al. (eds.), *Psychology of Terrorism*, 207.

[103] Ibid.

group and a negative out-group bias against those who are part of an alternative group."[104] First responders are more likely to share critical information with members of their own department (their in-group) than those that are outside of their department. Pfeifer refers to this as "stovepipe situational awareness"—when one agency obtains critical information but neglects to share it outside of their department, limiting SA amongst all responders.[105] This is not done maliciously, but rather is a result of the responders' training and their culture, and how they work with and view those outside of their department. Alternatively, McDermott and Zimbardo—citing a 1971 article by Tajfel et al.—suggest that "people allocate resources in this way not simply to provide an advantage for the in-group but also to create an explicit relative disadvantage for the in-group over the out-group."[106] This view suggests that the NYPD kept life-saving information from the FDNY to gain an advantage; Pfeifer, countering this idea, thinks it nearly impossible to imagine that, despite infighting long-standing rivalry, the police department would deliberately not share key information that could have saved the lives of other first responders. Pfeifer contends that the lack of SA was a result of organizational and cultural bias rather than conscious deceit.

3. Findings

According to Brannan, Darken, and Strindberg, social identity theory "argues that a group's behavior and relationships to other groups can be accounted for by examining both its social context and its members' understanding of themselves and their group within that context."[107] Without the context of the longstanding rivalry between the NYPD and FDNY, understanding the group dynamics is nearly impossible. Further, understanding and implementing unified command structures and cooperating during stressful times is critical. To deal with this issue, Pfeifer suggests, "Effective commanding during a crisis is dependent upon overcoming organizational biases and

[104] Bongar et al. (eds.), *Psychology of Terrorism*, 208.

[105] Ibid.

[106] Rose McDermott and Philip Zimbardo, "The Psychological Consequences of Terrorist Alerts," in *Psychology of Terrorism*, Bongar et al. (eds) (New York: Oxford, 2007), 363.

[107] David W. Brannan, Kristin M. Darken, and Anders Strindberg, *A Practitioner's Way Forward: Terrorism Analysis*(Salinas, CA: Agile Press, 2014), 61.

strengthening information sharing to maintain a common situational-awareness picture of the crisis venue."[108]

A tenet of social identity theory suggests that identity motivation is a major factor in individuals striving to be positive and distinct.[109] With long histories, the police and fire departments of New York City have fought to be the best—or "finest"—in their professions. The first responder community culturally strives to build public confidence and trust by proving they will serve and protect in trying times. However, both departments are motivated to promote their own, individual success to elected officials and politicians as a way to compete for budgetary and financial support, which is in turn critical to their success. From an identity perspective, each is motivated to compete in order to gain advantages.

Context and group identity of first responders are important elements to consider when developing information sharing protocols and capabilities as trust in complex environments can be complicated. While many departments and organizations may have organizational biases with long histories, these biases must be put aside during times of duress. Organizational biases referred to above resulted in the deaths of hundreds of first responders who were attempting to conduct rescue missions on 9/11.By institutionalizing unified command during these complex events, coordination across departments can help eliminate biases and associated behaviors. For departments with long histories of infighting, planning, training and exercising together can provide ideal opportunities to find common ground and build successful collaborations. It is here that out-groups can foster trust, where a new culture and behavior can emerge, which can ultimately improve coordinated emergency response.

This analysis of SA during disasters through the social identity theory lens, reveals that group dynamics factor into behaviors that affect collaboration during stressful and chaotic times. In order for organizations to optimize collaboration, coordination and communication, unified command structures should be leveraged, as it

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[108] Bongar et al. (eds.), *Psychology of Terrorism*, 214.

[109] Fathali M. Moghaddam, *Multiculturalism and Intergroup Relations, Psychology Implications for Democracy in Global Context*(Washington DC: American Psychological Association, 2011), 94.

provides an ideal opportunity to break down in-group and out-group barriers. Planning, training and responding in a unified structure are positive practices in breaking down cultural challenges to SA and can enhance coordinated emergency response.

D. TECHNOLOGY: 2008 NORTHEAST U.S. ICE STORM

In the EOC, technology supports many facets of SA. The following case study and additional research on EOC technology examines the necessity for technologies to supports tasks and people within a structure.

1. Event

On December 11, 2008, an ice storm of magnificent proportions impacted the northeastern United States. The storm left 1.25 million homes and businesses without power in seven states from Maine to Pennsylvania.[110] Winter conditions and ice accretion of 2 inches in some areas blanketed the northeast, bringing down tree limbs and utility wires where debris slowed and, in many cases, halting restoration activities. With schools and businesses closed for several days, mutual aid from around the country and Canada was deployed to support response operations. This was one of the most destructive ice storms in recent history, with sub-freezing temperatures and additional adverse weather following the initial event, leaving people in the northeast without power and communications.[111] The following morning, on December 12, the governors of New Hampshire and Massachusetts declared states of emergency and looked to the National Guard to assist with restoration efforts.[112]

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[110] Charles Krupa, "Ice Storm Leaves 1.25 Million Powerless in Northeast," *USA Today*, December 13, 2008, http://usatoday30.usatoday.com/weather/storms/winter/2008-12-12-ice-storm_N.htm.

[111] National Weather Service, *Analysis of the December 11–12, 2008 Destructive Ice Storm across Interior Southern New England* (WFO Taunton Storm Series Report, #2009-01) (Silver Spring, MD: National Weather Service), 3, http://www.weather.gov/media/box/officePrograms/science/December_2008_Ice_Storm.pdf.

[112] Krupa, "Ice Storm."

2. Analysis

In New Hampshire, over 400,000 customers, or over two-thirds of the state's population, were without power.[113] Lasting for over three weeks, this event taxed resources at all levels. At the New Hampshire State Emergency Operations Center (SEOC), there were significant delays in assessing restoration needs; the lack of accurate, timely and realistic restoration information delayed clearing roads and debris.[114] Further analysis of New Hampshire's AAR for this event discloses the need for improved SA in the SEOC; recommendations include improving real-time shelter information, increasing information exchange between utilities and state agencies, and the gathering information for mapping critical facilities.[115] The report did not provide enough detail about how or why information in the SEOC was not optimal. In reviewing the New Hampshire Public Utilities Commission's After Action Review, however, several recommendations included the use and incorporation of technologies to improve SA.[116] Better application of technology would have improved communication about utility outages and times of restoration, and would have informed decision making for clearing roads and debris.

