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THESIS

**MAKING SENSE IN THE EDGE OF CHAOS:
A FRAMEWORK FOR EFFECTIVE INITIAL RESPONSE
EFFORTS TO LARGE-SCALE INCIDENTS**

by

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LARGE-SCALE INCIDENTS**

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ABSTRACT

A review of response efforts to 9/11 revealed considerable challenges to resolving an event of this magnitude. To cope with these challenges, the federal government created the National Incident Management System (NIMS), an organizational structure intended to manage resources and channel communication between disparate agencies working together to solve a catastrophic crisis. Yet, first responders who have been on-scene at large-scale events know there is an initial phase of chaos during which the forms, checklists and organizational structure of NIMS offer them little help for making sense of the situation. A large-scale event moves through the four phases of the cynefin framework: chaotic, complex, complicated and simple. First responders must insert themselves into the initial chaos and begin to move it toward complexity. NIMS, then, becomes a valuable tool in the complicated arena to help restore the simple order of pre-event normalcy.

This thesis draws from sensemaking theory, human resource management literature, social science and biological science foundations to create a framework for first responder use during the initial chaos inherent in large-scale incidents. It recommends expanding NIMS to include recognition and discussion of this initial phase. Using a combination of classroom and scenario-based training, it also suggests a template to better educate first responders.

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LIST OF ACRONYMS AND ABBREVIATIONS

DHS	Department of Homeland Security
FBI	Federal Bureau of Investigation
HRO	High Reliability Organization
HSPD	Homeland Security Presidential Directive
IAP	Incident Action Plan
ICS	Incident Command System
NIMS	National Incident Management System
NRP	National Response Plan
OIC	Officer in Charge
PIO	Public Information Officer
ROEBs	Reliability-Oriented Employee Behaviors
Navy SEAL	Sea, Air, Land
SWAT	Special Weapons and Tactics
WMD	Weapons of Mass Destruction

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EXECUTIVE SUMMARY

A. INTRODUCTION

After the attacks on September 11, 2001, President Bush released Homeland Security Presidential Directive 5, calling for a standardized organizational structure that could manage the many elements comprising response to large-scale incidents. The subsequent release of Homeland Security Presidential Directive 8 provided the structure, mandates and funding to equip and train toward this standardized response. As a result of both these directives, coupled with goals stated in the *2002 National Strategy for Homeland Security*, which were further supported in the *2007 National Strategy for Homeland Security*, the National Incident Management System (NIMS) manual was released on March 1, 2004. Federal mandates required that every local area first responder receive NIMS training in order to understand how to use the system, and as a prerequisite to receiving any federal grant funding.

NIMS provides a framework to manage the disparate resources, personnel and equipment involved in protecting against a terrorist attack, and responding to and recovering from one should prevention fail. The Incident Command System (ICS) embedded within NIMS focuses on incident response. ICS provides structure to event response by segmenting response actions into the defined areas of command, operations, planning, logistics and finance. It provides an excellent framework to track and coordinate complicated response efforts that cross boundaries and disciplines. But, it does not provide guidance for every phase of incident response.

Despite the applicability and usefulness of ICS to coordinating the long-term part of incident response, police officers and firefighters first on-scene at large-scale events, tasked with assuming command of the incident, realize there is an initial phase to every event where chaos reigns. In this initial phase, ICS frameworks offer little help in assisting order emerge. At truly wide-reaching

events, many of the response elements will not work directly for the police officer or firefighter assuming the role of the first incident commander. Private businesses might be involved, utility companies might be needed, public works employees, private security officers, school principals and a host of other entities could have a stake in the outcome of the event. Because of this, the command and control concept of issuing clear, crisp orders might not be effective, as none of these people really have to follow those orders. All of this adds to the chaos and complexity of the event; a chaos expected and normal for any large-scale incident.

B. PROBLEM STATEMENT

First responders know, but rarely discuss, the reality that every large-scale incident involves an initial phase where chaos reigns. In this phase, the chaos is normal and to be expected. Success is not whether the first incident commander can immediately end the chaos by issuing a few crisp orders—an impossibility—but rather how quickly he or she can guide the situation out of chaos and toward complexity. In a complex environment, incident commanders can begin to see parts of the situation they recognize and can work with. As this complexity gives way to complicated situations, the NIMS and ICS structure can then be employed generally with a high rate of success. But, these facts are currently not recognized in NIMS literature and ICS training, an important omission failure.

C. RESEARCH QUESTIONS

How can first responders tasked with the role of Incident Commander during the first, crucial chaotic phase of an event be as prepared as possible to make sense out of often nonsensical events? Is there an identified check-list of tasks one can simply perform by rote that will bring order to chaos, or is a different type of education needed to help these first-responding incident commanders work effectively in situations of chaos and complexity? Can every police officer or firefighter successfully work within this initial phase of chaos, or

can certain behaviors, levels of experience and shared networks predict greater success for some first responders than for others? How should solutions to these questions be captured and shared with the first responder community in order to improve event response efforts in the initial phase of chaos?

D. ANALYSIS

This thesis will consider the life of a crisis event as it moves through the chaotic, complex, complicated and simple cynefin domains, and question the effectiveness of NIMS and ICS during the initial chaos of large-scale event response. Analyzing this initial phase through the lens of molecular biology's edge-of-chaos theory creates an opportunity to apply proven processes from other disparate disciplines and determine exploitable leverage points embedded in the chaos. This thesis will consider sensemaking, network theory, and human resource management principles governing High Reliability Organizations morphed into current tactical and operational tenets to create a framework for helping first responders work through initial chaos. It will further explore, through several small examples and one, larger case study of the Pentagon response on 9/11, how the framework functions in real situations. Finally, this thesis will discuss the importance of identifying and preparing those most likely to be first responders at large-scale events and offer suggestions for a sorely needed comprehensive training and education program.

E. RECOMMENDATIONS

This thesis makes the following recommendations:

- NIMS and ICS literature must articulate that chaos will reign during the initial stages of a large-scale event, and then recognize and label this phase as an "edge-of-chaos" transition phase. NIMS must institutionalize this fact and have it become part of ICS training. This is crucial to help solidify expectations among first responders about what they will encounter when arriving at the scene of something on the scale of the Oklahoma City bombing. If they do not prepare for confusion, complexity, emotional reactions and the likelihood that they very well might be unable to make any

immediate sense out of the situation, they will fail to realize that they must see the chaos as acceptable and normal.

- NIMS and ICS literature must identify what behaviors and traits will make some people better incident commanders in this initial phase than others. Seek these people out and work with them to further their skills. This might mean that rank, grade or position be ignored.
- NIMS and ICS literature must rely on reality-based scenario training to prepare first-responding incident commanders to better deal with a variety of unexpected events, causes and outcomes.
- The importance of NIMS and the relevance of ICS during subsequent phases of the event, once the chaos has begun to dissipate, must be stressed.

F. CONCLUSION

If a focused discussion in NIMS and ICS about the initial edge-of-chaos transition phase present in every large-scale event is included, practitioners can begin to find ways to bring about a successful conclusion to a complex, not easily understood catastrophe. In this initial, chaotic phase of an event, check-box lists can lull the responders with an illusion that they are in control. Such beliefs can be enticingly dangerous. A ready set of instructions for first-responding incident commanders are no solution. Other fields of study must be brought in to what has historically been a strictly tactical-minded conversation. Certain social science tools for making sense out of unique, difficult-to-understand situations, coupled with business strategy concepts and human resource management principles, can be drawn upon to create a workable starting point for the first responders who need to understand how to bring a chaotic situation back into the realm of simple order. This thesis attempts to combine these disparate disciplines into one framework applicable to the efforts of first-responding incident commanders working within an edge-of-chaos event.

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I. RESPONSE TO THE PENTAGON ON 9/11

American Airlines Flight 77 struck the Pentagon near the heliport between Corridors 4 and 5. It careened through the building and came to rest 310 feet from its impact point. In its path, it “destroyed more than 30 columns that were holding up the building and severely damaged 20 others. Decelerating from 530 miles per hour to a dead stop in that distance produced a gravitational force of 30 g’s, more than three times the force that fighter pilots are trained to withstand in the cockpit. From the moment of impact, the entire event had taken place in eight-tenths of a second” (Creed and Newman 30).

Rescue efforts began immediately. Pentagon civilian building operators worked alongside military personnel, and all risked their lives to save others. Steve Carter, the Pentagon’s assistant building manager, and his assistant, Kathy Greenwell, rushed to assess the building’s electrical system and determine which parts were functioning and which parts could be shut off. They knew exposed electrical wires could kill fleeing victims and slow down firefighters. Navy SEAL Craig Powell found a pocket of people trapped on an inner second floor and helped them down to the first floor and out to safety. Lieutenant General P.K. Carlton ran into the burning building and guided disoriented, injured people outside to safety. Medical personnel on scene set up a triage center in the open courtyard and began to render aid to victims.

Arlington County Firefighter Derek Spector arrived at the scene first. He initiated firefighting and life-saving efforts inside the Pentagon. He was soon joined by Captain Mike Defina, the acting battalion chief at Reagan National Airport. Behind Defina came Arlington County Battalion Chief Bob Cornwell and Firefighter Joe Lightfoot. Cornwell set the scene for Jim Schwartz, Arlington’s Assistant Chief of Operations, who arrived next. He established the first two priorities as searching for victims, getting them out of the building and then fighting the fire.

A little more than twenty-five minutes into the event, Arlington County Fire Chief Ed Plaughner arrived at the Pentagon. He received a briefing from Schwartz regarding the current status of the event and the response efforts continued based on the two priorities of first evacuating victims and then dealing with the fire. FBI agent Chris Combs joined the command post and the rescue efforts continued.

Forty-five minutes after Flight 77 crashed into the Pentagon most of the emergency workers had evacuated to the underpass of I-395, safely waiting out the threat of a second hijacked plane still in the air, believed to be headed their way. Multiple federal and local agencies along with media began to arrive. Plaughner spent a great deal of time reaching out to Pentagon officials, FBI, other fire agencies and police departments in an attempt to keep politics out of the rescue efforts.

When the second plane grounded in another location at 10:40a.m., rescue efforts began again at the Pentagon site. Now, firefighters decided that their priorities needed to change slightly. While they still needed to look for victims, they decided it was time to attack the fire aggressively. Ancillary parts of the response effort were not needed anymore. "Except for firefighters who needed attention for injuries, heat exhaustion, or smoke inhalation the medical operation in the courtyard was winding down" (Creed and Newman 164). Offensive firefighting became the focus of the operation.

At 11:30a.m., almost two hours after Flight 77 crashed into the Pentagon, Schwartz fully deployed ICS. Planning, Operations and Logistics were staffed, and the command post began to gain good accountability of units on scene with the ability to track their location inside the fire itself. ICS was used very effectively throughout the remainder of the incident. By 1:30p.m., "the firefight had become more organized after each evacuation, as commanders used the time to refine their plans, prepare fresh crews, and gather intelligence about the fire conditions inside" (Creed and Newman 194).

By Tuesday, September 18, 2001, “the nation was starting to get back to normal, or at least adapting to a ‘new normal’, as commentators were starting to say” (Creed and Newman 444). And on September 21, 2001, “the Arlington County Fire Department formally relinquished control of the Pentagon incident site to the FBI” (453).

The terrorist attack on the Pentagon claimed a total of 189 lives: one hundred twenty-five people working inside the building, fifty-nine passengers and crew of American Airlines Flight 77, and five terrorist hijackers. No firefighters or police officers responding to the event were killed. The *9/11 Report* found that “while no emergency response is flawless,” (Creed and Newman 314) the rescue efforts at the Pentagon were “mainly a success” (314). What made these first responders so successful during this enormous catastrophe? This thesis argues that those on scene, perhaps unwittingly, used a sensemaking process that allowed them to work through the initial chaos and later apply ICS with purpose. This process, along with other factors that impacted the initial phase of the event, can be distilled into a framework that should be included in NIMS and ICS literature and taught to first responders through scenario-based training exercises.

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II. INTRODUCTION

A. "HOMELAND SECURITY": A GLOBAL CONTEXT

On December 8, 1941, President Roosevelt delivered a speech to the Joint Session of Congress in which he described the previous day as "...a date which will live in infamy, the United States of America was suddenly and deliberately attacked...." Sixty years later, this description still effectively brackets these rare, cataclysmic events such as Pearl Harbor and 9/11 that mark a generation and shape the world. While Pearl Harbor occurred in the known arena of an army attacking another country's army, 9/11 happened in a completely new venue. Many unknown factors drove, and were driven by, this event. An enemy motivated by barely understandable and seemingly intangible concerns penetrated a perfectly peaceful day as innocent civilians attempted to go about their daily business. September 11 caused America to face an unwanted warrior-opponent in non-combatant arenas. The framework here was new. Who were the enemies? How do we respond? There is no government to blame and no global sanctions that can be usefully imposed. How do we retaliate to hold them accountable for their actions? What traditional warfare model can be applied in this case? What country can be invaded? Whose army can be engaged?

As the nation, and indeed the world, considered the situation, known, established reactions employed. Fighter planes were scrambled and armies were mobilized. While all of these methods and reactions are accepted, globally instituted models for responding to aggression from an enemy, how successful have they been in our efforts to defeat Al Qaeda, capture Osama bin Laden or secure the world against terrorist tactics? Some might say we have been trying to fit the square peg into the round hole. Or, perhaps, we are attempting to fight this war in the way we fought the last: a sure recipe for failure.

Since 9/11, a new phrase has come to dominate political landscapes, reshape long-standing government bureaucracies, drive federal funding streams and create priorities for local, state, federal and tribal agencies. This phrase, *Homeland Security*, has become a *thing* that must be performed by certain people in government employ in order to keep civilians safe. It has generated a tangible nationwide organization, the Department of Homeland Security (DHS), as well as actual sub-sections of state, local and tribal agencies that now have Homeland Security Divisions or Details.

So what, exactly, is *Homeland Security*? The *2002 National Strategy* says it is about protecting Americans from terrorist attacks here on our own soil, as well as abroad. Breaking the situation down into four overarching elements, the *2002 National Strategy* calls for the prevention and mitigation of terrorist events along with the ability to respond and recover should the nation fail in its first two goals. To support each category, the federal government handed out billions of dollars of grant funding to state, local and tribal agencies complying with specified parts of the *Strategy*, again, all geared solely towards terrorism. Organizations outfitted their agents and officers with personal protective equipment for WMD events, SWAT teams nationwide bought chemical testing agents and armored vehicles, agencies acquired state-of-the-art mobile command posts, and all agencies worked toward increased voice and data interoperability platforms. All of this equipment and support, though, filled a specific niche in the prevention of, or response to, a terrorist attack.

As the years have gone by, no subsequent attack has occurred, although a few have been prevented. Many jurisdictions, however, have been faced with other large-scale events that have cost hundreds of lives in a single incident. An example of this is the recent Hurricane Katrina episode. Using the language of risk managers, the nation found that it was preparing itself for “high-risk/low frequency” situations, meaning those events that do not occur very often, but when they do, can create catastrophic consequences if handled improperly. What the nation saw with Hurricane Katrina, though, is that perhaps *Homeland*

Security also meant preparing for “high-risk/high-frequency” events, those that might happen more predictably (such as natural disasters) and will cause severe loss of life if first responders and government agencies are not equipped and prepared to handle them properly.

A time span of six years since 9/11, coupled with such dramatic incidents as Hurricane Katrina, and push-back from local and state agencies that wanted their federal grant funding dollars to help not only their anti-terrorism efforts but their fight against everyday crime and general response issues, resulted in the slightly modified focus of the 2007 National Strategy. Here, the President now called upon government agencies to be able to protect our citizenry against all hazards, ranging from terrorism to natural disasters. Some argued that this approach diluted the importance of the terrorist threat. Others felt that broadening the homeland security mission gave organizations a chance to protect citizens not only from the unfathomable horror of a terrorist event, but also from the more mundane natural disaster or violent street criminal that will leave their victims equally dead.