In Massachusetts, the impacts were similar. Approximately 325,000 customers were without power, waiting more than two weeks for complete restoration.[117] The Massachusetts Emergency Management Agency (MEMA) activated their SEOC, where key officials organized response and recovery efforts. MEMA's *Incident After Action Report and Improvement Plan* provides a comprehensive analysis of the response efforts at the SEOC during this event, and details lessons learned and best practices.[118] In this report, challenges with SA in the SEOC are prevalent. Informed by feedback from

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[113] New Hampshire Public Utilities Commission, *After Action Review*, 1.

[114] Department of Safety Homeland Security & Emergency Management, *December 11–12, 2008 Ice Storm State Response After-Action Report* (Concord, NH: State of New Hampshire, 2009), 9.

[115] Department of Safety Homeland Security & Emergency Management, *December 11–12, 2008 Ice Storm State Response After-Action Report*.

[116] New Hampshire Public Utilities Commission, *After Action Review*.

[117] Massachusetts Emergency Management Agency, *December 2008 Ice Storm, Incident After Action Report & Improvement Plan*, (Framingham, MA: Massachusetts Emergency Management Agency, 2009), 10.

[118] Massachusetts Emergency Management Agency, *December 2008 Ice Storm*.

officials in the SEOC, municipal emergency managers and other key personnel, the report revealed the following areas for improvement: briefings, situation reports and products, WebEOC (a crisis information management system) and geographic information system (GIS). Although briefings did take place in the SEOC, they were not timely, efficient, or formal, resulting in poor SA and information sharing.[119] It was suggested that procedures be developed and the briefings be coordinated by a predetermined staff member—checklists and templates were suggested to streamline data collection and make the briefings more efficient. It was found that an inconsistent process for creating situation reports—the product and vehicle for sharing SA in and out of the SEOC—made the reports difficult to produce in a timely fashion.[120] Additionally, the report notes the multiple avenues or platforms used in sharing information overwhelmed those attempting to keep up with collecting it.

The event's severity combined with the loss of power and communications made it difficult for the SEOC to leverage technologies to provide SA throughout the incident. With much of the state impacted, WebEOC was quickly inundated and overloaded with information.[121] State and local officials who still had power entered hundreds of emergency response entries into the system; the sheer volume of information made it difficult to fully utilize. Power outages also limited municipalities' ability to submit and review critical information. The SEOC's reliance on WebEOC during this event negatively impacted SA; backup or redundant systems were not in place or implemented. Redundant systems can identify how information will be shared between response organizations to provide greater SA when the event stresses primary systems. The report did, however, note that WebEOC successfully tracked the resources mobilized out of the SEOC, which contributed to SA.

The use and implementation of GIS revealed that decision makers were able to leverage maps, statistics and other information displays to prioritize response actions and

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[119] Massachusetts Emergency Management Agency, *December 2008 Ice Storm*, 14.

[120] Ibid.

[121] Ibid.

resources.[122] Visually appreciating the bigger picture gave decision makers a better understanding of the event, ensuring that priorities and objectives for response were effective and appropriate. For officials at the SEOC, "maps with outages, shelters opened, EOCs activated, and local Declarations of Emergency, helped personnel collect information, analyze it and make sound decisions based on the information received."[123]

3. Findings

In this case study, the influence of technologies that support emergency response SA is well documented; numerous challenges could have been alleviated had the technology been used to assist decision making. While technology is critical, relying on the technologies without identifying alternative, redundant systems can impede the EOC's ability to maintain SA in complex events that impact utilities.

Personal and inter-organizational relationships are also critical to a smooth and constant flow of information. Practiced procedures and technology are both important when it comes to SA. Analyzing this case study reveals that, with today's technologies, there are simply too many platforms or opportunities to be overwhelmed with information. A 2014 Department of Homeland Security publication lists the vast means of obtaining and sharing SA:

> radio, paper maps, landlines, email, cellular phones, satellite phones, mobile data, computer-aided dispatch for incident and unit status, crisis management systems (e.g., E-Team, WebEOC), traffic cameras, amateur radios, enhanced 911, reverse 911, mobile text alerts, global positioning services (GPS) for the location of response vehicles, geographic information systems (GIS), windshield assessments, and traditional media (e.g., television, radio).[124]

The 2008 ice storm exposed both positive and negative practices of crisis information management systems (CIMS) as a primary technology for incident management SA. Further analysis of journals, articles and reports supports these findings, confirming that the lack of process, system design/requirements, interoperability, trust

[122] Massachusetts Emergency Management Agency, *December 2008 Ice Storm*, 15

[123] Ibid., 25.

[124] Virtual Social Media Working Group and DHS First Responders Group, *Using Social Media*, 8.

and information overload were the most common issues when examining adoption, acceptance and use of CIMS products and their effectiveness. At a higher level, the literature suggests these issues are more organizational and managerial than technical in nature.[125] According to Leavitt's Diamond, the lack of clearly defined tasks or processes, structure and the way people manage CIMS technologies in the EOC directly influence the technology's effectiveness.

Establishing and maintaining trust among individuals and organizations is essential when it comes to crisis information management and sharing systems and practices. If individuals or organizations do not trust the CIMS or those who have access to its information, providing and sharing information could become questionable. Individual and inter-organizational trust is essential for collaboration, and it is extremely important to crisis information management systems.[126] Literature consistently identifies trust—of both the systems, and the people using them—as one of the reasons individuals or organizations do not utilize technologies during emergency response. With an abundance of information, EOC SA is developed by and primarily dependent upon staff members, and is collected and shared via a number of different means. The challenge is identifying the most useful information from the field and being able to ignore the "noise."