All of this has culminated in many Homeland Security professionals questioning, as Dr. Christopher Bellavita has, *What is Homeland Security?* What was once so clear on September 12, 2001, became a very deep and murky subject indeed by June 2008. As America moves forward in the shadow of economic uncertainty, a shaken nation realizes that perhaps homeland security is a complex field with many moving parts and intricately involved public and private entities. Perhaps it is not as simple as trying to find and kill Osama bin Laden.

In an attempt to phrase the subject more concretely, Dr. Bellavita offers seven possible definitions of homeland security: Terrorism, All Hazards, Terrorism and Catastrophes, Jurisdictional Hazards, Meta Hazards, National Security and Security Über Alles (2). While the important “so what” here is that definition can direct focus and funding, another, equally important strategic implication emerges as well. Along with defining homeland security, it is perhaps

important to understand what framework we are using to reach that definition. Dr. Bellavita talks about the “ready, fire, aim” (2) approach to homeland security. Another way to understand this notion is through the model of *sensemaking*.

As Karl Weick defines it, “sensemaking is creation as much as discovery...[it]...is not just a process of interpreting the environment, it is as much the creation of the environment itself, as much authoring as it is interpretation” (Mantere 65). While *homeland security* is probably all of the things Dr. Bellavita discusses above, it has also clearly become a *thing* unto itself. It has become a process, an organization, an environment that gives life to government agencies, has spawned many private sector companies, and continually acts and reacts with itself to grow and change. This can be seen just by comparing the *2002 National Strategy* to the *2007 National Strategy*. By definition, homeland security is a complex adaptive system, displaying “organization without a central organizing principle (emergence) [...] with a large number of elements, building blocks or agents, capable of interacting with each other and with their environment” where “in the most elaborate examples the agents can learn from past history and modify their states accordingly” (NICO 1).

How can one attempt to understand or influence a complex adaptive system? Homeland security practitioners who become expert in any one aspect of the their complex adaptive system can influence it by writing about their experiences, conducting relevant workshops and training drills and adding to the body of knowledge about their particular area of expertise. This effort to interpret their small segment of the homeland security environment will undoubtedly add to the overall process of making sense out of one arena, discovering something new and adding to the community discourse and knowledge base. In short, practitioners who deeply consider one aspect of the overall homeland security environment will participate in the sensemaking process that will add to the better strategic understanding of homeland security. And this translates into the tangible societal benefit of lives saved, property preserved and a way of life protected.

B. PARTS OF THE WHOLE: INCIDENT RESPONSE

As the 2010 Quadrennial Homeland Security Review outlines, “Achieving the goals of the core homeland security missions will require scientific research to discover new knowledge and methods that can be applied to homeland security challenges, and the creation of new technologies and new ways of thinking about problems and possible solutions” (75). One of the main homeland security core missions is response to large-scale incidents, whether caused by terrorists, local criminals or natural disasters. Current practitioners need to consider more fully the elements of complex incidents and how first responders can best end the threat and resolve the crisis, saving lives, protecting property and restoring normalcy.

The topic of incident response has been broadly considered and is supported by a wide base of doctrines. The National Incident Management System (NIMS) has been created for a standardized response to any crisis incident. NIMS, and other similar military doctrines, create a fairly rigid practice to instill command and control over a crisis incident. Posts are created with officers in charge of each to section the event into bite-sized pieces. The overarching belief is that information must immediately flow so that all those on scene can occupy that elusive arena of “situational awareness” in order for a response to be swift and effective.

But what of the initial response efforts? What happens to those first few men and women who arrive to the World Trade Center on 9/11 or the Alfred P. Murrah Federal Building in Oklahoma in 1995 and know that the whole world expects them to bring this crisis back to some sort of normalcy? These first responders cannot arrive at that type of carnage, disruption and chaos, quickly assign out the NIMS sections of Operations, Planning and Intelligence, Logistics and Finance, and believe that this will begin to quiet the event.

Whether a crisis is caused by human perpetrators or generated by a natural disaster, first responders insert themselves into what has become a

spontaneously created, active, living cell of an environment, perhaps only a few miles from their own homes, comprised of critically injured innocent bystanders, ongoing property destruction, and multiple responders who, while trying to render aid, are perhaps also tasked with engaging an active foe. Add to that mix the routine business tasks of communicating clearly with others inside the event, liaising with involved private entities, and managing such routine needs as ordering barricades for street closures, and additional lighting if the event continues into the night, and these seemingly simple tasks become impossible to perform. Covertly, yet undeniably, driving the event can be individual agendas of elected officials, indecisions based on fear of blame for missteps, private companies driven by monetary concerns, and the intricate web of interpersonal and group dynamics. All of this comes together to heighten the “chaos” defined in the cynefin framework model.

Molecular biologists studying cells have discovered an edge to every cell where individual agents interact with each other and their environment in an atmosphere of disorder and seeming turmoil. Out of that chaos, order can emerge. If an order does emerge, the type ultimately determines whether the cell lives or dies. Scientists have named this area of the cell “the edge of chaos.” Using this analogy, the normal business of life resembles the living cell, ordered and structured and predictable, to some extent. When a crisis strikes a community, whether an incident such as 9/11 or a natural disaster such as Hurricane Katrina, the event occupies an extra space created along an edge of this normality of living. In this turbulent space, the spontaneity of the incident erases order, and actors engage with each other and their environment in a chaotic fashion, much as cellular particles do in the molecular biological “edge of chaos.” As scientists have shown, order can emerge from this chaos.

The challenge for first responders to large-scale events, however, is that lives will be lost and property destroyed if they wait for order to emerge out of their chaotic event. Yet neither can they attempt to arrive at an event and move it from the cynefin realm of the “chaotic” straight and easily into the “simple.”

First responders dealing with the “edge of chaos” of a mass casualty event need a way to manipulate the actors, elements and environment away from chaos, into the realm of “complex” where it can be worked toward understood, yet still “complicated” components, and finally de-escalated into a “simple” situation.

After 9/11, the federal government mandated the use of the National Incident Management System (NIMS) to manage emergency situations of all kinds. Its name is accurately descriptive; NIMS is a great tool for managing an event. Unfortunately, the edge of chaos cannot be *managed*. The strict framework offered through the command positions and checklists of NIMS will not only fail to bring order to the chaos, but could contribute to it. While NIMS is an excellent framework for managing an event once it has become complicated, it is an inappropriate structure to attempt to impose upon chaos. Space must be created in NIMS for the recognition of this initial phase of chaos along with methodology and techniques aimed at successfully manipulating that environment into an arena where the command structure of NIMS can be usefully applied.

Joseph Pfeifer, one of the New York City Fire Department first responders on scene at 9/11, recognized in his subsequent Naval Postgraduate School thesis a specific part of a large-scale event he labeled as “the initial hours of a terrorist attack” (i). He went on to explore how his agency was over-tasked during the overall course of the response effort and argues for organizational preparedness and operational adaptability to combat this. To carry his findings and recommendations further, practitioners and researchers must also specifically consider response efforts during these “initial hours.” How do the first incident commanders begin to bring order to chaos? Review of the current literature establishes that this crucial area needs to be addressed, yet currently remains inadequately discussed.

One can see by applying a sensemaking framework to the problem, that, as an incident unfolds, as actors and agents interact with each other and their environment in this “edge of chaos,” they are interpreting the environment,

creating it as much as reacting to it, and by doing so, they are also authoring it. But, who will write the best ending? Who will be able to work best within the chaos to bring about resolution?

In a clinical, academic review, both sensemaking and molecular biology's edge-of-chaos theory allow scientists and sociologists to watch how order emerges from the chaos. Unfortunately, first responders do not have this luxury. While personal experience, discussions with others who have functioned as Incident Commanders at large-scale emergencies, and reviews of agency After-Action reports about those events reveal the existence of a *crucial*, initial phase, there is little help on how to deal effectively with it. In an emergency, the initial choice of action determines success or failure. Poor choices inevitably generate other poor choices. Delays translate into the unchangeable reality of lives lost rather than saved, and property destroyed rather than preserved. Preventing such chains of disaster cannot be accomplished by just anyone who has completed a federally mandated NIMS/Incident Command System (ICS) class for first responders. It takes a certain kind of person to function in that type of environment and bring it to a successful conclusion.

This thesis will explore the initial edge of chaos, briefly document what types of people best respond in these situations and, using sensemaking as a model, detail some tangible processes to help first responders think through unusual, chaotic periods. Ultimately, it will argue that the NIMS structure must be expanded to recognize that there is such a distinct phenomenon as an initial chaotic phase and discuss ways of thinking, techniques and best practices for working through it successfully. This might seem absurdly evident, yet as noted earlier, it seems not to have been focused on as such, and therefore, inadequately dealt with.

C. THE NATIONAL INCIDENT MANAGEMENT SYSTEM: AN EFFECTIVE ORGANIZATION FOR ALL PHASES OF EVENT RESPONSE?

“Emergency response is a product of preparedness. On the morning of September 11, 2001, the last best hope for the community of people working in or visiting the World Trade Center rested not with national policymakers but with private firms and local public servants, especially the first responders: fire, police, emergency medical service, and building safety professionals.” (The 9/11 Commission Report 278) This statement reduces the vast and complex subject of national response preparedness down to its most vital component: the importance of understanding how first responders can most effectively begin to deal with the initial chaos of a large-scale event. The most important person to every individual caught in this type of cataclysmic moment is the first responder with the power and potential ability to save his or her life. Not even the President of the United States, at that moment, would be a sight more welcome than a firefighter or police officer offering the hand that pulls them from certain death. National preparedness, in the initial stage of any event, becomes all about the most qualified, ablest, albeit sometimes very small, group of first responders capable of beginning to bring order to chaos.

For this reason, any discussion of national preparedness must start with considering how best to find, train and equip those who will be first on-scene at large-scale incidents, tasked with working through the initial, chaotic phase. This, however, has not been done, revealing a gaping hole in what NIMS was designed to correct—a gap in response readiness. This thesis seeks to fill that gap.

The national discussion on preparedness started with Homeland Security Presidential Directive 5, released on February 28, 2003, the stated purpose of which is “To enhance the ability of the United States to manage domestic incidents by establishing a single, comprehensive national incident management system” (1). The resulting National Incident Management System (NIMS) document, released March 1, 2004, states that “The NIMS represents a core set

of doctrine, concepts, principles, terminology, and organizational processes to enable effective, efficient, and collaborative incident management at all levels. It is not an operational incident management or resource allocation plan” (NIMS ix). How, then, does one go about operationally managing an incident?

Consider the events of 9/11 at the Twin Towers as happening in three phases. The first phase was the normalcy of Manhattan life on a bustling Tuesday morning. At 0846 hours, this phase was violently altered by an unimaginable catastrophe. The chaos of this second phase lasted for 102 minutes while two planes purposely collided into the towers, causing severe fires and the ultimate collapse of both iconic structures. This second phase slowly gave way to a third, involving the complicated coordination of the massive, cross-discipline, multi-jurisdictional response team charged with working through the necessary process of recovery. While NIMS provides a valuable framework to structure the processes that will accomplish the third phase, how can first responders operationally work in the second, the crucial, inevitable transition phase needed to begin the recovery process? The pertinent question, then, is whether NIMS provides an adequate overall framework to help first responders work through chaos.

HSPD 5 states that NIMS “...will provide a consistent nationwide approach for federal, state, and local governments to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity” (3). What NIMS really strives for, however, is compatibility and interoperability across jurisdictions, disciplines and sectors. To achieve this, it memorializes a “core set of concepts, principles, terminology, and technologies covering the incident command system; multi-agency coordination systems; unified command training; identification and management of resources (including systems for classifying types of resources); qualifications and certification; and the collection, tracking, and reporting of information and incident resources” (3).

Part of the National Response Plan (NRP), NIMS addresses much more than just incident response. It is intended to foster communication, cooperation and standardization across federal, state, local, tribal entities and private partners as well, so the nation can attempt to prevent an attack before it occurs. In case prevention fails, NIMS provides a framework for preparedness and coordination of response efforts. Once an event has been handled, NIMS provides the organizational structure to achieve recovery. Within NIMS, the Incident Command System (ICS) is the command and control component used for event response. When and how ICS should be employed is the portion of NIMS this thesis considers.

The NIMS manual states that “ICS defines the operating characteristics, interactive management components, and structure of incident management and emergency response organizations engaged throughout the life cycle of an incident” (3).

The ICS is a management system designed to enable effective and efficient domestic incident management by integrating a combination of facilities, equipment, personnel, procedures, and communications operating within a common organization structure, designed to enable effective and efficient domestic incident management. A basic premise of ICS is that it is widely applicable. It is used to organize both near-term and long-term field-level operations for a broad spectrum of emergencies, from small to complex incidents, both natural and manmade. ICS is used by all levels of government—federal, state, local, and tribal—as well as by many private-sector and nongovernmental organizations. ICS is also applicable across disciplines. It is normally structured to facilitate activities in five major functional areas: command, operations, planning, logistics, and finance and administration (NIMS 7).

Some major concepts of ICS are that all incidents are local incidents and that local first-responders will be the ones handling the first stages of the event. It offers a modular approach to incident management, meaning one, two, three or

all of the functional areas listed above can be stood-up and staffed as recognized sections. The expansion of the modules depends upon the size and severity of the event and the resources needed to mitigate it. Its core philosophy stresses fostering communication, cooperation, collaboration and standardization among multiple entities, jurisdictions and disciplines responding to an event. As such, it places a heavy emphasis on creating and using a common language, which includes demanding the use of standardized forms, resource tracking and command positions.

The five major organizational functions of ICS are: command, operations, planning, logistics, and finance. Intelligence can be added as a sixth function, should the event require it. There are command staff and general staff positions. The command staff is comprised of operations, planning, logistics and finance, as depicted in the chart below.

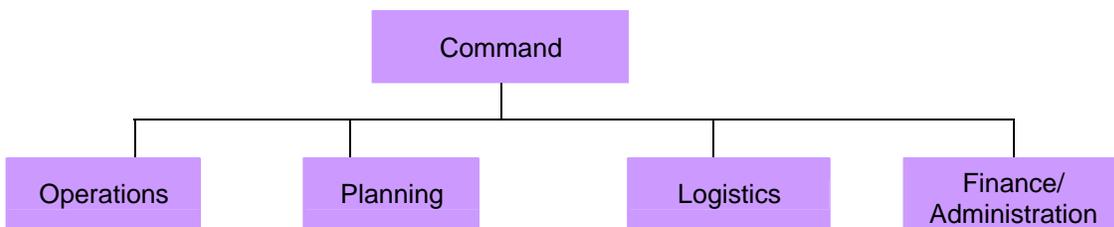


Figure 1. ICS Command Structure

Operational periods, guided by preceding Incident Action Plans (IAP), takes a center place in ICS. The IAP is meant to “provide a coherent means of communicating the overall incident objectives in the contexts of both operational and support activities” (NIMS 10). IAP’s are written documents generated by the Planning Section Officer in Charge (OIC) and given to the Incident Commander, who approves the plan. The plan is then tactically implemented by the Operations Section Chief.

The Command Staff portion of the ICS organization includes the Incident Commander, the Public Information Officer (PIO), the Safety Officer and the Liaison officer. The General Staff positions include the Operations Section, the Planning Section, the Logistics Section, and the Finance/Administration Section. The Operations Section can also have either branches or divisions and groups. A branch may be either “functional or geographic in nature. In general, branches are established when the number of divisions or groups exceeds the recommended span of control of one supervisor to three to seven subordinates for the Operations Section Chief” (NIMS 19). A division or group is established when “the number of resources exceeds the manageable span of control of the IC and the Operations Section Chief. Divisions are established to divide an incident into physical or geographical areas of operation. Groups are established to divide the incident into functional areas of operation. For certain types of incidents, for example, the IC may assign intelligence-related activities to a functional group in the Operations Section” (19). Each one of these sections has specific sub-sections that report to them, as depicted in the following charts.