E. CHAPTER SUMMARY

This chapter analyzed the responses to four large-scale emergencies. Examining the data through a structured framework provided evidence to identify positive and negative practices of SA in the EOC. Positive practices included the use of the intelligence model and briefings (task), incident command system and unified command structures (structure), leveraging trained analysts and utilizing liaisons (people), and the use of technology to support processes and enhance decision making (technology).Negative practices included lack of plans and procedures (task), inadequate

[125] Institute for Security Technology Studies, *Crisis Information Management Software (CIMS) Interoperability* (Hanover, NH: Dartmouth College, 2004).

[126] Jan Martin Jansen, Bas Lijnse, and Rinus Plasmeijer, "Toward Dynamic Workflow Support for Crisis Management," in *Proceedings of the 7th International ISCRAM Conference*, 1.

organization and staffing (structure), lack of trained and skilled personnel and cultural biases (people), and technologies that did not support processes and decision making (technology).SA in the EOC was found to be essential to collaboration, coordination and decision making. When there are challenges with these elements, AARs suggest improving SA. However, when issues with these elements are not identified, reports often do not cite how or why SA was beneficial, with some exceptions.

Chapter VI presents a summary of research findings, recommendations to improve SA and performance in the EOC, and a conclusion.

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VI. FINDINGS, RECOMMENDATIONS AND CONCLUSION

A. FINDINGS

This thesis has analyzed the research question: How can SA in the EOC be improved? EOCs play a critical role in supporting response efforts; they are responsible for facilitating interagency coordination, which enables officials at all levels to operate effectively. This thesis has revealed that SA during emergency response is a persistent issue that continues to plague officials on the scene and in the EOC. Events like the September 11, 2001 terrorist attack, 2008 Northeast U.S. Ice Storm, 2011 Christchurch, New Zealand earthquake and 2012 Hurricane Sandy revealed that, without cooperation, collaboration and coordination at all levels of government, no one agency can prepare for and respond to a catastrophic event. Poor SA in these events resulted in delayed response efforts, confusion, and poor decision making that ultimately impacted tens of thousands of people.

By examining the four case studies through Leavitt's Diamond, it was found that processes, structures, people and technologies are all critical components to obtaining and maintaining SA in the EOC. This analysis identified both positive and negative practices. Positive practices included the use of the intelligence model and briefings (task), incident command system and unified command structures (structure), trained analysts and liaisons (people), and technology that supported processes and enhanced decision making (technology).Negative practices included the lack of plans and procedures (task), inadequate organizational support and staffing (structure), improperly trained and skilled personnel and cultural biases (people), and use of technologies that did not support processes and decision making (technology).

Examining the challenges to EOC SA revealed several barriers that should be considered when addressing this problem. Understanding these pitfalls and challenges before an emergency can help emergency managers develop plans and strategies to mitigate and avoid them. Table 1 compiles findings of this thesis by listing the barriers to SA found within the research.

Table 1. Barriers to EOC Situational Awareness

TASK	STRUCTURE	PEOPLE	TECHNOLOGY
• Procedures or processes • Standardization • Formal training • Inclusion of technology • Unclear roles and responsibilities of external stakeholders • Information collected, but not processed or analyzed	• Unstructured organization • Staffing levels • Span of control • Information flow • Inclusion of interagency stakeholders • Flexibility	• Perception based on faulty information • Cultural bias • Excessive motivation • Complacency • Fatigue • Stress • Training • Experience • Groupthink • Stovepipe SA • Assumptions	• Not designed to support processes, plans and procedures • Information overload • Interoperability • Poor user adoption • Weak content organization • Reliable functionality • Lack of redundancy • Garbage in. garbage out

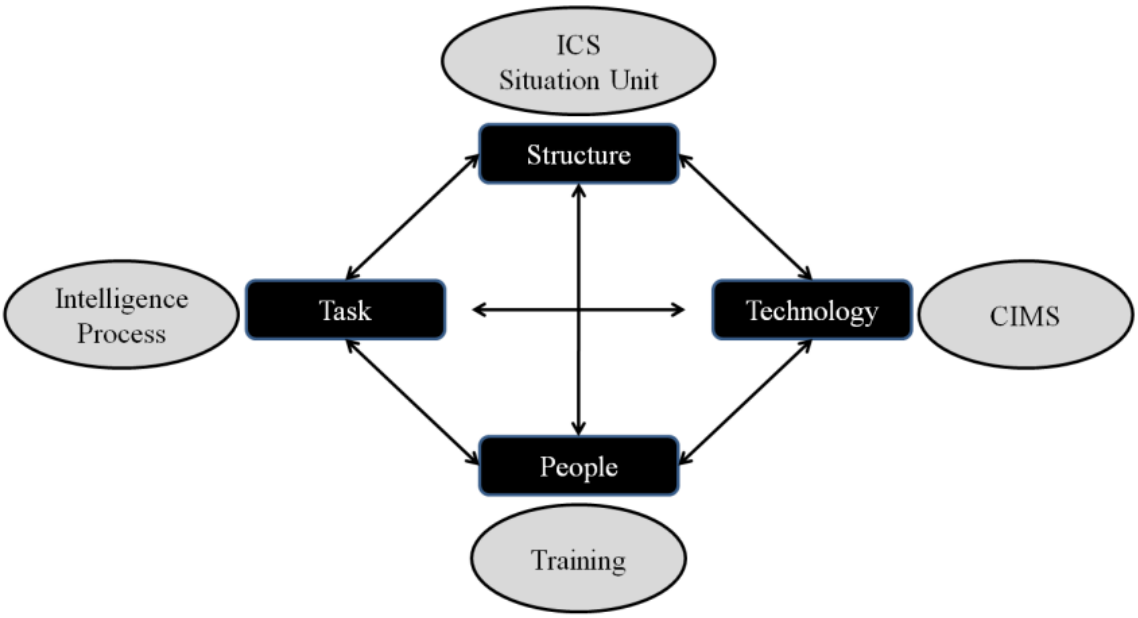
Table 1 further highlights the importance of task, structure, people and technology in examining EOC SA. In designing, changing and improving the SA organization in the EOC, these barriers should be considered. Further, this list could be used when debriefing EOC officials after an emergency to provide additional insight and lessons learned into why SA was not optimal. Exploring the causes of inadequate SA in the after action review process can yield detailed evidence that could improve in identifying corrective action. The barriers listed, however, were limited to the findings found as a result of this thesis research; additional study could provide a more comprehensive list of barriers to EOC SA for consideration.

B. RECOMMENDATIONS

Thinking of SA in the EOC as an organizational system comprised of tasks, structure, people and technology allows one to understand SA holistically. According to Leavitt's Diamond, the interdependencies of each component in the EOC must be considered when (re)designing, planning for or changing any of the components. EOC SA can be improved by designing an organizational system that includes linkages and relationships among all of the components. Evaluating strengths and weaknesses for each of the components also affords emergency managers an opportunity to identify and implement changes that are necessary to improve SA.

Investments must be made to address and improve all of the components. Focusing on recommendations for just one component will not significantly contribute to better SA in the EOC. For example, if the intelligence model (task) were implemented but structure, people and technology were not adjusted accordingly, there will likely be further SA challenges. Figure 4 illustrates the EOC SA organization, a model presented that incorporates the positive practices found within this research and addresses the negative practices.

Figure 4. The EOC SA Organization



The EOC SA organization model utilizes Leavitt's Diamond to integrate the research findings and provide an understanding of the system as a whole. The following recommendations suggest how to address the research question, which is focused on how SA in the EOC can be improved.

1. Develop a Process

The task or process of SA in the EOC must define what successful SA looks like and how it will be established, maintained and shared. This process should also provide an organizational structure and discuss how people and technology will be utilized to achieve SA. The process should focus on developing incident intelligence rather than the simple collection of data. In an article in *Emergency Management* magazine, it is explained that intelligence provides choices, where assessments and predictions can be made based on decisions.[127] The article claims that emergency managers must know the difference between information and intelligence, as their decisions depend on it.

[127] Valerie Lucus-McEwen, "Recalibrating Emergency Management: Information Is not the Same as Intelligence," Emergency Management, December 29, 2010, http://www.emergencymgmt.com/emergency-blogs/campus/Recalibrate-Emergency-Management-Information-Intelligence-122910.html.

During Hurricane Sandy, New Jersey activated their State Emergency Operations Center (SEOC) and leveraged the New Jersey Regional Operations and Intelligence Center (ROIC) to maintain SA. According to a DHS Office of Inspector General report issued in 2011, however, this is an inconsistent approach across the nation. The report authors interviewed a number of fusion center and EOC personnel and found that fusion centers and EOCs often do not understand each other's information needs.[128] This was not the case in New Jersey; in fact, the use of the ROIC and their processes and structure to develop SA in the SEOC proved beneficial for all in the EOC, the recipients of situational awareness products and decision makers. This suggests that, where collaboration opportunities exist between fusion centers and EOCs, officials should work together to establish agreements, plans and procedures, formalizing this relationship. If funding, politics, geography and/or structures do not afford such a collaborative opportunity, adopting the intelligence process in the EOC can improve SA.

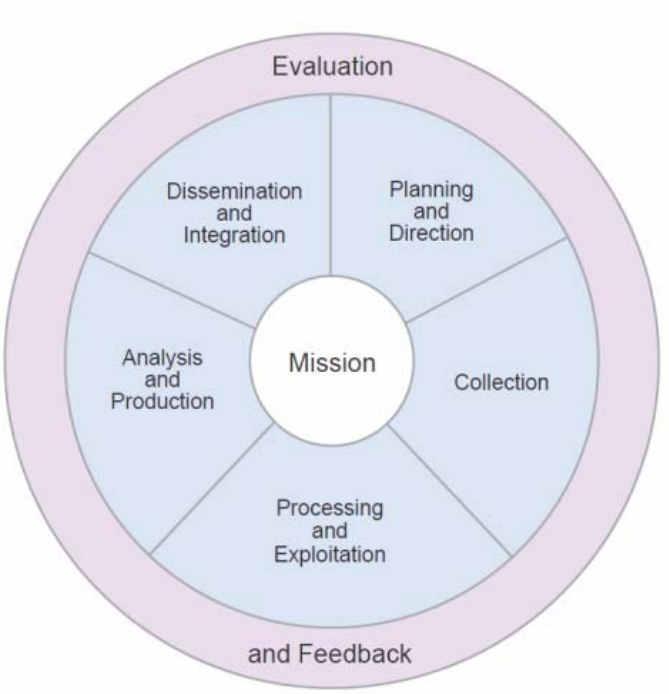
Implementing the intelligence process in the EOC to establish and maintain SA was identified as a positive practice and should be considered by emergency managers looking to improve SA in the EOC. According to Joint Publication 2–0, *Joint Intelligence*, issued by the Joint Chiefs of Staff in October 2013, the intelligence process provides a structure that includes defined procedures.[129] In the joint intelligence process, "the six categories of intelligence operations are: planning and direction; collection; processing and exploitation; analysis and production; dissemination and integration; and evaluation and feedback."[130] Figure 5 depicts the intelligence process model, in which the mission drives requirements and evaluation and feedback is a constant throughout.

[128] Department of Homeland Security Office of Inspector General, *Relationships between Fusion Centers and Emergency Operations Centers.*

[129]Joint Chiefs of Staff, *Joint Intelligence*(Joint Publication 2-0) (Washington, DC: Department of Defense, 2013), I-5, https://fas.org/irp/doddir/dod/jp2_0.pdf.

[130] Joint Chiefs of Staff, *Joint Intelligence*, I-5.

Figure 5. DOD Joint Publication Intelligence Process



Source: Joint Chiefs of Staff, *Joint Intelligence*(Joint Publication 2–0) (Washington, DC: Department of Defense, 2013), I-5, https://fas.org/irp/doddir/dod/jp2_0.pdf.

SA is more than just data collection; perception and comprehension are vital to its success. Mark Lowenthal, in *Intelligence: From Secrets to Policy*, defines intelligence as information that has been collected, processed and analyzed according to the needs of those requiring it.[131] Applying the intelligence process would enable emergency managers to identify what they need to know about the incident, collect information, process and analyze it for meaning, and make informed decisions based on the intelligence. The collection of information without analysis produces information that has limited meaning.[132] Staff in the EOC must be given guidance based on incident priorities in order to collect the right information, process it for the intended meaning and analyze it in relation to the environment, incident progress, resources and predictions.