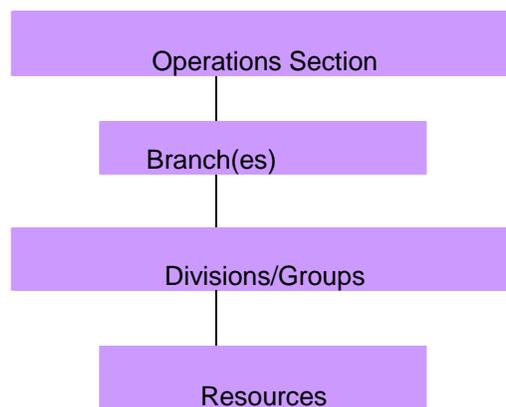


Figure 2. ICS Operations Section Structure

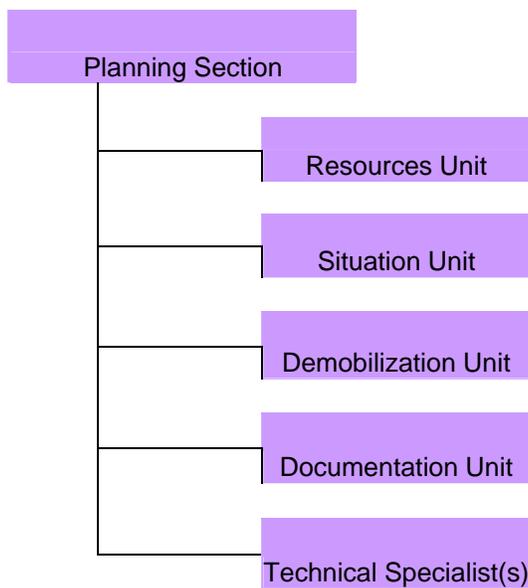


Figure 3. ICS Planning Section Structure

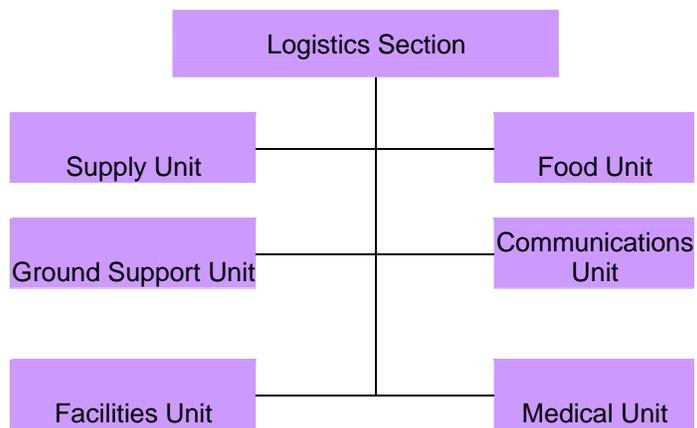


Figure 4. ICS Logistics Section Structure

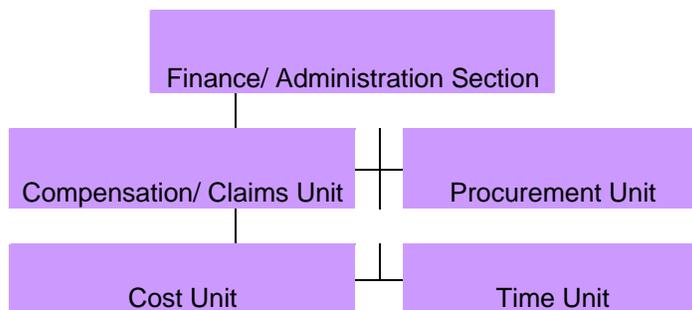


Figure 5. ICS Finance/Administration Section Structure

For federal reimbursement later, IAPs must be written on the proper NIMS forms. While only the needed forms are used, depending on the type and severity of the incident, the NIMS forms are as follows:

ICS-201	Incident Briefing
ICS-201	Summary of Current Actions
ICS-201	Current Organization
ICS-201	Resources Summary
ICS-202	Incident Objectives
ICS-203	Organization Assignment List
ICS-204	Assignment List
ICS-205	Incident Radio Communications Plan
ICS-206	Medical Plan
ICS-207	Organizational Chart
ICS-209	Incident Status Summary
ICS-210	Status Change Card
ICS-211	Check-In-List
ICS-213	General Message
ICS-215	Operational Planning Worksheet

In summary, ICS, in theory, works when someone names him- or herself Incident Commander. This person is supported by a PIO, a safety officer and a liaison officer. He/she assigns Operations, Planning, Logistic and Finance section chiefs. The Planning Chief works with the other sections, gathers all necessary information and formulates a plan of action. That plan is given to the Incident Commander who, if he/she approves it, gives it to the Operations Section Chief and orders that it be carried out. Operational periods are established. Usually twelve-hour time frames, the time can be modified as dictated by the incident. At the beginning of every operational period, the Incident Commander meets with his/her staff and the section chiefs to discuss the progress of the event and necessary modifications to the current plan. Ultimately, the Incident Commander becomes responsible for supervising the organizational structure responding to the event, not for the event itself. As the NIMS manual states, "Thus, in ICS, and especially in larger incidents, the Incident Commander manages the organization and not the incident" (NIMS 2-15).

A complicated structure, ICS operates in its own language. One must know whether he/she is part of a division or branch and what that means. People assigned to Planning must understand the language of that section and what is expected of them. First responders tasked with preparing an IAP, yet who do not understand what that entails, what ICS forms they should use, or how to go about compiling such a document, will be lost and will, ultimately, hinder the event response effort. Because of this, the federal government has mandated that every local and tribal first responder receive NIMS training. Currently a host of classes must be completed depending upon rank and job classification within his/her department. ICS 100, 200 and 300 are the introductory courses for all first responders. ICS 700 and 800 provide management level information.

In the days, weeks and months following an event such as Hurricane Katrina or 9/11, the complicated NIMS framework will allow disparate agencies and jurisdictions to come together and speak one language. It will provide a way to track resources, people and events. Standardized forms detailing personnel movement, medical treatments and actionable intelligence will forever memorialize actions needed for later de-briefs and cost reimbursement processes. Mandating that all first responders are trained in NIMS has been a valuable “lesson learned” from 9/11 that the federal government has put into action.

How valuable might such forms and frameworks have been to those firefighters and police officers working in the first 102 minutes of the World Trade Center response on 9/11?

Consider the first responding incident commander arriving at the chaotic scene of a large-scale event. According to NIMS, that incident commander should be concerned about, and is responsible for, the following:

- Ensuring clear authority and knowledge of agency policy.
- Ensuring incident safety.
- Establishing an Incident Command Post.

- Obtaining a briefing from the prior Incident Commander and/or assessing the situation.
- Establishing immediate priorities.
- Determining incident objectives and strategy(ies) to be followed
- Establishing the level of organization needed, and continuously monitoring the operation and effectiveness of that organization.
- Managing planning meetings as required.
- Approving and implementing the Incident Action Plan.
- Coordinating the activities of the Command and General Staff.
- Approving requests for additional resources or for the release of resources.
- Approving the use of students, volunteers, and auxiliary personnel.
- Authorizing the release of information to the news media.
- Ordering demobilization of the incident when appropriate.
- Ensuring incident after-action reports are complete. (2-15)

Notice that each of the responsibilities entails some sort of action on the part of the incident commander. Action, though, must be based on an understanding that allows for purposeful direction. This understanding builds the basis for answering the question, “What am I trying to accomplish here?” Once that question has been answered, all of the listed action items enable an incident commander to work the incident back towards normalcy. NIMS has no framework, though, that helps incident commanders achieve that initial understanding.

NIMS dissects incident response into section responsibilities. It does not approach an incident or event as being comprised of different stages, each requiring slightly different things from the response structure. NIMS only points to “Initial Response Actions” and states that Incident Commander should:

- Size up the situation.
- Determine if life is at risk.
- Ensure personnel safety.
- Identify environmental issues to address (4-9)

Immediately accomplishing these checklist items, helpful as they might be, during the initial chaos of an event can be nearly impossible.

The National Incident Management System does not address how to handle chaos because its purpose is mainly to provide organizational structure to the response efforts. And while this is a necessary part of event response, it is only after the chaos has subsided to a certain level that first responders can help order begin to emerge. What remains, then, is the need for an addition to the NIMS literature, which recognizes that this initial chaos exists, and then discusses ways in which first responders can be better equipped to handle it—a need addressed by this thesis.

It is critically important for the first responder community to consider how to work in the initial stages of chaos always present in any event because terrorists constantly create new playing fields. Because the business of terrorists is to find some new and shocking way to interrupt and devastate our way of life, we can no longer rely on studying certain types events and how to respond to them specifically. We have to consider the process of event response, not just the form, if we are successfully to handle another episode such as 9/11.

Consider this example. Police Officers train on how to respond to specific situations. For example, protocol is different for domestic violence situations, bank robberies, homicides and gang shooting calls. Because of experience with each one of these situations, police officers drive to the scene preparing mentally for what they will most likely face. In the case of a bank robbery, they know they will probably face an armed gunman, a potential hostage situation, escape routes that will need to be covered, traffic patterns that will have to be diverted or stopped. They have faced these situations before and know essentially what to expect. How could any New York City policeman on 9/11 have known what to expect from planes flying into buildings? In such cases, it becomes important to consider the process of event response because protocol created from responding to the last time planes hit the Twin Towers will not exist. National moved a line of text to next page for more text at top of page literature and a

national focus on the *how* of incident response, not just the mechanics of it, must be built anew because of the unprecedented enemy tactics we now face.

Military theory applied to law enforcement practice begins with the varying response efforts either to a crisis, defined as “an emotionally stressful event or situation involving an impending, abrupt, and decisive change” (Heal 27), or a conflict. Crises are most notably caused by natural disasters or mechanical in nature, such as major traffic accidents. A crisis can also involve and be caused by a conflict, in which there are “one or more suspects who must be captured or defeated in some manner” (Heal 28). Law enforcement officers facing a conflict have many more leverage points. They are usually dealing with a suspect who has an intensely personal interest in the outcome of the situation. This offers places where officers can influence and impact the crisis in an effort to bring it to a resolution. It offers an identifiable enemy, and many protocols and practices have been created and taught regarding how to deal with one. Similarly, the crises caused by natural disasters or major traffic accidents carry with them established and generally predictable response procedures.

But terrorism brings with it a new category of crisis for local law enforcement officers. Here, enemies offer no leverage points because they value nothing: not their escape, their life, nor any object they seek that they can be deprived of. There is nothing an officer can do to influence the actions of the terrorist suspect once the terrorist act has been committed. If prevention has failed, local first responders can only react. Already, they are placed in an unfamiliar environment. As in the case of 9/11, the crisis is so new and unique that there is no established response protocol. In fact, no standardized protocol for this type of incident will ever be effective, because that exact type of incident will probably never recur. Instead, the focus needs to be on how to equip first responders with an appropriate process enabling them to deal with the initial chaos of an event so they can evolve it to a point where protocols such as those of NIMS and ICS can then be effective.

ICS for local responders was built during the 1970s by firemen for multi-jurisdictional responses to large wildfires. It created a common language and command structure to bring multiple agencies together into one cohesive unit, for days, if not weeks, of work. ICS has been very successful as an ad-hoc organization to track resources, foster communication, determine mission and prepare action plans. Wildfires, however, are a little different than, for example, the recent active-shooter incident in Mumbai. Wildfires present leaders with opportunities to evacuate people and an almost fiscal approach to decision-making as leaders can factor in the manpower costs to save certain amounts of land. Wildfires also bring together groups of firemen accustomed to responding in strike forces year after year. Few other disciplines are involved. Wildfires are, to a certain extent, anticipated every year and these firefighters have all seen wildfires before. ICS, then, shows itself as a successful tool to manage an expected event, one that first responders have dealt with before and one that allows for decisions to be made a slower pace where almost all the facts are known and situational awareness is high.

Every event, whether it necessitates a police or fire response, will reach a point where the initial chaos subsides, information and intelligence begin to flow, situational awareness is firmly established, and communication becomes fluid. Once an event reaches that point, ICS, in its fully expanded form with all major sections deployed, staffed and operating smoothly, has proven itself as an essential management framework. But, how does ICS work in the initial stages of response efforts to a completely unthinkable catastrophe such as 9/11?

From their research, Buck, Trainor and Aguirre found that applying the ICS model to an event the magnitude of Hurricane Katrina reveals that it does not work well in certain phases of response efforts for events that have not been encountered before. They found that “Many social demands produced by disasters are too complex and unexpected to be handled by ICS. The command and control model does not currently, and given the social complexity, likely never will work for all phases of disaster operations. The federal government’s

hopes to apply NIMS to all phases of disaster operation are misguided” (Buck et al. 21). While NIMS and ICS are very effective at structuring and organizing multiple response efforts in a stable environment, they are not an effective tool first responders can use during the initial phase of chaos inherent in every unstable large-scale event.

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III. LITERATURE REVIEW

A. FRAMING THE PROBLEM: THE EDGE OF CHAOS

In the late 1980s, the Santa Fe Institute in Los Alamos, New Mexico, became home to a think tank of scientists spanning hard and soft scientific disciplines who came together to study complexity in all its forms. They learned that complexity, and complex adaptive systems, operate in the worlds of physics, biology, sociology, economics, political science, psychology, human group and social interactions, business arenas, everywhere human beings live and work, and, most importantly, in the fundamental building blocks that comprise our physical bodies, and thus the human condition itself. Individually, these scientists considered what implications complexity theory had in each of their specific fields. Collectively, they came to some enlightened conclusions applicable to every aspect of life. Their findings are no less relevant to Homeland Security practitioners working to make sense of the confusion and chaos that brackets all the details, organizations, events, ideologies, groups and individual people who compete either to make our world safe or keep it in the flux of fear generated by unpredictable, and seemingly unstoppable, terrorist attacks. Their findings, clearly, are applicable to the complex adaptive system created after 9/11 known as “*Homeland Security*.”

The Santa Fe Institute’s working definition of a complex adaptive system involves “anything with lots of strongly interacting parts” (Waldrop 53). As Stephen Wolfram framed it, “Whenever you look at very complicated systems in physics or biology...you generally find that the basic components and the basic laws are quite simple; the complexity arises because you have a great many of these simple components interacting simultaneously. The complexity is actually in the organization—the myriad possible ways that the components of the system can interact” (86).

Clearly, this description frames Homeland Security as a complex adaptive system. Within what we have come to call *Homeland Security*, consider just the federal agency Department of Homeland Security (DHS) itself. Each of its over twenty individual agencies has an established order, which has evolved over decades of operational procedure, mission guidance and experience. Individually, each agency works towards its own mission. Although some agencies in DHS do this more successfully and more smoothly than others, it can be argued that each autonomously develops a certain amount of success in achieving its individual mission goals. Collectively, however, these agencies interact with each other in the organization we have come to know as the Department of Homeland Security. The complexity surrounding the mission of securing our homeland arises from *how* and *how successfully* these interactions take place.

One of these Santa Fe scientists, Chris Langton, deeply considered complex adaptive systems in computer science. Credited with coining the term “artificial life,” he believed that computer programs could evolve into self-contained, self-generative, self-sustaining systems. He determined that even though a programmer wrote the initial code, as that code acted and grew on itself, it no longer needed the outside programmer to sustain or maintain it. It became “alive” in its own right. As he worked through the computer coding and considered various lambda values, he found the following rule applied systematically:

“Class I & Class II → Class III

Moreover, that sequence suggested an equally provocative transition in dynamical systems:

Order → “Complexity” → Chaos

where ‘complexity’ referred to the kind of eternally surprising dynamical behavior shown by the Class IV automata.” (Waldrop 228)

As Langton considered this proven formula, he became fascinated studying the transition between each of these phases:

Suppose you thought of the parameter λ as being like temperature. Then the Class I and II rules that you found at low values of λ would correspond to a solid like ice, where the water molecules are rigidly locked into a crystal lattice. The Class III rules that you found at high values of λ would correspond to a vapor like steam, where the molecules are flying around and slamming into each other in total chaos. And the Class IV rules you found in between would correspond to—what? (Waldrop 228)

Langton became fascinated with the “what” that, in his computer formula, separated Phase II from Phase III, or in his word formula separated order from chaos. In physics books, he found descriptions of first-order and second-order transitions. First-order transitions are clear to understand because they provide simple either-or choices. Continuing with the water analogy, at temperatures clearly above or below freezing, water molecules “decide” whether they will freeze or remain liquid. When the temperature is low, they vibrate slowly enough to form ice (order), and when the temperature is high, they vibrate so violently that their bonds break more quickly than they form, and they remain water (chaos).

The second-order phase transition, in contrast, is an arena where molecules in such a system do not have to make this either-or choice because their environment provides for a combination of order *and* chaos. To continue with the analogy of the water molecules:

Above the transition temperature, for example, most of the molecules are tumbling over one another in a completely chaotic, fluid phase. Yet tumbling among them are myriads of submicroscopic islands of orderly, latticework solid, with molecules constantly dissolving and recrystallizing around the edges. These islands are neither very big nor very long-lasting, even on a molecular scale. So the system is still mostly chaos. But as the temperature is lowered, the largest islands start to get very big indeed, and they begin to live for a correspondingly long time. The balance between order and chaos has begun to shift. Of course, if the temperature were taken all the way past the transition, the roles

would reverse: the material would go from being a sea of fluid dotted with islands of solid, to being a continent of solid dotted with lakes of fluid. But right at the transition, the balance is perfect....Order and chaos intertwine in a complex, ever-changing dance of submicroscopic arms and fractal filaments. (Waldrop 229-230)

Langton labeled this transition place “the edge of chaos” (Waldrop 230), and found that the analogy using water molecules was more than just an analogy. The “solid” and “fluid” phases of matter are also “two fundamental classes of dynamical behavior in general,” which “implies the existence of a third fundamental class: ‘phase transition’ behavior at the edge of chaos, where you would encounter complex computation and quite possibly life itself” (Waldrop 235).

Langton headed a workshop at the Santa Fe Institute on his discoveries and his belief in the “edge of chaos.” Well attended by leading scientists studying such fields as embryonic development, the origin of life and artificial life, they made no major breakthroughs but did conclude that “‘lifelike’ behavior seemed to lie in such principles as bottom-up rules, no central controller, and emergent phenomena” (Waldrop 239). They also found that “the mysterious ‘something’ that makes life and mind possible is a certain kind of balance between the forces of order and forces of disorder” (Waldrop 293): between *order* and *chaos*. Between these two extremes, there exists an “abstract phase transition called ‘the edge of chaos’” where one finds “*complexity*: a class of behaviors in which the components of the system never quite lock into place yet never quite dissolve into turbulence, either” (293).

While this is wonderful cellular automata theory, does it hold true in any other arenas? Physicist Doyne Farmer believes it does. While the Santa Fe Institute admits that applying edge-of-chaos theories to an economy or an ecosystem remains specifically, scientifically untested, they cite several examples that strongly imply its existence and applicability to many systems. Consider, for example the former Soviet Union. Farmer states:

'It's now pretty clear that the totalitarian, centralized approach to the organization of society doesn't work very well'. In the long run, the system that Stalin built was just too stagnant, too locked in, too rigidly controlled to survive. Or look at the Big Three automakers in Detroit in the 1970s. They had grown so big and so rigidly locked in to certain ways of doing things that they could barely recognize the growing challenge from Japan, much less respond to it. On the other hand...anarchy doesn't work very well either—as certain parts of the former Soviet Union seemed determined to prove in the aftermath of the breakup. Nor does an unfettered laissez-faire system: witness the Dickensian horrors of the Industrial Revolution in England or, more recently, the savings and loan debacle in the United States. Common sense, not to mention recent political experience, suggests that healthy economies and healthy societies alike have to keep order and chaos in balance—and not just a wishy-washy, average, middle-of-the-road kind of balance, either. Like a living cell, they have to regulate themselves with a dense web of feedbacks and regulation, at the same time that they leave plenty of room for creativity, change, and response to new conditions. (Waldrop 294)

Does edge-of-chaos theory have any applicability to homeland security? If, as discussed earlier, homeland security is indeed a complex adaptive system, what are all the parts that interact with each other to create that whole system? The *National Strategy* defines homeland security as crossing four realms: prevention, mitigation, response and recovery. This thesis will explore the response realm, specifically arguing the applicability of the edge-of-chaos theory to response efforts in the initial phase of a large-scale incident, one that becomes, in its own right, a complex adaptive system within the overall framework of the homeland security arena.

1. Initial Event Response: The Edge of Chaos

Remember the twin towers during the early morning hours of 9/11. A morning governed by the normalcy of everyday affairs (order) was suddenly and violently turned into a scene of harrowing death and unprecedented terminal disorder (chaos). The goal of the world that day was to end the chaos and return to whatever semblance of normalcy could be found. The achievement of this

goal rested squarely on the shoulders of the men and women who arrived to the scene in those crucial first hours via police squad car, fire truck or fire engine. To them fell the task of breaking down the agents creating that chaos and bending divergent, competing elements to their will and direction so that order could eventually be restored.

Using Christopher Langton's terms, a delicate balance on 9/11 had been breached, and, as in the analogy of water that either settles into the rigid order of ice or tumbles into the disorder of water, a boiling point was reached that day as elements went too far to one side and chaos took over. To restore order required the first responders to work within the edge of chaos, which in dynamical behaviors "is like an infinitesimally thin membrane, a region of special, complex behaviors separating chaos from order" (Waldrop 295) and, ultimately, "where complex systems go in order to solve a complex task" (313).

While the scientists at the Santa Fe Institute did a wonderful job of defining, watching, studying and understanding this phenomenon, this "edge of chaos," they had no reason to want to influence it in one direction or another, either toward order or toward chaos. In their hard-science worlds, that answer was easy, as clearly evidenced by the main analogy of water molecules. To influence the cell environment toward order, one must simply cool the temperature to the proven point that allows the crystals to solidify into ice. To move it into chaos, one merely elevates the temperature to encourage liquidity and the free-fall of water molecules tumbling into each other in perpetual randomness.

For these academics, the science was in the discovery of emergence: how do the elements in these complex adaptive systems interact through the process of emergence? The parallel of emergence theory in dynamic social systems has been studied as well by sociologists and psychologists. While that might apply in some business model concepts, as economist W. Brian Arthur

notes, “Collective decision-making means molasses-slow decision-making” (Waldrop 43). So how, then, do “edge-of-chaos” theories apply to event response?

The following concepts seem indisputably clear. First, a place labeled “the edge of chaos” exists in dynamic systems. It follows that in this area, elements and agents interact with each other and their environment to sustain a delicate balance that is neither order nor chaos. Most often, these areas function undisturbed by an oversight intervention of outside influences. As with the analogy of the water molecules, usually no outside hand either turns up or turns down the boiling point causing simple order or extreme chaos in the water. This leads, logically, to the point that the edge of chaos is allowed to progress based on the principles of emergence. Outside observers simply watch and study the order that emerges from the interactions in and with this environment in the edge of chaos.

In event response, however, emergence is an unavailable luxury. First responders to such scenes as 9/11 or the Oklahoma City bombing incident cannot simply stand by and wait to see what order emerges from the chaos. To save lives and preserve property, they must insert themselves into the event quickly and successfully. As the simple flow charts listed above suggest, these first responders must move from chaos back into order, a task accomplished only by working through a transition phase, in this case the edge-of-chaos transition phase. As detailed above as well, there is a first-order transition phase where an outsider simply and quickly influences one key factor in the edge of chaos to bring either order or chaos (in the example above, it simply influences the temperature of the water), and a second-order transition phase where elements live in a delicate balance of order *and* chaos. Here the exact applicability of scientific models to event response becomes a little stalled, for first responders tasked with working in the edge of chaos actively seek to end that model, kill that space and return all the elements and agents to a predictable environment or order. And because this goal differs completely from the goal of the purely

scientific edge-of-chaos environment and the scientists who study it, first responders must look to other models for solutions to their edge-of-chaos situations.

To recap quickly, this thesis argues that such an event as 9/11 creates chaos. First responders arriving at the event are faced with how to move from chaos back to order. Science tells us that chaos or order can be reached only by traveling through transition phases. First responders, then, work to establish order from chaos by living in the transition phase known as the edge of chaos. Whereas scientists study how order emerges in such situations as these, first responders actively promote the return of order. But, how do they begin to accomplish such a herculean task? This scientific model offers few recommendations because most scientists want to watch the order emerge, not work to influence it themselves.

Their theories, though, do offer some apparent advice. Using first-order transition phase philosophies, first responders should look for any tipping points that can be created and exploited. They can also glean best practice advice from considering the opposite of second-phase transition order, which attempts to keep that delicate area of complexity, that balance between order and chaos. Second-order transition aims at perpetuating the chaotic interaction of agents with environment that creates the complexity keeping the edge of chaos alive. In stark contrast, to unravel the complexity and neutralize this edge of chaos, first-responders work to end these chaotic interactions. They do this by performing the opposite of what scientists have found keeps complexity alive. First responders must quickly understand the environment and actively work to influence the composite parts in ways that will end chaos, work through complex situations and restore simple order.

B. SENSEMAKING IN THE EDGE OF CHAOS

Karl E. Weick has produced many detailed studies of sensemaking, finding it an applicable model for business problems, strategic planning concepts

and, most notably, the world of first responders working in life-threatening situations. Complicated in its parts, sensemaking is simply the way human beings make sense of out of complex situations. It is the sociological study of how people confronting chaotic, challenging events are able to work with and through the myriad components to bring some sort of resolution and calm to a perhaps turbulent or uncertain situation. “To engage in sensemaking is to construct, filter, frame, create facticity (Turner, 1987), and render the subjective into something more tangible” (Weick Sensemaking 14).

When should sensemaking be used? Not every situation one confronts is problematic. Many everyday events follow known, readily understood patterns and orders. Sensemaking is necessary when a practitioner confronts a situation falling into the cynefin framework area of complex or chaotic. When the practitioner’s goal is to move that situation out of these realms and into the complicated and eventually the understandably simple, he or she must engage in sensemaking. As Weick describes it, “In order to convert a problematic situation to a problem, a practitioner must do a certain kind of work. He must make sense of an uncertain situation that initially makes no sense” (Weick Sensemaking 9). This type of situation presents a daunting task in which known methods will probably not provide applicable resolutions simply because the situation is new and untested. And so, “...sensemaking begins with the basic question, is it still possible to take things for granted: And if the answer is no, if it has become impossible to continue with automatic information processing, then the question becomes, why is this so? And, what next?” (Weick Sensemaking 14).

Culturally, sociologists and social anthropologists have found that the East and West appear to approach problems differently. P. E. Drucker found that the West focuses on the *answer* to a problem whereas the East focuses on *defining the question*. Sensemaking causes practitioners first to define the question, and in doing so, to consider how the various parts can work together to frame the answer. NIMS, as a framework, rightly focuses on the *answer* to a crisis situation. Because it means to impose order as quickly as possible, it offers a

robust management structure to perpetuate order. Defined management positions break an incident into workable pieces so that one person or group can focus on logistical tracking, another on intelligence gathering and dissemination, another still on operational and tactical concerns, et cetera.

But what of *defining the question*? When do practitioners responding to the initial phases of a large-scale event have the opportunity to first define the question? What are they trying to accomplish at that particular scene? How did this happen? What type of enemy are they facing? Is there still an active foe inside the event that must be neutralized, or is the event past that and must life-saving measures be employed as effectively and as quickly as possible? These questions, and many others like them, must first be considered and answered so the very applicable structure of NIMS can effectively move the event further toward the cynefin realm of “simple.” Without answers to these questions, incident commanders and first responders could make missteps costing lives or delaying the apprehension of dangerous suspects.

But is this theory really applicable to homeland security and one of its main missions regarding readiness for incident response? Consider, for example, a recent policing event. Two officers conducting what should have been a fairly routine traffic stop of a suspicious subject were suddenly confronted by an armed gunman who jumped out of his car before the officers had time to exit theirs, ran up to their patrol vehicle and fired several rounds into their car from a .40 caliber handgun, hitting both officers in the head and neck areas. Responding units on-scene in moments engaged the suspect in a moving gun battle through busy streets in a downtown area. The suspect was able to escape from the officers, but his license plate was known and recorded.

Back at the original shooting scene, other officers dragged the wounded men from their police car and sped them to the nearest trauma center, detailing on the police radio their movement through the city streets. Every officer

listening to the radio that day could hear the men gasping for air, and the desperate attempts of their fellow officers to render aid in the cramped back seat of a police car.

At the scene of the shooting, hundreds of officers arrived within the first twenty minutes. Not just that jurisdiction's officers, but federal officers from the nearby court house, county deputies who were in the area as well as those from nearby cities, and border and transportation officers who worked in nearby buildings, among others. There was blood in the street, a bullet-ridden patrol car left abandoned in an intersection and hundreds of people who wanted to do something to help the situation, but did not quite know what to do. The normalcy of an early Friday afternoon had been shattered. It was complete chaos.

The crime scene was shut down, and, since this occurred during business hours, many command staff members were on scene fairly quickly. NIMS was immediately deployed and the Incident Command System (ICS) employed. An incident commander assumed command responsibility for the event, and the four ICS sections were used, a named officer placed in charge of each. Operational periods were established and assignments handed out to waiting officers, bringing a certain amount of calm to a disrupted police force. Implementing NIMS changed a situation where everything seemed unknown and unusual into a basically familiar one.

Unfortunately, and importantly, this jump to immediate implementation of NIMS circumvented some crucial sensemaking steps. Had the first responders and initial incident commanders been taught to think in sensemaking terms, they might have reasoned as follows:

Q: What do I have here?

A: Two officers critically wounded and an armed, dangerous, outstanding suspect.

- Q: Ok, what else do I have here?
- A: An emotionally charged event with hundreds of officers deeply impacted and perhaps not thinking or acting as coolly and calmly as normal because of the emotion of the event.
- Q: And what else?
- A: I have a really big crime scene with lots of bystanders, potential witnesses, citizens with good intentions, maybe citizens with some bad intentions as well, media attention, elected officials beginning to arrive on scene.
- Q: With all of that understood, *what am I trying to accomplish here*, and in what order?
- A: First, I want to save the officers' lives.
- Q: They are on their way to the hospital. There is nothing more I can do to help them. What next?
- A: I want to catch the suspect.
- Q: So that's goal number one. Then what?
- A: Concurrently here, I need to contain the crime scene so that after I capture him, I can successfully prosecute him.

This very sparse, but quick, sensemaking exercise would then allow NIMS to be applied with purpose. Without this individual mental exercise performed by the first incident commander, or perhaps audibly done between him and his team, ICS tends to be used as an end unto itself. It will become that thing first responders do at a scene because that was all they were trained to do, not because they are purposefully using it to achieve clear goals.

And this kind of sensemaking exercise will vary from situation to situation. While a generic framework of questions can be constructed and presented through training to first responders to encourage them to think independently and appropriately, it will be the exercise of sensemaking itself that triggers an effective incident response. The NIMS lists of "things to do" at an event amount to "check-box tactics," as one police lieutenant calls it. While these checklists are important in later phases of an event, they will not offer first-responding incident commanders the proper tools needed to work through the initial edge of chaos.

In the example from the officer-involved shooting, ICS was quickly employed in order to bring order to the scene. A command post was established, the crime scene was contained and processed, the media were dealt with and the elected officials were brought into the decision-making process. As a result, the scene ran smoothly. Some time into the event, a separate command post was established in the Detective Division to process intelligence, clues and leads in an attempt to track and apprehend the suspect. Five days later the suspect again confronted police officers in a violent and deadly gun battle. This time, no officers were hurt and the suspect was shot and killed.

How could the handling of this scene have been improved by employing sensemaking in the initial edge-of-chaos phase? Perhaps a more thoughtful approach to understanding that the primary mission was to apprehend the suspect could have focused ICS section chiefs in slightly different directions than the ones they took that day. For example, as Logistics OIC that day, I was surrounded by over one hundred officers all wanting to *do something*. (The “resources” tracked and assigned out by the logistics section includes people as well as equipment.) Unfortunately, I had no task to give them. The crime scene was stagnant and the wounded officers were at the hospital. There was precious little to do.