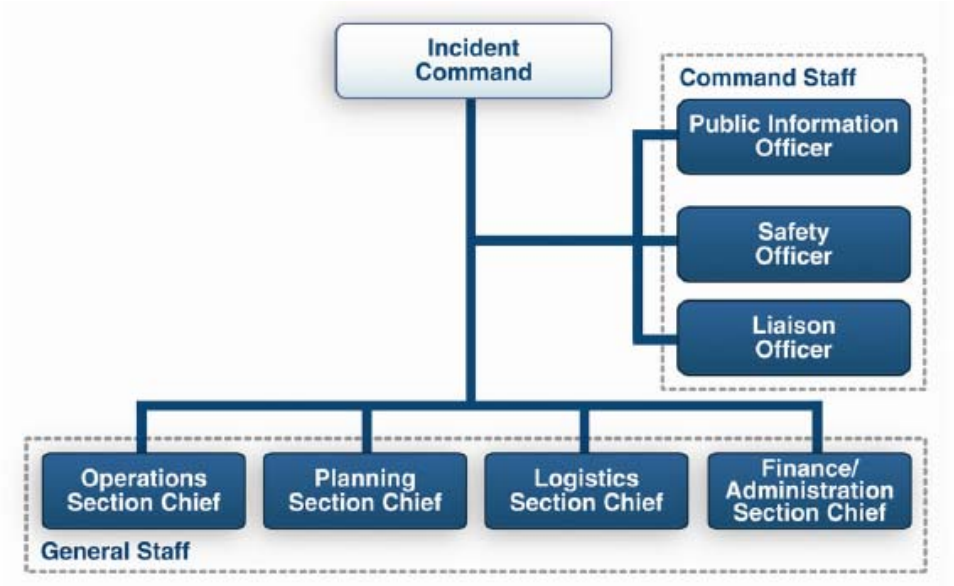
[131] Mark M. Lowenthal, *Intelligence: From Secrets to Policy*, 6th edition (Washington, DC: CQ Press, 2014), 2.

[132]Lowenthal, *Intelligence*, 71.

2. Establish an Organizational Structure

The organizational structure for EOC SA should be based on and consistent with the Incident Command System (ICS).ICS is a widely accepted management system that provides an organizational structure for emergency response organizations. Within ICS, modular organization allows officials to organize roles and responsibilities based on the situation at hand. Figure 6 depicts the ICS table of organization.

Figure 6. ICS: Command Staff and General Staff



Source: U.S. Department of Homeland Security, *National Incident Management System* (Washington, DC: Department of Homeland Security, 2008), 53.

According to NIMS, "The Planning Section is responsible for collecting, evaluating, and disseminating operational information pertaining to the incident."[133] In the EOC, the planning section is tasked with receiving incident information from incident commanders, the stakeholders—including Emergency Support Functions (ESFs) present in the EOC, and the media—and organizing this information for SA purposes and dissemination. Figure 7 shows the units within the planning section.

[133] U.S. Department of Homeland Security, *National Incident Management System*, 103.

Figure 7. Planning Section Organization

Source: Department of Homeland Security, *National Incident Management System* (Washington, DC: Department of Homeland Security, 2008), 56.

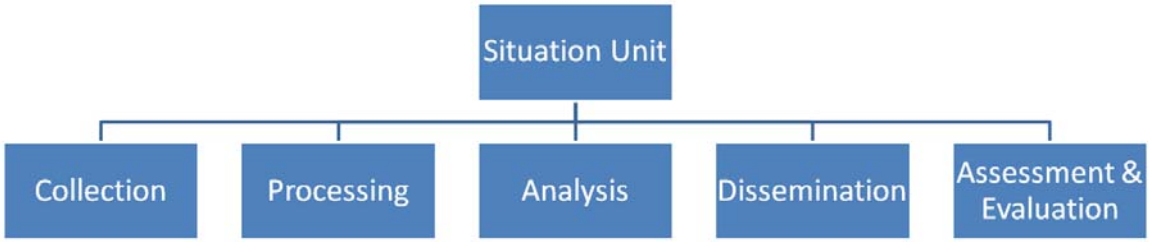
Within the planning section, "the Situation Unit collects, processes, and organizes ongoing situation information; prepares situation summaries; and develops projections and forecasts of future events related to the incident."[134] Commanders are able to assign staff based on the needs of the incident because ICS is a scalable organization. The span of control is also a key feature in ICS, which suggests there is a range (3–7) of individuals that one supervisor can successfully manage.[135] For example, NIMS and ICS provide guidance and examples of expanding the operations section to include more and more staff, in order to address the needs of complex or expanding incidents. Such guidance is not given for expanding the planning section or the situation unit. For large-scale disasters that require a significant amount of resources to collect, analyze and disseminate information, emergency managers should consider expanding the situation

[134] Ibid., 104.

[135] "ICS 200: Lesson 5: Summary and Posttest," Department of Agriculture, accessed December 11, 2015, 5,http://www.usda.gov/documents/ICS200Lesson05.pdf.

unit. Figure 8 proposes an expanded situation unit that includes the five categories of the intelligence process; staff would be assigned to each category.

Figure 8. Expanded Situation United Based on the Intelligence Process



Organizing the situation unit in this manner would allow efficient implementation of the intelligence process. Should a disaster require several individuals to collect, process, analyze, disseminate, assess and evaluate incident information, this expanded unit, which is compliant with ICS principles, would speak to a span of control issues. Where incidents require fewer individuals, or even only one person, following the categories of intelligence operations provides a methodical approach to developing and maintaining SA.

Implement Technology

SA in the EOC would be impossible without technology. Since the EOC is a remote physical location, information-sharing to and from the incident area(s) requires communicative technology. In the EOC, technology aids people within a structure to perform the tasks at hand. One of the most widely used and accepted technology solutions for emergency response SA in EOCs is crisis information management software (CIMS).When information is received from many technologies, CIMSs serves as a platform to collect and manage all incident information. CIMS manages incident information, supports on-scene incident commanders and provides SA to all stakeholders.[136]

[136] National Institute of Justice, *Crisis Information Management Software (CIMS) Feature Comparison Report* (Washington, DC: Department of Justice, 2002), 1, https://www.ncjrs.gov/pdffiles1/nij/197065.pdf.

At the federal level, DHS created the Homeland Security Information Network (HSIN) to provide "homeland security stakeholders with effective and efficient collaboration tools for decision making, secure data, and accurate, timely information and situational awareness."[137] What has yet to be determined is HSIN's effectiveness and whether or not this is a successful network at all levels—federal, state and local. In a 2013 DHS Office of Inspector General (OIG) report, it was revealed that despite, spending an estimated $231 million in HSIN over nine years, information sharing across the homeland security enterprise had yet to be fully achieved.[138] Some of the issues identified in the report include poor user adoption, content organization, reliable search and functionality. It is interesting to note that in the AARs for the case studies presented in this thesis, HSIN was barely, if not at all, mentioned. Federal officials should critically evaluate if it makes sense to continue to expend millions of dollars into a system that has not garnered the appropriate attention as a critical technology in providing SA.

Defined processes for information flow are fundamental to CIMS and how they are designed, developed and implemented. This challenge then has an impact on identifying CIMS design requirements and development of software capabilities.[139] Emergency managers should first define the process (intelligence process) and associated tasks and build an organizational structure (expanded situation), and then implement CIMS technologies that support the process and structure.

Emergency managers will still be faced with the challenge of strategically identifying the right fit among all the available tools and technologies, and then properly integrating the tool into their systems. With technologies being developed and created every day, this will be a major challenge for the foreseeable future.

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[137] Department of Homeland Security Office of Inspector General, *Homeland Security Information Network Improvements and Challenges*, 2.

[138] Ibid., 20.

[139] Jansen, Lijnse, and Plasmeijer, "Toward Dynamic Workflow Support," 1.

3. Conduct Training

The case studies identified several challenges to SA when it came to people.SA has human factor implications; emergency managers must be able to perceive, recognize and cognitively process what is happening and project outcomes based on forecasts, contemplating decisions. In intelligence analysis, one of the most problematic challenges is human mental processes.[140] A defined process can clearly outline the tasks, the structure can provide organization, and technologies can support both, but if the right people are not put in a position to succeed, then SA will be hindered.

Identifying right people who have the best knowledge, skills and abilities is important to effectively establishing and maintain SA in the EOC. Once staff is identified, a comprehensive interagency training program that considers human factors and social interactions should be conducted periodically. By training as a team, trust issues and cultural biases highlighted in the case studies can be broken down over time.

The training program should address all of the previously mentioned recommendations for process, structure and technology as an organization. The EOC SA organization is interdependent; changes to one component will, over time, require changes in the others. Emergency managers and their staffs will have to be receptive to the intelligence process as a new way of thinking about SA in the EOC.

Finally, where opportunities exist for fusion centers and EOCs to collaborate, officials should conduct joint training and exercises. A report on the National Network of Fusion Centers issued in June 2014, cited only 42 of 78 fusion centers as having formalized relationships with EOCs.[141] Such collaboration could familiarize fusion center staff with EOC SA requirements, and familiarize EOC staff with the intelligence process.

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[140] Richards J. Heuer, Jr., *Psychology of Intelligence Analysis* (Washington, DC: Central Intelligence Agency, 1999), 1.

[141] Department of Homeland Security, *2013 National Network of Fusion Centers*, 25.

C. CONCLUSION

Large-scale emergencies and disasters continue to take place around the world, creating havoc of immense proportions. Society relies on all kinds of organizations to answer the call of duty when a disaster strikes, to rescue and provide relief to those who have been affected. Response and relief efforts are maximized when organizations work together to restore communities' sense of normalcy. The EOC serves as a central coordination point that is responsible for information management, resource coordination and executive level decision making. The success of the EOC depends on its ability to maintain SA.

This thesis sought to identify opportunities for improving SA in the EOC. In analyzing four responses to large-scale emergencies, SA barriers and smart practices were identified. For SA in the EOC to be optimal, an organizational system comprised of process, structure, people and technology must be present. Investments must be made to improve all elements of the organization. EOC staff must understand how the entire organization works and be well practiced. Personal relationships are critical to ensure a smooth and constant flow of information and practiced procedures and technology are important when it comes to SA.

This research was limited to four case studies, each representing a component of Leavitt's Diamond. Although barriers and smart practices were identified, it is possible other practices and findings could emerge by analyzing all four components for case study. Future research could examine the relationships of each component and their interdependencies.

Responding to large-scale emergencies and complex disasters requires leaders and responders alike to be adaptable, as situations can be fluid and dynamic. General Stanly McChrystal, in *Team of Teams, New Rules of Engagement for a Complex World*: suggests, "The familiar pursuit of efficiency must change course. Efficiency remains important, but the ability to adapt to complexity and continual change has become

imperative."[142] Adaptability in the EOC is important, as complex events present unanticipated challenges; having a clearly defined and understood EOC SA organization is crucial to its success.

[142] Stanley McChrystal et al., *Team of Teams: New Rules of Engagement for a Complex World* (New York: McChrystal Group, 2015), 5.

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LIST OF REFERENCES

9/11 Memorial. "FAQ about 9/11." Accessed December 10, 2015. https://www.911memorial.org/faq-about-911.

Andersen, Bjorn, and Tom Fagerhaug. *Root Cause Analysis: Simplified Tools and Techniques*, 2nd edition. Milwaukee, WI: ASQ Quality Press, 2006.

Bazeley, Pat. "Analysing Qualitative Data: More than 'Identifying Themes.'" *Malaysian Journal of Qualitative Research* 2, no. 2 (2009): 6–22.

Blake,Eric S., Todd B. Kimberlain, Robert J. Berg, John P. Cangialosi, and John L. Beven II. *Tropical Cyclone Report, Hurricane Sandy* (AL182012). Miami, FL: National Hurricane Center, 2013.

Bongar, Bruce, Lisa M. Brown, Larry E. Beutler, James N. Breckenridge, and Philip G. Zimbardo (eds.) *Psychology of Terrorism*. New York: Oxford University Press, 2007.