And yet, we had the license plate of the suspect vehicle. With our current work force so technology-savvy, individual officers, even our dispatchers, had begun to do computer work-ups on the vehicle, the suspect, his family members, last locations in the city he was known to visit, where he had been stopped by the police before, the location of his last parking ticket, his complete rap sheet, known associates, et cetera. While this type of independent action is not always valued by investigators who know they need to put their case together in a certain way to assure a later, successful prosecution, we, as leaders, cannot ignore the fact that our current generation X and Y’ers will, indeed, be taking action. The point here is that knowing this, perhaps the immediate task that day should have been to gather this information, communicate clearly with officers

about what actions they should and should not be taking to track the suspect, and most importantly, determine what actions they could take, and assign out missions based on them.

For example, it was later found that the suspect's mother lived approximately a block and a half from where the command post was set up, and he had dumped his vehicle in the underground parking there before changing transportation methods and fleeing the city. Teams of officers could have been assigned to perform grid searches that would have found this vehicle hours before it was eventually discovered. Instead, absent information and intention that could have been determined through a sensemaking process, small groups of officers took independent action during the initial hours of this event and necessarily conducted incomplete grid searches themselves, even though not directed to do so by the command post or the incident commander.

Sensemaking also elucidates the valuable point that incident responders become part of the event once they arrive. The event is not some separate entity that they sit back and observe. They and their actions become part of the event itself, thereby not only controlling it and helping to bring order to chaos, but also becoming part of the chaos and, ultimately, part of the order. As such, experience is an important part of sensemaking, becoming an invaluable part of successful incident response during the edge of chaos. As Weick states, "A crucial property of sensemaking is that human situations are progressively clarified, but this clarification often works in reverse. It is less often the case that an outcome fulfills some prior definition of the situation, and more often the case that an outcome *develops* that prior definition" (11).

Take, for example, Weick's review of the Mann Gulch Disaster. In this 1949 wildfire, a highly select group of sixteen smokejumpers were flown in to a mountainous area in Montana to deal with a wildfire that was growing bigger because of the dangerous wind and rising temperatures. Their leader was Wagner "Wag" Dodge. These men had not worked together before and none knew Wag as a leader or had experience with his abilities in life-threatening

situations. They were parachuted in to the mountain location of the wildfire and experienced some difficulties with the jump (the parachute connected to the radio did not open, so the radio broke upon impact with the ground), it seemed, mostly, like a routine situation. The men were calm and many stopped to eat rations for dinner along the way. Wag led the men in a safe route toward the fire, but things suddenly changed as they approached the river. He saw that the fire had now crossed a gulch only 200 yards ahead of them and was moving straight for them with unprecedented speed.

At this point, Wag did something very unusual. He told his men to drop their tools and equipment, lit a fire directly in front of them, and told them to lie down in the area that fire had burned. This was completely the opposite of the structure these men were familiar with. They knew to run from a fire, not stay in place. And certainly not drop their tools and equipment, the things that made them firefighters and gave them protection against fire. Rather than obey Wag's command, the men turned and ran. Two were able to squeeze through a crevice and lived. The other thirteen died. Wag, who had lain down in the ashes of the escape fire he had built, survived as the fire passed over him.

What Wag demonstrated here was a heroic, counterintuitive use of creativity. As Weick points out, "What we do not expect under life-threatening pressure is creativity" (Weick "Mann Gulch" 639). Jerome Bruner describes creativity as "figuring out how to use what you already know in order to go beyond what you currently think" (Weick "Mann Gulch" 639). Wag knew from his training and experience as a firefighter that there are four main rules in firefighting: start a backfire, get to where the fuel for the fire is thinner, try to work through it and if you cannot, do not let the fire pick the spot where it hits you. Wag's escape fire creatively demonstrated all four of these principles. Since this event, the Forestry Fire Service has incorporated the use of escape fires as part of its arsenal. They also learned from the parachute loss of the radio; firefighters are now equipped with back-up radios. As a result of the learning that took place

from this event, and its learning points being institutionalized into best practices for fighting forestry fires, there have been no deaths to firefighters in the Forestry Service since then.

So what can we learn from this event that can apply to the field of homeland security and response to large-scale incidents? Clearly, the firefighters' training and process (keep tools and run for the hills) did not work in this case. They were ill-equipped and not taught or encouraged to think actively their way through the problem, as Wag did. In short, in the midst of chaos, they relied on structure and process and did not use sensemaking to work their way towards order. Perhaps some lessons from sensemaking theory can provide positive future learning points for first responders who find themselves in similarly unprecedented chaotic and life-threatening events.

As he studied this event, Weick focused on the question, "What the structure of a small outfit should be when its business is to meet sudden danger and prevent disaster" ("Mann Gulch" 632). He found that this structure needs to rely on four sources of resilience: "(1) improvisation and bricolage, (2) virtual role systems, (3) the attitude of wisdom, and (4) respectful interaction" (638).

Bricoleurs remain creative under pressure, precisely because they routinely act in chaotic conditions and pull order out of them. Thus, when situations unravel, this is simply normal natural trouble for bricoleurs, and they proceed with whatever materials are at hand. Knowing these materials intimately, they then are able, usually in the company of other similarly skilled people, to form the materials or insights into novel combinations. (Weick 639-640)

This brings up some main points for incident response to large-scale events. First, the chaos inherent in the initial response efforts to these incidents is normal. In fact, it might be the only seemingly normal part of the whole episode. When a crisis the magnitude of 9/11 occurs, when the normalcy of everyday life is stripped from society by such unexpected and unfathomable terror, the only normal situation left in its place is complete chaos. If first responders arriving at these events anticipate that and understand that they will

be working in that transition phase known as the edge of chaos, they can better prepare their minds and their constitutions to become part of that edge of chaos, part of that transition, and begin to impact, affect and manipulate the situation back towards normalcy.

Weick also saw from the Mann Gulch disaster that edge-of-chaos sensemaking occurs most productively if the leader has a small team with whom to conduct the sensemaking exercise. This leads to discussion about the importance of the leader. L. Thayer believes that:

the leader is a *sense-giver*. The leader always *embodies* the possibilities of escape from what might otherwise appear to us to be incomprehensible, or from what might otherwise appear to us to be chaotic, indifferent, or incorrigible world – one over which we have no ultimate control. (Weick Sensemaking 10)

This leader must be a “seasoned hunter,” who embodies experience but also can “invite doubt, reassembly, and shaping to fit novelties in the present” (Weick *The Collapse of Sensemaking* 642).

This creative bricoleur, able to improvise with an attitude of wisdom, works best with a small group, for “a partner makes social construction easier. A partner is a second source of ideas. A partner strengthens independent judgment in the face of a majority. And a partner enlarges the pool of data that are considered” (Weick *The Collapse of Sensemaking* 642). What are the implications of this discovery to the field of homeland security and incident response? Clearly, it shows that the best incident commanders at large-scale events are experienced, creative leaders able to help themselves and others make sense of confusing, unique, chaotic situations. They do this using a small team who have worked with them and developed a “triangle of trust, honesty and self-respect” (Weick *The Collapse of Sensemaking* 643) the absence of which has led to disaster in such well-documented events as Mann Gulch, where “faulty interaction processes led to increased fear, diminished communication, and death” (Weick 643).

As has been touched on throughout the previous pages, sensemaking also teaches us that the first responders will, indeed, become part of the chaos and part of the event. Viewing incident response in this context allows one to see the unique opportunity first responders have not only to shape the chaos of that event, but to bring experience to bear while they are creating and inventing what will become part of incident response history and dialogue applied, through training and thoughtful practice, to future events. In this sense, it becomes an iterative process. “[T]o talk about sensemaking is to talk about reality as an ongoing accomplishment that takes form when people make retrospective sense of the situations in which they find themselves and their creations” (Weick Sensemaking 15). This reality establishes the need for experienced first responders. But how can this experience be gained and retained? The best way is to identify those creative leaders in an organization, allow and encourage them to develop and hone their incident response skills and support these efforts with the necessary time and funding.

1. Properties of Sensemaking

Sensemaking is comprised of seven properties:

1. Grounded in identity construction: The recipe is a question about who I am as indicated by discovery of how and what I think
2. Retrospective: To learn what I think, I look back over what I said earlier
3. Enactive of sensible environments: I create the object to be seen and inspected when I say or do something
4. Social: What I say and single out and conclude are determined by who socialized me and how I was socialized, as well as by the audience I anticipate will audit the conclusions I reach
5. Ongoing: My talking is spread across time, competes for attention with other ongoing projects, and is reflected on after it is finished, which means my interests may already have changed
6. Focused on and by extracted cues: The ‘what’ that I single out and embellish as the content of the thought is only a small portion of the utterance that becomes salient because of context and personal dispositions

7. Driven by plausibility rather than accuracy: I need to know enough about what I think to get on with my projects, but no more, which means sufficiency and plausibility take precedence over accuracy (Weick 61–62)

The concepts found in all seven properties apply to response efforts in the edge of chaos. Properties one, two and four state concepts grounded in psychological and sociological study. Considering them in the context of incident response, these three properties point to the importance of the incident commander him- or herself. Who is he or she as a person? Over the course of a lifetime, what social constructs have created and shaped him or her? How does he or she communicate with others? What type of retrospective learner is he or she?

This thesis argues that the Incident Commander is vitally important to the overall success of the operation and that not every first responder with NIMS training is capable of being an Incident Commander. These three properties support that point by showing that a person, created through many years of personal experiences, exposures and social contacts, will retrospectively learn and communicate in certain ways based upon how they he or she has been socialized. This individuality creates some people who are more effective at certain tasks than others. A deeper discussion about the psychological and sociological tenets upon which these properties are based is a topic substantial enough for separate theses work. This thesis takes properties one, two and four discussed in the sensemaking framework as factually grounded in social science studies. As such, it substantiates the claim that first responders will have varying levels of capability as incident commanders based upon their own developed identity constructions, retrospective learning processes and socialization forces that have already shaped who they are as people. Further research focused on these three properties could be very helpful to determine how to identify those first responders who have become socialized in such a way that their skill base is conducive to working within the initial phase of large-scale event response.

Taking place over a lifetime, properties one, two and four will have largely shaped the incident commander long before he or she arrives at the scene of a large-scale event. The following four properties, however, contain methods for ways of action and thought that, if understood by a first-responding incident commander and factored into his or her actions and thought processes, can help the commander work through the chaos as quickly and effectively as possible.

“Enactive of sensible environments. I create the environment to be seen and inspected when I say or do something” (Weick Sensemaking 61–62). Incident commanders will be responsible for a vast structure of resources and personnel that also respond to help calm a chaotic event such as 9/11. Just the implied ability to lead that the title “incident commander” affords means that what he or she says, does or concentrates on will become the focus of the rest of the response machine comprised of policemen, firefighters, additional first responders, public and private partners, elected officials and perhaps even world leaders and world agencies on the scene to solve or remedy the problem and make sense of the unfathomable situation. In this role, incident commanders wield considerable power and will truly direct the operation. Realizing the importance of this as part of NIMS could be invaluable to thinking practitioners arriving on scene at large-scale events.

“Focused on and by extracted cues. The ‘what’ that I single out and embellish as the content of the thought is only a small portion of the utterance that becomes salient because of context and personal dispositions” (Weick Sensemaking 61–62). Incident commanders should be aware that what they say and do and the orders they give will become magnified by additional responders eager to take on any task that might contribute to the successful conclusion of the event. Understanding this, incident commanders should realize that their orders are merely starting points, and that how others focus on these orders or intentions ultimately contributes to the life of the event itself.

“Ongoing. My talking is spread across time, competes for attention with other ongoing projects, and is reflected on after it is finished, which means my

interests may already have changed' (Weick Sensemaking 61–62). This property embodies the very nature of incident response in the edge-of-chaos transition phase of large-scale events. In this phase, the situation is so fluid and changing, the environment so vast and chaotic, that orders given by the incident commander applicable when given might be rendered obsolete or ineffective by the time they reach responders working in the heart of the incident.

Using 9/11 again as an example, initial information led to uncertainty about how the incident occurred. It could have been planes off course or it could have been a targeted attack. Until the second plane hit the towers, orders were given in one direction with life saving as the primary mission. When the second plane hit, responders quickly and completely had to switch their thoughts away from only life saving efforts and towards the realization that life saving must be conducted while protecting the first responders from additional attacks. In this case, initial interests of the first responders and incident commanders could have changed, and were now certainly competing for attention with other ongoing concerns as well.

"Driven by plausibility rather than accuracy. I need to know enough about what I think to get on with my projects, but no more, which means sufficiency and plausibility take precedence over accuracy" (Weick Sensemaking 61–62). This point is something with which every incident commander struggles. It really refers to the law enforcement and military issue known as "situational awareness." Almost no incident commander is ever on-scene from the very beginning of an event. Even if the commanders arrive five to ten minutes after the crisis occurred, they are still five to ten minutes behind the curve and *someone* has started to do *something*. This "someone" may be a policeman or a firefighter. It might be another government worker or private security person. It might also very well be the normal, average, everyday citizen who, at that time, becomes a hero—an ordinary person who does extraordinary things in extraordinary circumstances.

The “official” incident commander arriving on scene often assumes that he or she often must stop whatever actions and events are under way to be “brought up to speed,” gain all pertinent information possible, in order to achieve situational awareness and thus begin making proper and correct decisions. But sensemaking shows us that situational awareness is driven by plausibility more than by complete accuracy. And the true challenge to arriving incident commanders is to glean immediately what is plausible so that he/she can get on with his/her project without having to stop the momentum of those who already have things in motion. In short, the incident and the response to the incident cannot wait to give the arriving incident commander a situational update, but rather the new arrival must catch up as best as he/she can “on the run,” and glean the plausible situational awareness as well as possible.

2. Occasions for Sensemaking

Sensemaking does not work in every situation. It is not needed in every situation. Tasks defined in a cynefin framework as “simple” or “complicated” do not require a sensemaking approach because they involve well-known, common situations or circumstances. Codified policies and procedures apply nicely and effectively to them. In fact, checklists work extremely well and offer a usable structure in the known realm of the simple tasks.

Sensemaking, then, applies most readily to complex and chaotic situations. “Two types of sensemaking occasions common to organizations are ambiguity and uncertainty. The ‘shock’ in each case is somewhat different. In the case of ambiguity, people engage in sensemaking because they are confused by too many interpretations, whereas in the case of uncertainty, they do so because they are ignorant of any interpretations” (Weick Sensemaking 91). Hurricane Katrina exemplifies an ambiguous situation where many interpretations for the response efforts were present whereas 9/11 became an uncertain situation because the tactic of flying commercial airliners into buildings had never been seen before. Because all of these individual people at the scene of an

event contribute to and perpetuate the chaos, the incident commander must see the whole situation. When individuals become locked in their own sensemaking process for their own small section of the event, the overall process of sensemaking breaks down. To incident commanders,

sensemaking is about the enlargement of small cues. It is a search for contexts within which small details fit together and make sense. It is people interacting to flesh out hunches. It is a continuous alternation between particulars and explanations, with each cycle giving added form and substance to the other. (Weick Sensemaking 33)

3. Action-Driven Processes of Sensemaking: Behavioral Commitment and Manipulation

Behavioral commitment offers a useful vehicle for institutionalizing sensemaking in incident response curricula. This concept teaches that although it might be easy to change specific actions for certain time frames, it is more important, and more binding, to alter the beliefs that underpin these actions as a way to achieve sustainable change. This speaks to the need to incorporate sensemaking principles in the NIMS literature and training, acknowledge that the initial edge-of-chaos transition phase exists in large-scale events, and realize that only by successfully working in this phase can first responders move an event from chaos back to normalcy.

Another trenchant concept, though, is that of *manipulation*, a word usually associated with negative connotations. Consider, however, the Oxford English Dictionary definition: “To operate upon with the mind or intelligence; to handle or treat (questions, artistic matter, resources, etc) with skill” (OED 1716). In sensemaking terminology, “sensemaking by means of manipulation involves acting in ways that create an environment that people can then comprehend and manage” (Weick Sensemaking 165). This is the daunting and difficult task of incident commanders in the edge of chaos. To maintain that delicate balance between individual focus and action that stops short of stifling tunnel vision in order to move an event along the edge of chaos, they must steer the

sensemaking actions of others at the scene by manipulating the situation into understandable pieces and contexts. Manipulation is a sensemaking process that begins:

with actions to which beliefs accommodate....Manipulation generates clearer outcomes in a puzzling world, and these outcomes make it easier to grasp what might be going on....Manipulation is about making things happen, so that a person can then pounce on those created things and try to explain them as a way to get a better sense of what is happening. (Weick Sensemaking 168)

4. Sensemaking Under Stress

The act and art of sensemaking can be challenging to apply thoughtfully and purposefully, even in calm times. Add to that challenge the difficulty of using it as a decision-making tool in crisis situations, and natural impediments to obtaining successful outcomes clearly arise. First responders using sensemaking in the initial stages of a large-scale event are really using it as a tool to guide their thinking, so they can quickly and efficiently achieve the following: 1) Cognitively process the scene to understand the scope of the disaster in terms of life-threatening concerns and property destruction consequences; 2) Determine, in order of importance, the critical tasks that need to be accomplished; 3) Gain the best possible (but not perfect) accompanying situational awareness picture to facilitate good decisionmaking and actions that will save lives and speed recovery; 4) Avoid the tendency to focus on only certain parts of the incident—keep an holistic view of the problem being worked; 5) Be an inclusive leader able to guide all response elements (even those sectors maintaining autonomous power, such as private industry partners) toward a unified response effort; 6) Employ creative thinking to manipulate a crisis situation through the transitional edge of chaos and back into normalcy.

How does the stress of a crisis add to the difficulty of using sensemaking to accomplish the above goals? And what, exactly, are the factors that can influence this stress load, either positively or negatively? Identifying and studying

those factors could lead to recommendations for mitigating them, thus increasing the positive outcomes of sensemaking in crisis situations, and, ultimately, the effectiveness of first responding incident commanders working in the edge of chaos.

Arjen Boin, et al, have studied the effects of stress on sensemaking in crisis situations such as Hurricane Katrina and the 9/11 response to the World Trade Centers and the Pentagon, and have determined the following:

Based on experimental, historical, and field studies, researchers have identified a wide range of specific stress effects. For example, under heavy stress, individuals are thought to:

- focus on the short term, to the neglect of longer-term considerations;
- fall back on and rigidly cling to old and deeply rooted behavioral patterns (often forgetting more recent ones);
- narrow and deepen their span of attention, scrutinizing 'central' issues while neglecting 'peripheral' ones;
- be more likely to rely on stereotypes;
- be more easily irritable. (30)

Through their studies of response efforts to large-scale events, these researchers identified some of the psychological and organizational factors that can impede the use of sensemaking in crisis situations.

5. Psychological (Individual) Factors

"In addition to their memory, people's expectations are highly significant. Under conditions of ambiguity humans tend to 'see' what they expect to occur" (Boin et al. 31). This can have disastrous implications for incident commanders working in the edge of chaos. For example, first responders to a bomb that had been detonated were prone to work immediately to save lives, without looking for a still-active adversary. Because the bomb had already exploded, there was an expectation that the active threat had reached its crescendo and dissipated.

They saw what they expected to occur. But because first responders have been caught by the explosion of secondary devices, they now routinely look for secondary devices when responding to bomb calls.

Take this example and apply it to the Twin Towers on 9/11. The responding firefighters saw what they expected to see: a fire. They acted as they were trained to act: they began to evacuate people and worked to put out the fire. They were not, however, considering how the fire would impact the structure of the tower itself. They were most definitely not expecting to see such an iconic structure implode and collapse so quickly. Because they were responding to a fire, they were not expecting to see an explosive device. Being so affected by the stress and the momentum of the situation, how could they have stepped back, thought creatively and realized that the plane, in effect, was a bomb. And as we know from bombs, first responders should consider looking for a secondary device. Because the first responders to the Twin Towers at 9/11 were certainly (and understandably) not expecting to see a bomb, not expecting to see a plane used as a bomb, there was no consideration of a secondary device. And then the second plane hit.

This example provides several learning points. First, there must be some sort of standardized incident response, surely. That point is not in question. NIMS provides a very good framework and standard language that help combine various working groups into one cohesive entity. The checklists offered in NIMS are indispensable to ordering elements and units to avoid duplication, maintain consistent tracking, and create a communication environment so all parties can clearly see what response and recovery actions are taking place at what locations. But checklists do not provide answers for every situation. There are spans of time so unique, so massive, so traumatizing and perhaps even so unfathomable that no one has seen anything like that before. And yet, someone, some small group of people, will be tasked with restoring order to that chaos.

Such events as 9/11 and the Oklahoma City bombing show us that during the initial response phase, creativity and the ability to think beyond perceived

expectations must be employed in order for incident commanders to move the event out of the edge of chaos and into a realm of complication where NIMS checklists and position duties effectively work to restore normalcy. As we are beginning to determine, sensemaking can be a very useful technique in this phase. Working through the edge of chaos, though, has the most hope of being accomplished if performed by experienced incident commanders working with equally experienced partners who can, cumulatively, help each other make sense of chaotic situations.

“Human brains collect, organize, store, and recall information by making use of packaging and organizing devices, which are generically called cognitive structures. These cognitive structures—alternatively referred to by researchers as schemas, scripts, analogies, metaphors, or stores—enable people to draw upon encoded and selectively recalled experience to interpret the present and prepare for the future” (Boin et al. 32). Unfortunately, first responders’ effectiveness is often limited by their humanness. The firefighters responding to the Twin Towers on 9/11 saw not only what their cognitive process told them to see, but a process reinforced by years of Fire Department training. No matter what we do, even an optimally functioning human brain will prepare for the future and interpret its present situation based on these scripts and experiences. Knowing this, the question becomes how can we, ahead of time, trick or reorganize the brain of those who will be first responding incident commanders to an edge-of-chaos event into creatively making sense of the disasters and crises they face?

We can understand this problem and frame an answer to the above question by considering the difference between *education* and *training*. Where *training* molds one’s brain to perform a specific task in a way that an outside influence wants him/her to perform it, *education* expands a person’s thought processes to encourage the use of the brain to think for him-/herself. First responders need both training and education to perform their jobs effectively. Unfortunately, in police work and firefighting, the emphasis is on training and very

little on education. Whereas NIMS is useful training, it misses the educational component needed to make it a viable, holistically appropriate tool and philosophy for event response.

Training has many very important uses in law enforcement. For example, in riot and crowd control situations, police officers must know the commands that will be used and how to carry out certain movements such as a skirmish line, a rout step, an arrest circle, et cetera. That is an example of excellent training. In stressful situations, such as being a police officer assigned to the front line of a squad deployed into a rioting crowd, it will be helpful that the officers have been thoroughly trained regarding the various movements. In those situations, when the platoon leader orders a rout step, officers will comply and move, even under stress. In stressful situations, however, training can be taken too far and have negative effects.

For example, California Highway Patrol officers involved in a shooting in Newhall, California in the 1970s lost their lives in a gun battle with an armed suspect. Processing the crime scene revealed one officer had several empty shell casings placed neatly in his pant pocket. During previous shooting range training, CHP officers had been taught to empty the expended shell casings into their hand and then place them in their pant pocket before reloading and shooting again. Being trained this way, the officer performed that way under stress. Taking the time to retrieve his shell casings and place them in his pocket meant he had less time to fire rounds at the suspect. This inability to think through the stress and toward a different course of action contributed to what cost him his life that day.

But can people be taught to think under stress? Can heuristic “short cuts” be created to help first responding incident commanders manage an edge-of-chaos event? Answers lie in the arena of *education* more than in training. But what does *education* look like for police officers? Research has proven the following:

Experienced incident commanders rarely arrive at situational assessments through an explicit conscious process of deliberation, as researchers of many stripes and colors were long wont to assume. Professional commanders of this kind have developed a rich store of experience and a repertoire of tactics upon which they draw when confronting a critical incident. The minds of these crisis commanders work like a mental slide carousel containing snapshots of a wide variety of contingencies that they have encountered or learned about. When they find themselves in a new situation, this is immediately compared with their stored experiences. This mental slide carousel quickly revolves until an adequate match is found. Each slide contains not only an image of the situation but also a recipe for action. In order to double check that the tactic in question is appropriate for this situation, the commander may perform a mental simulation to make sure that there isn't some contextual factor that might prevent the tactic from producing the desired outcome. If not, it is time to issue orders and begin implementing the tactic. Thus once the specific type of situation is identified, the commander *knows* what to do. (Boin et al. 35)

So the heuristic trick, then, is to take experienced incident commanders and broadly educate them to create many different “mental slides” they can choose from when responding to an edge-of-chaos event. The greater their library of slides, the greater their ability to perform sensemaking when they arrive at the event. “The basic idea of sensemaking is that reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs” (Weick [The Collapse of Sensemaking](#) 635), and incident commanders educated in ways that increase their access to mental slides are participating in the process of sensemaking before they have to respond to a large-scale event. Education helps them create ahead of time a reality enabling them to understand the current event by pairing it with exposure to similar or analogous situations, and using these to jump-start a workable tactic for the task at hand. A prime example of this was Wag's ability at Mann Gulch to take bits of previous solutions he had been exposed to and create the new reality of an escape fire that ultimately saved his life.

To cultivate this type of education in police work means working with reality-based scenarios. And not the scripted scenarios that multiple jurisdictions currently use to comply with grant funding requirements. This needed type of education involves finding experienced professionals with the ability to teach (a unique skill not to be taken for granted) who come together and design scenarios that force students to confront non-routine situations in, as well as possible, a real-time period. Along with finding the right teachers, one must find the right students. A long-debated question is whether leaders are born or made. I posit they are born, but can come to little success without being properly made. A further discussion on the behaviors signaling those who could be effective incident commanders to edge-of-chaos events follows in subsequent sections.

This type of scenario-based education has proven effective on smaller scales in police work. And this is not to argue that training and education are completely divorced from each other. There is a certain element of both in whatever a student does, but active student participation in scenarios moves the pendulum in a heavier swing toward the educational side, while allowing it to be supported by training.

For example, the Long Beach Police Department moved to scenario-based models for teaching such highly stressful tasks as felony vehicle stops, emergency action teams for hostage rescues and active-shooter situations, and multiple officer-involved shooting scenarios. The Department had historically taught any and all police-related topics in a mandatory week-long, once-yearly, forty-hour Advanced Officer Training class for all personnel. One officer assigned to the Academy, however, noticed that the hit-ratio on officer-involved shootings—the number of times officers were actually striking the suspect when firing rounds—was extremely low. This officer drastically, and completely, changed the teaching model at the Academy. In a shocking move, he stopped the once-a-year week-long training and had every officer attend one day every three months. Instead of sitting in a classroom listening to lectures, officers were forced outside to participate in “live” scenarios.

Using simunitions, officers were shot at while performing simulated car stops, hostage rescues, et cetera. This taught them that no matter what they were currently dealing with, their situation could change drastically and instantly, so they needed to be ready to adapt at all times. Simunitions do physically hurt when they strike and so real stress was created because officers knew injury was possible if they did not perform appropriately. This model quickly took hold in the department. The one officer was given others to help him create scenarios and teach concepts to the department. As most officers can be fairly devious when dreaming up attack scenarios, this group created realistic, extremely challenging, riot and crowd-control situations, active shooter events, vehicle stops gone awry, and a host of other life-threatening situations officers could face at any moment.

Slowly, responses in the field showed noticeable improvement. The hit ratio on officer-involved shootings increased and involved officers returned to the academy to tell the staff there that the last scenario they had been put through was “just like what I came across in the field.” They credited their survival to the education received in the scenario-based training episodes.

The Advanced Officer Training group also put together scenarios for the department’s command staff specific to large-scale incident response. In this course, they created a crisis scenario involving an officer-involved shooting, citizens and officers shot, and an active hostage situation. Ranking officers then had to respond to the situation and return normalcy to the chaos. Role players were used as wounded and dead scattered across a large area, radio channels were purposely crowded with all the hysterics that would take place during an event like this, and simunition shots rang out signaling potential death or injury to the hostages in the building.

In as realistic a creation as possible, the first responding incident commander had to make sense of the event quickly and begin to manipulate the response machine necessary to resolve the situation. After the scenario was over, the staff and students participated in an honest, if somewhat grueling, de-

brief. What went well was applauded and further explored, what went wrong was thoroughly discussed, and what could happen in the future was considered.

But that sensemaking process did not end with just one scenario day. The lessons, both positive and negative, observed through this process added to the mental slide-show of everyone who was there that day, both what works at a chaotic event and what does not. In a very iterative process, it created a reality while preparing for response to future events. In short, it was that complete process of sensemaking, the awareness that “reality is an ongoing accomplishment that emerges from efforts to create order and make retrospective sense of what occurs” (Weick The Collapse of Sensemaking 635).

So how can this one small idea be employed on a large scale to prepare incident commanders for an edge-of-chaos response? Good, experienced teachers who can put together scenarios forcing incident commanders to confront situations and events a little outside their current comfort realm with productive de-briefs afterwards will slowly but surely contribute to an overall body of knowledge and collective “mental slide show” of what they might face from a terrorist attack or a natural disaster. While the goal is not to *train* for every specific event, the process of *educating* these first responders about possibilities teaches them to use their brains for their own, individual thought process.

This approach to training is supported by current literature in the field as well. Retired Army Lieutenant Colonel Dave Grossman preaches the importance of using stress-inoculation techniques while preparing fighting forces. In his book *On Combat*, he cites the military uses of realistic scenarios to train soldiers. As Amanda Ripley discovered while researching for her book *The Unthinkable*, “The best way to negotiate stress is through repeated, realistic training” (75). In looking at the law enforcement community, she saw that “Advanced police training now relies on actual gunfights—using gunpowder-propelled, paint-filled plastic bullets that actually sting when they hit you. Self-defense courses use ‘model muggings’, in which a pretend assailant, wearing heavy padding, relentlessly attacks the students” (Ripley 75). While the Long Beach Police

Department stumbled across this type of education rather intuitively, its importance is clearly supported by research and literature throughout the field of law enforcement.

6. It's Lonely at the Top

“In most if not all crises, the moment arrives when a single man or woman must make faithful choices about the government’s course of action” (Boin et al. 43). However, even though decisions can only, finally, be made by one person who will bear the responsibility for the outcomes, carrying out these decisions rests with a large body of groups, entities and individuals. This brings with it the realization that successfully working through the edge of chaos “depends not so much on critical decision making but on the facilitation of crisis implementation and coordination throughout the response network” (Boin et al. 43).

This leads to two areas that require further, more detailed exploration as they contribute to the sensemaking process in an edge-of-chaos event. First, how to define what “the right incident commander” looks like; the importance of his or her experience and perhaps some proven behaviors that predict success working in these stressful crisis situations. Second, the importance of networks and the related ability to manipulate them into achieving the incident commander’s end objective.

C. HIGH RELIABILITY ORGANIZATIONS AND THEIR IDENTIFIED RELIABILITY-ORIENTED EMPLOYEE BEHAVIORS: APPLICABILITY TO LARGE-SCALE EVENT RESPONSE EFFORTS

Literature about High Reliability Organizations (HROs) define them as organizations that:

strive to achieve virtually problem free performance under the most trying of circumstances....their organizational goals are both unique and quite clear: to avoid disasters, breakdowns, errors and the like....people play a crucial role in helping organizations to achieve high reliability performance. Or, put in the negative, that inappropriate employee behavior tends to be a common cause of

organizational failure....that the presence of trying conditions (the complexity of the system, high levels of interdependence between and among people and technology, and external volatility) requires organizing systems (and, thus, employee behaviors) that differ substantially from those used in more stable settings. (Ericksen and Dyer 5-6)

Because the employees are so important to the success of HROs, they are focused on. Human resource management literature has distilled a set of reliability-oriented employee behaviors (ROEBs) that, if cultivated in the employees, will make an organization successful. Those who respond to an edge-of-chaos event naturally form a temporary, but solid, organization used to calm the crisis and return to normalcy. Studies regarding the creation of effective incident commanders would benefit by examining how lessons from these HROs and the identified ROEBs can contribute to better incident response to large-scale events.