Brannan, David W., Kristin M. Darken, and Anders Strindberg. *A Practitioner's Way Forward: Terrorism Analysis*. Salinas, CA: Agile Press, 2014.

Bucci, Steven, David Inserra, Jonathan Lesser, Matt A. Mayer, Brian Slattery, Jack Spencer, and Katie Tubb. *After Hurricane Sandy: Time to Learn and Implement the Lessons in Preparedness, Response, and Resilience* (Special Report #144 on Homeland Security). Washington, DC: The Heritage Foundation, 2013.

Bush, George W. *Management of Domestic Incidents* (HSPD-5). Washington, DC: Department of Homeland Security, 2003.

Cichocki, Patricia, and Christine Irwin. *Organization Design: A Guide to Building Effective Organizations*. London: Conan, 2011.

Cohen, Wilbur, and Evelyn Boyer. "Federal Civil Defense Act of 1950: Summary and Legislative History." *Social Security Bulletin* (April 1951): 11–16.

Committee on Homeland Security and Subcommittee on Counterterrorism & Intelligence. *Majority Staff Report on the National Network of Fusion Centers*. Washington, DC: U.S. House of Representatives, 2013.

Department of Agriculture. "ICS 200: Lesson 5: Summary and Posttest." Accessed December 11, 2015. http://www.usda.gov/documents/ICS200Lesson05.pdf.

Department of the Army. *Operational Terms and Graphics* (FM 1–02, MCRP 5–12A).Washington, DC: Department of the Army, 2014.

Department of Homeland Security. “2012 Fusion Center Success Stories.” Last modified July 28, 2015, http://www.dhs.gov/2012-fusion-center-success-stories.

———. *2013 National Network of Fusion Centers Final Report*. Washington, DC: Department of Homeland Security, 2014.

———. *National Incident Management System.* Washington, DC: Department of Homeland Security, 2008.

———. *National Response Framework*. Washington, DC: Department of Homeland Security, 2013.

———. “Section Three: Engagement Overview and Best Practices.” In *Fusion Center and Emergency Management Collaboration Meeting, After Action Report.* New Orleans, LA, March 25–26, 2014.

Department of Homeland Security Office of Inspector General. *Homeland Security Information Network Improvements and Challenges*. Washington, DC: Department of Homeland Security, 2013.

Department of Homeland Security and Department of Justice. *Considerations for Fusion Center and Emergency Operations Center Coordination* (CPG 502). Washington, DC: Department of Homeland Security, 2010.

Department of Safety Homeland Security & Emergency Management. *December 11–12, 2008 Ice Storm State Response After-Action Report*. Concord, NH: State of New Hampshire, 2009.

Endsley, Mica R. “Designing for Situation Awareness in Complex System.” In *Proceedings of the Second International Workshop on Symbiosis of Humans, Artifacts and Environment* (2001).

———. “Measurement of Situation Awareness in Dynamic Systems.” *Human Factors* 37, no. 1 (March 1995): 65–84.

———. “Toward a Theory of Situational Awareness in Dynamic Systems.” *Human Factors* 37, no. 1 (1995): 32–64.

Endsley, Mica, and Debra Jones. *Designing for Situation Awareness: An Approach to User-centered* Design, 2nd Edition. Boca Raton, FL: CRC Press, 2012.

FEMA. “About the Agency.” Accessed December 10, 2015. http://www.fema.gov/about-agency.

———. *Developing and Maintaining Emergency Operations Plans* (CPG 101, Version 2). Washington, DC: Department of Homeland Security, 2010.

———. “Emergency Manager: An Orientation to the Position”(IS-0001a). Accessed December 10, 2015. https://emilms.fema.gov/is1a/index.htm.

———. *EOC Management and Operations* (G775 Resource Guide). Washington, DC: Department of Homeland Security, 2012. https://www.preparingtexas.org/Resources/documents/TDEM%20Training/RG_COMPLETE_Dec2012.pdf.

———. *FEMA National Incident Support Manual*. Washington, DC: Department of Homeland Security, 2011.

———. *Hurricane Sandy FEMA After-Action Report*. Washington, DC: Department of Homeland Security, 2013. http://www.fema.gov/media-library-data/20130726-1923-25045-7442/sandy_fema_aar.pdf.

———.”Introduction to Emergency Management Course.” 1995. Visual 10.2.

Fidel, Raya. *The Case Study Method: A Case Study*. Seattle, WA: University of Washington, 1984. http://faculty.washington.edu/fidelr/RayaPubs/TheCaseStudyMethod.pdf.

Fuentes, Rick. “Fusion Center Coordinates New Jersey Hurricane Sandy Disaster Response.” Information Sharing Environment. February 5, 2013. https://www.ise.gov/blog/col-rick-fuentes/fusion-center-coordinates-new-jersey-hurricane-sandy-disaster-response.

Gibbs, Linda, and Caswell F. Holloway. *NY City Hurricane Sandy After Action Report and Recommendations to Mayor Michael R. Bloomberg*. New York: The City of New York, 2013.

Haddow, George, Jane Bullock, and Damon P. Coppola. *Introduction to Emergency Management*,5th edition. Oxford, UK: Butterworth-Heinemann, 2014.

Heuer, Richards J., Jr.. *Psychology of Intelligence Analysis*. Washington, DC: Central Intelligence Agency, 1999.

Howitt, Arnold, and Herman Leonard. *Managing Crises: Response to Large-Scale Emergencies* Washington, DC: CQ Press, 2009.

Institute for Security Technology Studies. *Crisis Information Management Software (CIMS) Interoperability*. Hanover, NH: Dartmouth College, 2004.

Jansen, Jan Martin, Bas Lijnse, and Rinus Plasmeijer. “Toward Dynamic Workflow Support for Crisis Management.” In *Proceedings of the 7th International ISCRAM Conference*.

Joint Chiefs of Staff. *Joint Intelligence*(Joint Publication 2–0). Washington, DC: Department of Defense, 2013. https://fas.org/irp/doddir/dod/jp2_0.pdf.

Kaye, Nikki. “Christchurch Earthquake Lessons Completed.” Scoop. October 20, 2015. http://www.scoop.co.nz/stories/PA1510/S00333/christchurch-earthquake-lessons-completed.htm.