1. Reliability-Oriented Employee Behaviors (ROEBs)

1. *Diligence.* “Diligence refers to an organization’s capacity to anticipate or detect surprises early and without compromising routine operations” (Ericksen and Dyer 11). Keep in mind that “routine operations” for employees responding to large-scale incidents are not “routine” in a normal use of the word. Here, “routine” means the operations that are currently aimed at saving lives and protecting property. Because these routines cannot be interrupted, employees diligent in their actions at large-scale events contribute greatly to the success of the operation.
2. *Ascertain.* “People in HROs are chronically on the lookout for the unexpected” (Ericksen and Dyer 12).
3. *Communicate.* “They strive to avoid distortions and misunderstandings by conversing and corresponding in a direct, clear, precise, and accurate manner” (Ericksen and Dyer 12).
4. *Facileness.* “...requires people to initiate and deploy, to know when and how to switch from one mode of organizing to the other,” between “well-planned and practiced response tactics” and “almost wholly emergent processes” (Ericksen and Dyer 13).
5. *Initiate.* “...initiate appropriate action to mitigate and rectify unexpected events” (Ericksen and Dyer 13).

6. *Deploy.* They “rapidly deploy. They switch tasks and roles with minimal time and effort so that help arrives where and when it is needed” (Ericksen and Dyer 13).
7. *Fluidity.* “...they exhibit the capacity to operate effectively in chaotic situations where traditional order has collapsed....Many disasters have resulted from small system failures that amplify because human interaction breaks down in the ensuing chaos and people act less like a collective force and more like independent strangers (Ericksen and Dyer citing Weick, 1993, Reason, 1997 & Shrivasta, 1987). People in HROs, by contrast, are collectively at their best in a crisis because they thrive when spontaneously coacting and improvising to face down emergencies (Ericksen and Dyer citing Weick, 1993, citing Weick & Sutcliffe, 2001)” (Ericksen and Dyer 13).
8. *Coact.* “Novel and complex problems require people with diverse talents and perspectives to coact or spontaneously collaborate—to collectively attack the issues at hand with minimal wasted time and effort” (Ericksen and Dyer 14).
9. *Improvise.* “They accomplish novel tasks through the creative use of available resources to reduce the time between discovery and execution to close to zero” (Ericksen and Dyer 14).
10. *Generativeness.* HROs “are, in effect, learning organizations” (Ericksen and Dyer 14). They accomplish this mostly through de-briefs of situations and events along with the successes and failures of others.
11. *Learn.* “People in HROs are also tenacious about learning from the past” (Ericksen and Dyer 15).
12. *Educate.* People in HROs “take responsibility for each other’s learning by openly sharing information and knowledge with colleagues both inside and across departmental boundaries” (Ericksen and Dyer 15).

This list shows us not only the behaviors we should be striving to grow through educating incident commanders, but, by considering their opposites, conversely, the behaviors we should be attempting to weed out.

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IV. ANALYSIS

A. **FORGING A PATH: COMBINING BEHAVIORS AND DECISION-MAKING MODELS TO DISCOVER VIABLE WAYS TO “MAKE SENSE” IN EDGE-OF-CHAOS EVENTS**

Current literature on decision-making models by such well-known researchers as Gary Klein have focused on how emergency responders make decisions in crisis situations, yet, most of this study has come from those responders facing situations for which they have been specifically trained. Klein uses the example of firefighters responding to a man who has cut his artery and is bleeding to death. Because he had dealt with similar situations before, this fire captain decided in seconds how to act. Incident commanders responding to the initial, chaotic phase of a large-scale event might well be faced with a specific catastrophe they have never before encountered, perhaps one so horrific they never imagined in their worst nightmare could actually occur. This is what the firefighters responding to the Pentagon on 9/11 must surely have felt, as well as those New York City firefighters arriving at the World Trade Center just an hour earlier.

Such an unprecedented disaster creates an area sorely in need of further exploration. An edge of chaos never encountered before—a plane hitting the towers or dive-bombing into the Pentagon—must still somehow be navigated and neutralized. The body of literature must be created by piecing together applicable theories and studies from roughly analogous realms. Just as the above listed ROEBs are helpful, so are some of the decision-making models studied and proven effective in “normal” crisis situations.

The model presented in this thesis takes a somewhat deconstructionist approach, using sensemaking as its overall framework. It argues that a first responding incident commander to an edge-of-chaos event must have the holistic ability to recognize any separate parts similar to those dealt with before, and begin to facilitate response to those individual parts. It will be the pieces of

these “known” responses (much like that of the fire captain applying pressure to the cut artery that accomplished the overall task of saving the man’s life) that the incident commander will bring together to calm the chaos of the overall event. With the goal of discovering additional methods for dealing with these individual pieces, let us turn to a discussion about how people make decisions in crisis situations.

B. DECISION-MAKING MODELS

As Gary Klein discusses in *Sources of Power*, the ability to make decisions in crisis situations involves certain sources of power:

the power of intuition, mental simulation, metaphor, and storytelling. The power of intuition enables us to size up a situation quickly. The power of mental simulation lets us imagine how a course of action might be carried out. The power of metaphor lets us draw on our experience by suggesting parallels between the current situation and something else we have come across. The power of storytelling helps us consolidate our experiences to make them available in the future, either to ourselves or to others. (3)

Further, those sources of power are needed when confronting situations framed by “time pressure, high stakes, experienced decision makers, inadequate information (information that is missing, ambiguous, or erroneous), ill-defined goals, poorly defined procedures, cue learning, context (e.g., higher-level goals, stress), dynamic conditions, and team coordination” (Orasanu and Connolly 1993). This describes an edge-of-chaos event. So what can we learn from this decision-making model applicable to incident commanders in large-scale incidents?

Again, relationships are crucial. One firefighter related his experience battling with a higher commanding officer who arrived on his scene and gave an order that would have seriously injured, if not killed, firefighters: “This was a guy I hadn’t worked with before. If it had been my usual commander, he would have

trusted my judgment” (Klein 15). This solidifies the importance of not only established working relationships, but of the trust needed to make these relationships work.

The idea of “mental slides” has been discussed in previous pages of this thesis. As further proof of that concept’s validity, Klein discusses *recognition-primed decision making*, which reflects the “commanders’ secret...that their experience lets them see a situation, even a non-routine one, as an example of a prototype, so they knew the typical course of action right away” (Klein 17). This gives credibility to the recommendation that a reality-based education program be created to help first responders gain experience with various types of situations and thereby build the ability to see the “routine” in an otherwise unique-seeming situation, thus allowing an effective response to begin.

The recognition-primed decision-making model complements the sensemaking framework because it “fuses two processes: the way decision makers size up the situation to recognize which course of action makes sense, and the way they evaluate that course of action by imagining it” (Klein 24).

Intuition, also a powerful component of sensemaking, “*depends on the use of experience to recognize key patterns that indicate the dynamics of the situation*” (Klein 31). As suggested earlier, reality-based scenarios help create and generate experience. The Marine Corps also uses tactical decision games, classroom exercises where a Marine will read an account of a situation he/she might encounter in the field, and is given maps and written descriptions about what has happened. “The verbal description presents a dilemma with high levels of uncertainty. Upon completing the verbal description of the dilemma, the person leading the tactical decision game asks each of the participants to take three to five minutes to consider how he or she would react” (Klein 106).

While no stress is introduced in this decision-making exercise, it could nevertheless be used as an essential building block to bring first responders to the level necessary to deal with large-scale, chaotic events. Simply, the very act

of thinking through a complex problem begins to shape the cognitive process in such a way that confronting complex tasks becomes routine. It creates the expectation in people that they will be asked to think quickly through ill-defined problems. This, in and of itself, is a basis of sensemaking: training one's brain to anticipate complexity, and demanding that he/she must work through the problem. Failure is not an option.

Making such patterns part of an everyday life will prepare first responders at least to expect chaos and complexity as normal. And instilling this mindset in first responding incident commanders reveals a crucial, yet little discussed fact about large-scale incidents: that the initial chaos is normal. Too often, first responders seem to feel that initial chaos is a sign of their inability to handle a situation. On the contrary, they must see that chaos is what they are to conquer or transform—that chaos is their necessary challenge.

Consider this: chaos is created by complex parts. Those complex parts, in turn, can be approached by sensemaking first responders seeing the familiar in the complexity. As they work with these familiar parts, an order begins to emerge, allowing them to manage the chaotic event back to normalcy. The chaos is necessary. The definition of a successful response, then, becomes how quickly and efficiently the first-responding incident commander can work through that edge-of-chaos transition phase to bring the situation back toward normalcy.

C. LEVERAGE POINTS

Leverage points are defined as “the starting point for insightful problem solving,” the “focus for building a solution” (Klein 113). Ultimately, “they provide fragmentary action sequences, kernel ideas, and procedures for formulating a solution” (Klein 117). The fallacious notion discussed above, that the initial chaos of a large-scale event is bad, often comes along with the following potentially damaging reaction by first-responding incident commanders arriving into the edge of chaos.

These incident commanders, even if arriving only minutes after the cataclysmic act that caused the chaos, are, indeed, late. Whatever they have arrived to, other people there at the outset were, in a sense, part of that cataclysmic incident. Those people could be other trained first responders, they could be civilians and citizens who were simply victimized, caught in the vortex of being in decidedly the wrong place at the wrong time.

In certain situations, though, these people might be acting heroically. They might be further along in the sensemaking process than the arriving incident commander is. In whatever little piece of their contributing complexity making up the chaos that they have latched on to, they might very well be doing something right. They might be doing something positive in one little area that will start a chain reaction among other aspects of the chaos. Arriving incident commanders often blunder by stopping those actions and breaking that forward momentum because they do not understand what is going on. This is, they feel extremely uncomfortable and unable to make any sense of the situation until they have been “fully briefed.” Their quest for situational awareness and their need to feel—and be seen—as in command of the situation, causes them to stop positive action at the event.

Consider the case of Walter Bailey, an eighteen-year-old busboy, working the Beverly Hills Supper Club in Cincinnati on the night of May 28, 1977, when a large fire broke out. On scene at the outset and part of the initial chaos, he reacted differently than others that night. While his supervisors seemed unable to function or perform the simplest task, such as issuing evacuation orders to their guests, Bailey remained calm, announced exit paths, helped people flee the building and then many times went back inside under perilous conditions to lead others out, saving many lives. Walter Bailey is an example of a civilian leverage point. An incident commander arriving on scene, seeing Bailey’s situational awareness regarding layout of the hotel, areas where people huddled waiting for

rescue and information about what rescue efforts had already been made, would have been wise to dedicate resources to multiply and continue these successful actions.

While it seems counterintuitive to the need to take immediate and decisive action, a good incident commander will take a moment to go through some simple, cognitive sensemaking steps on arrival. He/she will think, what has happened here? What am I trying to accomplish? What do I recognize in this event? What have I never seen or heard about before? What do I know? What do I need to know? What can I begin to do? In doing this, his/her challenge is to “catch up” to the event, not attempt to stop the quickly spinning carousel of chaos so he/she can step on to participate in the ride.

D. THE NATIONAL INCIDENT MANAGEMENT SYSTEM: APPLICABLE IN ALL STAGES OF AN EVENT?

Can anyone be trained or educated to be an effective Incident Commander charged with responding to an edge-of-chaos transition phase event? The federal government currently mandates that all first responders go through a certain level of NIMS training. Most of us have completed ICS 100, 200, 300 and the supervisory levels of NIMS/ICS 700 and 800. Built in to this mandate, then, is the assumption that once a student has taken the week-long class and passed the accompanying written test, he/she is proficient in NIMS and can effectively use the model when responding to a large-scale event.

But is this true? Is event response really as simple as arriving, pulling out the NIMS checklists for the various positions and then starting to go down the list of “items to do”? Would that have worked at the Twin Towers on 9/11? Did it work in the nationwide response to Hurricane Katrina?

While those checklists are invaluable once a situation has moved into the cynefin arena of “complicated,” they are not the proper tool to apply in the initial, chaotic phase of event response. While NIMS is a very useful management tool and provides an excellent framework to track multiple resources and coordinate

resources across jurisdictions, this model must anticipate that chaos will initially reign, and then look at some ways first responders can work within that chaos.

E. THE FIRST-RESPONDING INCIDENT COMMANDER

Along with techniques, best practices, lessons learned and de-briefs that can help us understand how to function in the edge of chaos, we cannot forget the importance of the incident commander himself (or herself). While everyone can be NIMS trained to follow a checklist during later stages of an event, there is no exact guide for how to work through chaos. While this thesis has highlighted the importance of experience, reality-based scenario work, use of mental slides, sensemaking as an approach to edge of chaos response efforts, and has even identified the behaviors of people who make HROs function, all of this means only the right person can be an effective incident commander during the initial, chaotic phase of a large-scale event. And this returns us to the question of whether a leader is born or made. In this case, good incident commanders are born with innate skills made better through education and application.

In *The Unthinkable*, Amanda Ripley dedicates a section to this topic, entitled, “Special Forces Soldiers Are Not Normal.” She details what Charles Morgan III, an associate clinical professor of psychiatry at Yale University, found after fifteen years of studying how people are physically, psychologically and physiologically wired differently and how that translates into the fact that those with certain chemical make-ups and psychological profiles react efficiently and effectively under extreme stress, while others cannot optimally function in such an environment.

He found that blood samples of special forces soldiers and enlisted military servicemen who fare well in survival school showed higher levels of the chemical neuropeptide Y, a compound that helps one stay focused on tasks performed under stressful conditions. These soldiers reported few to no incidents of disassociation in events they had endured up to that time. Some psychological profiles indicated most of them had suffered through difficult

childhoods or previous traumatic events. The implications alone of these findings for local first responders working in an edge-of-chaos environment are widespread.

NIMS is a useful framework comprised of section descriptions, checklists and job duties that most people can be taught to apply in managing complicated incidents. The unique skills, abilities and even chemical-physiological makeup that comprise effective incident commanders, however, probably cannot be taught or cultivated in every first responder, but rather must be developed in those found to possess the natural proclivity for performance under stress.

In the absence of routine blood tests or reviewing first responders' childhood experiences, the ROEBs discussed provide concrete descriptions of behaviors that indicate people will probably perform well under stress. Such people could be worked with to increase their number of mental slides, encourage a sensemaking approach to situations and, through educational programs grounded in reality-based scenario work, build upon their innate abilities to help them be as prepared as possible to respond to a large-scale incident.

F. THE IMPORTANCE OF NET WORKING

In her book *Net Work*, Patti Anklam offers a slightly different, more specific definition of the organizations that arise out of the function of people networking: "The reason that individuals, businesses, and organizations create networks comes down to the simple proposition that working together, in conscious collaboration, means that we can accomplish more than we ever could individually" (Anklam 8). Through her work with many nationwide organizations, she has found that "...when a group of like-minded people with shared interests understand that their personal growth and development require learning with others...a network emerges" (Anklam 8).

Considering the importance of net works in incident response mechanisms so historically governed by a command and control approach may seem contradictory. Let us consider, however, some of the working definitions presented in this thesis. Using the cynefin framework, NIMS, and its well-known command and control approach, is a proven tool to work within complicated situations. Large-scale events, however, are always initially chaotic and move into a realm of complexity before they become complicated situations that must be resolved. As Anklam's research shows, "The complex domain is the one that is the most important for net work, because the heuristic here reminds us that when there are human relationships at play, results cannot be predicted" (Anklam 186). For this reason, a detailed consideration of how networks form, function and thrive is relevant to considering how to improve event response to the initial edge of chaos inherent in every large-scale incident.

While the ad hoc networks that form during an incident response are indeed inevitable and important, perhaps the "smart practice" (Bardach 1) here is to hedge one's bet. Those networks that spontaneously come together during the initial stages of an event will be very important. If it is a large-scale event, those resources and people will come from all different venues. There will be firefighters, police officers, emergency medical workers, public works employees, private industry partners, utility workers, city government personnel, perhaps even elected officials—not only from one city or jurisdiction but from many.