Krupa, Charles. “Ice Storm Leaves 1.25 Million Powerless in Northeast.” *USA Today*. December 13, 2008. http://usatoday30.usatoday.com/weather/storms/winter/2008-12-12-ice-storm_N.htm.

Leavitt, Harold J. “Applied Organizational Change in Industry: Structural, Technological and Humanistic Approaches,” in *Handbook of Organizations*. Edited by J.G. March, 114–1170. Chicago: Rand McNally, 1965.

Lowenthal, Mark M. *Intelligence: From Secrets to Policy*, 6th edition. Washington, DC: CQ Press, 2014.

Lucus-McEwen, Valerie. “Recalibrating Emergency Management: Information Is not the Same as Intelligence.” Emergency Management. December 29, 2010. http://www.emergencymgmt.com/emergency-blogs/campus/Recalibrate-Emergency-Management-Information-Intelligence-122910.html.

Massachusetts Emergency Management Agency. *December 2008 Ice Storm, Incident After Action Report & Improvement Plan*. Framingham, MA: Massachusetts Emergency Management Agency, 2009.

———. “MEMA Mission.” Accessed December 10, 2015. http://www.mass.gov/eopss/agencies/mema/mema-mission.html.

McChrystal, Stanley, Tantum Collins, David Silverman, and Chris Fussell. *Team of Teams: New Rules of Engagement for a Complex World*. New York: McChrystal Group, 2015.

McLean, Ian, David Oughton, Stuart Ellis, Basil Wakelin, and Claire B. Rubin. *Review of the Civil Defence Emergency Management Response to the 22 February Christchurch Earthquake*. Christchurch, New Zealand: Christchurch Migrant Inter-Agency Group, 2012.

Meadows, Donella H. *Thinking in Systems: A Primer*. White River Junction, VT: Chelsea Green, 2008.

Ministry of Civil Defence & Emergency Management. *Corrective Action Plan—Following the Review of the Civil Defence Emergency Response to the 22 February 2011 Christchurch Earthquake*. Wellington, New Zealand: Ministry of Civil Defence & Emergency Management, 2012.

———. *Response Management: Director’s Guideline for CDEM Group and Local Controllers*. Wellington, New Zealand: Ministry of Civil Defence & Emergency Management, 2014.

Moghaddam, Fathali M. *Multiculturalism and Intergroup Relations, Psychology Implications for Democracy in Global Context.* Washington, DC: American Psychological Association, 2011.

National Commission on Terrorist Attacks upon the United States. *The 9/11 Commission Report*. New York: W. W. Norton, 2004.

National Institute of Justice. *Crisis Information Management Software (CIMS) Feature Comparison Report*. Washington, DC: Department of Justice, 2002. https://www.ncjrs.gov/pdffiles1/nij/197065.pdf.

National Weather Service. *Analysis of the December 11–12, 2008 Destructive Ice Storm across Interior Southern New England* (WFO Taunton Storm Series Report, #2009-01). Silver Spring, MD: National Weather Service, http://www.weather.gov/media/box/officePrograms/science/December_2008_Ice_Storm.pdf.

———. *Service Assessment: Hurricane/Post-Tropical Cyclone Sandy, October 22–29, 2012*. Monterey, CA: U.S. Department of Commerce, 2013. http://www.nws.noaa.gov/os/assessments/pdfs/Sandy13.pdf.

New Hampshire Public Utilities Commission. *After Action Review: December '08 Ice Storm Final Report*. Concord, NH: New Hampshire Public Utilities Commission, 2009. https://www.puc.nh.gov/2008IceStorm/Final%20Reports/PUC%20IceStorm%20After%20Action%20Report%2012-03-09.pdf

New Zealand History.net. "Christchurch Earthquake Kills 185." February 22, 2011. http://www.nzhistory.net.nz/page/christchurch-earthquake-kills-185.

Nofi, Albert A. *Defining and Measuring Shared Situational Awareness*. Alexandria, VA: Center for Naval Analysis, 2000.

Obama, Barack. *Presidential Policy Directive 8:National Preparedness* (PPD-8). Washington, DC: Department of Homeland Security, 2011. http://www.dhs.gov/presidential-policy-directive-8-national-preparedness.

Office of Electricity Delivery and Energy Reliability. *Comparing the Impacts of Northeast Hurricanes on Energy Infrastructure*. Washington, DC: U.S. Department of Energy, 2013.

———. *Hurricane Sandy-Nor'easter* (Situation Report #13). Washington, DC: Department of Energy, 2012. http://www.oe.netl.doe.gov/docs/SitRep13_Sandy-Nor'easter_120312_300PM.pdf.

Pfeifer, Joseph. "First Chief on Scene." Fire Engineering. September 1 2002. http://www.fireengineering.com/articles/print/volume-155/issue-9/world-trade-center-disaster/volume-i-initial-response/first-chief-on-the-scene.html.

Schulz, Christian and Raymond Guidetti. “Fusion during Crisis: Aftermath of a Perfect Storm.” *DomPrep Journal* 9, no. 5 (May 2013): 16–19.

Smith, Catherine and Bob Norton. “Leavitt’s Diamond and the Flatter Library: A Case Study in Organizational Change.” *Library Management* 13, no. 5 (1992): 18–22.

TIBCO Blog. “John Boyd, the OODA Loop, and Near Real-Time Analytics.” July 11, 2013. http://www.tibco.com/blog/2013/07/11/john-boyd-the-ooda-loop-and-near-real-time-analytics/.

U.S. Coast Guard. *Team Coordination Training Student Guide: Situational Awareness* (8/98). Washington, DC: Department of Homeland Security, 2014. https://www.uscg.mil/auxiliary/training/tct/chap5.pdf.

Virtual Social Media Working Group and DHS First Responders Group. *Using Social Media for Enhanced Situational Awareness and Decision Support*. Washington, DC: Department of Homeland Security, 2014.

The White House. *The Federal Response to Hurricane Katrina Lessons Learned*. Washington, DC: The White House, 2006. http://library.stmarytx.edu/acadlib/edocs/katrinawh.pdf.

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