These individuals will not have worked together before. Some will have never even seen each other before, let alone know first names, job functions, capabilities, skills or experience. On top of that, they will not know each other as human beings. These people will not know whether they can trust those they must now depend on in a potentially life-threatening situation. Patti Anklam points out that these are ingredients for a poorly functioning organization or network.

Arjen Boin, et al. cite the poor handling of the anthrax crisis that surfaced immediately after 9/11. These researchers found that much of the failure

resulted from the inability of disparate groups to work together effectively. “Many different organizations were part of the crisis management process: hospitals, intelligence organizations, police, specialized army units with knowledge of anthrax, the United States postal service, and all the organizations that received white powder letters” (Boin et al. 57). These groups, when thrown together in a crisis situation, were unable to form quickly the networks necessary to establish trust and begin working together towards a resolution.

But what if these networks are created ahead of time? What if identified first responders reach out to area counterparts to establish relationships? Chat with firefighters regularly? Stop by the emergency room and say hello to their local medical staff? Reach out to public utility companies responsible for dangerous power lines and electric plants to get a tour of their facilities and gain an understanding of their job? What if they solidify these casual contacts into solid working groups that meet once a quarter and begin to talk about response protocol, call-out lists and important topics specific to each entity represented? What if they even participate in scenario-based training together to prepare for a large-scale incident?

Research shows that when thrown together ad hoc in a stressful situation, such a network would function much more effectively than just a group of arriving first responders who do not know each other, have no established ties, no relationships and, subsequently, little to no trust in each other. The wonderful thing about networks is their ability to regenerate and function even if one (or more than one) important person or element is removed. In *The Starfish and the Spider* analogy, spiders have one head orchestrating their movement and their lives. Should that head or a limb of its body be cut off, the spider will cease to function. The starfish, on the other hand, moves through the coordination of its many limbs. Should one limb be cut off, the starfish regenerates itself and keeps moving.

Much like this analogy, networks certainly have recognized leaders, but not the hierarchical structure that renders the entire system useless should the

one leader be removed. This model is necessary at the chaos of large-scale incidents where dependence on one person giving orders means that hardly any action is actually taking place. With the many responders and citizens who will be involved in such an event, a certain amount of self-initiated action will be imperative to achieving success. In the network model, all members of the group understand the end goal because they operate together based on sustained relationships created out of shared values, common goals and trust. This type of network approaches the chaos of an incident like many parts of one whole. Should one section be cut off, as with the starfish, the organization does not die, but rather regenerates and continues to move.

This theory has also been proven in practice by those studying response efforts to a large number of events spanning the last several decades. These studies show that “the crisis response in modern society is best characterized in terms of a network. This is not necessarily counter-productive, as many leaders have learned, because delegation of decision-making authority down the line usually enhances resilience rather than detracting from it” (Boin et al. 51).

Some important points about networks apply to incident response. First, the relationships, discussions and shared experiences among people in the network generate knowledge. This is one way in which those mental slides, so important in sensemaking, are created. Networks encourage tacit interactions that “require workers to synthesize and articulate what they know from experience; such interactions are more likely to involve decision-making and problem-solving rather than moving or transforming raw materials (the transformational) or performing coordinating, recording and clerical work (transactional)” (Anklam 13).

Networking also creates social capital. As defined by Don Cohen and Larry Prusak in *In Good Company*, social capital is “the stock of active connections among people; the trust, mutual understanding, and shared values and behaviors that bind the members of human networks and communities and make cooperative action possible” (Anklam 14-15). Most important for incident

response, however, is that “We also know that the value of that social capital can be incalculable in times of stress” (Anklam 15). And social capital enhances “team performance...if the pre-existing interpersonal and inter-organization relationships among the chief actors represented in the crisis group are marked by a reasonable degree of mutual trust” (Boin et al. 49).

But how does this network model fit into a response scheme where someone must be in charge to shape direction and assume responsibility for the event? Even with networks, some are “directed or guided by a single leader. This person is the hub who defines the purpose of the conversation, the network decides whom to bring into the conversation, and assigns or allocates resources to tasks” (Anklam 64). This leader, a hub in a regional area, that creates an environment where these networks can form—either through training exercises, meetings, or even social site visits to other disciplines’ places of business, for example—also fulfills another important requirement of building and sustaining a network, for networks must be used in order to work and remain intact.

“When a network is not actively engaged in a project, it needs to have some regular place of communication so that its membership continues to identify with it” (Anklam 91). The network of first responders at an incident might never, during the course of their careers, have to calm the chaos of a large-scale event. Consistent face-to-face meetings, joint scenario exercises and routine communication will establish that regular contact, build trust and foster the sensemaking process that ultimately contributes to the further creation and reality of that nebulous arena known as homeland security that we all currently inhabit.

In responding to chaos, that “state in which there is no order to the relationships and neither patterns nor rules can be perceived” (Anklam 183), pre-existing networks could prove invaluable toward making sense out of a nonsensical situation.

V. SYNTHESIZING THEORIES: CREATING A FRAMEWORK FOR WORKING WITHIN THE INITIAL PHASE OF LARGE-SCALE EVENT RESPONSE

This thesis does not debate the usefulness of NIMS and ICS in managing the ad hoc organizations formed for responding to large-scale incidents. It does, however, argue that ICS has become a series of checklists and tasks tending to focus first responders on *process* instead of *purpose*. A first-responding incident commander arriving to a scene of seeming chaos must first go through some sort of sensemaking process to understand what type of situation he or she is truly facing and what he or she is really trying to accomplish. A clear understanding helps form solid intentions leading to a good course of action. Once this happens, NIMS and ICS become valuable tools for working toward simple order.

The preceding pages have discussed seven main frameworks drawn from a variety of disciplines and theories: The cynefin framework, molecular biology's edge-of-chaos theory, Sensemaking literature, human resource management literature discussing High Reliability Organizations and corresponding employee behaviors, the undeniable personal and public politics that influence crisis response, Gary Klein's work regarding recognition-primed decision-making and Patti Anklam's discussion of networking. The life of an event or incident has been mapped using the four arenas of the cynefin framework. An argument has been made that each event goes through distinct phases matching these four arenas, beginning with an initial chaos that gets worked into deep complexity, then moved toward a complicated state that can finally be rendered simple.

Using molecular biology's edge-of-chaos theory, an analogy has been made that the initial phase of a large-scale event is similar to the part of a living cell where chaos reigns, where agents interact with each other and their environment in seeming chaos until an order emerges. Just as scientists have

found that they can affect the cell by finding and influencing trigger points, so can first-responding incident commanders look for those specific elements in an incident that help restore order.

Sensemaking literature offers great insight about the need for creativity, innovation, improvisation and courage in a leader. It also offers seven attributes that can help an incident commander understand his or her environment and work through the chaos. Finally, as Gary Klein and Patti Anklam both point out, pre-established networks created by people who know and trust each other will work together more efficiently in stress and chaos than strangers coming together for the first time to solve a wicked problem.

While, admittedly, these facts seem theoretical in a world of police officers and firefighters accustomed to manuals, laws, checklists and the need for a relatively black-and-white way of doing things, this thesis does offer a concrete framework synthesized from its explored amalgam of seemingly disparate ideologies. This synthesized construct has proven effective for first-responding incident commanders arriving to scenes of seeming chaos. The checklists of NIMS and ICS should begin not with statements of actions that must be performed, but rather with questions the incident commander should first ask him- or herself. The seven theories discussed throughout this thesis provide the foundation for the following framework (or dare I say list?) of questions that should begin every response effort in the edge of chaos:

- What has happened here?
- What have I never seen before; what is completely foreign to me?
- What have I seen before; what is familiar to me?
- What do I know?
- What do I need to know?

Once these questions have been addressed, the incident commander can then move to the next bit of vital work by deciding:

- What do I *want* to do?
- What do I *have* to do?

- What *can* I do?

These questions answered, an order emerges from the chaos and the incident commander is able to consider the last, most important question:

- ***What am I trying to accomplish here?***

After this sensemaking exercise has been completed, incident commanders may begin to apply the ICS *process with purpose*.

And while these handful of questions seem a simple list undeserving of a thesis project, not understanding *why* they must be asked and *how* the answers should be used turns them into just another checklist process. First responders must be educated about why and how this sensemaking process is so important and how it serves to help them work through chaos. They must be placed in scenarios as real as possible where they can exercise their brains, think through wicked problems, rely on each other and on innovation and creativity to deal with situations they have perhaps never encountered before. This type of education will create a thinking practitioner who arrives at the next 9/11, or the next Hurricane Katrina, or the next Oklahoma City bombing, or the next (and the list goes on) ... able to apply the process of ICS with some determined purpose behind it.

Effective event response efforts begin long before the event itself ever happens. While a seemingly small point, it is of paramount importance that leaders train themselves to make challenging decisions as quickly as possible every day. Every police officer or firefighter in a command-level position is routinely faced with making decisions that affect his or her department, employees and citizens. Some leaders put off these decisions or defer to someone else. Such leaders will, likewise, hesitate in the field as well. We do not suddenly change who we are when a crisis strikes. Each of us is still the same person who drove to work that day with the same mentality and the same tendencies. Strong decision-makers in day-to-day operations will be that when a crisis strikes as well. For this reason, leaders must train themselves to make

decisions in their daily jobs and accept the failure that, undoubtedly, will come from some of these decisions. The ability to fail but quickly regroup and continue to move forward is an underestimated, yet crucial, aspect of effectively functioning during chaos.

VI. CASE STUDY

A. RESPONSE TO THE PENTAGON ON 9/11: HOW FIRST RESPONDERS HELPED ORDER EMERGE FROM CHAOS

This thesis began with a brief summary of the Pentagon response efforts on 9/11 and intimated that the success of this operation surely had some discernable basis that, if distilled, might be applicable in solving future crises. The following case study delves deeper into the actions of those responders, military personnel and innocent civilians caught on-scene who contributed to the life-saving efforts that, ultimately, returned all rescuers safely to their homes that evening. Analyzing actions and processes at the Pentagon on 9/11 through the lens of the conceptual framework created in this thesis shows its utility in guiding future effective response efforts.

At 8:50a.m. the morning of September 11, 2001, firefighters in Arlington, Virginia sat in their stations watching news coverage of what their NYFD brethren faced at the Twin Towers. Thinking through all the issues a fire like this would cause, they also thought that NYFD was up to the task. An iconic department, they knew that “about any kind of fire there was, the guys in New York had seen it” (Creed and Newman 4). But even with that, Paul Marshall, an off-duty Arlington firefighter, called his best friend and asked, “How do you fight a fire like that? What are they gonna do?” (Creed and Newman 9). Firefighters were already coming to the realization that this was like nothing they had ever seen before. There were no protocols or procedures for dealing with commercial airliners flying into buildings. Indeed, how would NYFD fight this fire? Little did these men know that less than an hour later they would be asking themselves the same questions regarding the same situation in their jurisdiction.

B. CHAOS

American Airlines Flight 77 struck the Pentagon near the heliport between Corridors 4 and 5. It careened through the building and came to rest 310 feet from its impact point. In its path, it “destroyed more than 30 columns that were holding up the building and severely damaged 20 others. Decelerating from 530 miles per hour to a dead stop in that distance produced a gravitational force of 30 g’s, more than three times the force that fighter pilots are trained to withstand in the cockpit. From the moment of impact, the entire event had taken place in eight-tenths of a second” (Creed and Newman 30). It would take rescuers ten days to respond to the chaos caused by these eight-tenths of a second and work the event back into normalcy.

As discussed earlier in this thesis, the first-responding firefighters and police officers are sometimes not the initial rescuers. As in the example of Walter Bailey in the hotel fire, the Pentagon had its own civilian heroes as well. Steve Carter, the Pentagon’s assistant building manager, and his assistant, Kathy Greenwell, had been in the Pentagon’s Building Operations Command Center watching the events in New York on television when they felt the thud. Immediately, their panels lit up with reports of fire alarms, but none of sprinklers, and they saw patterns of activation that did not make sense. They looked at each other and asked, “What do we do now?” (Creed and Newman 31).

Carter ran out into the hallway of the Pentagon and saw black smoke and a gaping hole in the building. Before rushing into action, he performed a few quick, critical first steps. He found his network of trusted, experienced people and together they tried to make sense of the situation. Using creativity, innovation and courage, they formed a plan and then initiated action.

Carter found two of his engineers, who had also come running out, and the three huddled and formed a quick plan. Before anything else, they needed to figure out which parts of the building’s electrical systems were working, which needed to be repaired, and which needed to be shut off. That was critical. They needed power to run everything in the building—computer-monitoring systems,

ventilation, air-conditioning—yet exposed electrical lines in the wrong places could electrocute victims trying to get out, and slow down firefighters. (Creed and Newman 33)

Carter and his men identified trigger points that could influence the chaos and acted on them. Other surviving workers in the Pentagon joined in. At one point, as Carter and a group worked in a line passing victims to each other and out of the building, he found “the rescue effort was a slapdash effort, yet there was a surprising orderliness to it” (Creed and Newman 33).

Newly assigned to the Pentagon, Navy SEAL Craig Powell also acted to save many lives that day. In one situation, he saw men attempting to build a makeshift staircase so people trapped on the floors above could climb out the windows and down to safety. Quickly assessing the situation, he realized there were not enough pieces of furniture to build any kind of structure, and the fire was quickly advancing on the room above them. Creativity occurs when all “normal” options are actually worse than the outlandish one being currently considered. In such a creative step, Powell told all the men on the floor to form a human net and then told the people above to jump into the waiting net. Unfortunately, when they jumped, the other people helping him form the net pulled away. Powell ended up catching the jumpers one by one on his own and taking them to safety.

When Lieutenant General P.K. Carlton arrived on scene and saw Powell he attempted to stop him and ask for a situational briefing. As this thesis recommends, those arriving to a scene attempting to assume some kind of command must realize that others may already be performing positive actions. A good incident commander will find these people and help move their actions forward, not stop their work and demand situational briefings. In this case, Carlton recognized Powell as one of those rare individuals, much like Walter Bailey, who was moving the incident in a positive direction. Carlton immediately followed Powell and began to help him.

Arlington County Firefighter Derek Spector, the acting officer in charge of Truck 105, arrived at the Pentagon and knew “the first officer to arrive at a fire was always responsible for providing a ‘size-up’ of the situation’ (Creed and Newman 41). NIMS does state that a “size-up” should be performed by the Incident Commander but the statement comes late in the NIMS literature and no further attention is given to this vital point. Nor does it explain how, exactly, one performs a “size-up.” This thesis argues that the “size-up” is the outcome of a sensemaking process performed by experienced, trained professionals working within a successful network built upon established relationships. This sensemaking “size-up” allows the incident commander to answer the question, “what am I trying to accomplish here?” and forms the solid purpose that the process of ICS then accomplishes.

Many people performed sensemaking “size-ups” at the Pentagon. Spector certainly did, and the process looked like this: Panicked at first, he called in on his radio, “We’re at the heliport....I have a plane into the building. Five stories. Give me a third alarm” (Creed and Newman 41). Then he began to look around, saw a shiny piece of aluminum with a big red C on it, recognized it as the American Airlines log and realized a plane had flown into the Pentagon. This small piece of evidence began to bring some clarity to the event. Spector then relied on his mental slides. “An old training session flashed through his mind. After a DC-10 crash-landed in Sioux City, Iowa, in 1989, tearing the fuselage apart, some of the 110 victims who died were found still strapped in their seats. Spector quickly scanned the debris field, looking for airplane seats” (42). Seeing military personnel running to and from the building, Spector and his crew realized they were trying to rescue as many people as possible.

Captain Mike Defina, the acting battalion chief at Reagan National Airport, was the next on-scene at the Pentagon. When he pulled up behind Spector’s fire rig, he first looked for a command post. Seeing none, he made his way to the helipad. As he moved along, he too went through his own sensemaking process.

“As Defina sized up the situation, his first question was, “What might get us into trouble here? A mass evacuation was under way. One airplane had hit the building, and there might be another. He reminded himself to stay focused on the big picture and be prepared for the unexpected” (Creed and Newman 44).

Behind Defina came Arlington County Battalion Chief Bob Cornwell and Firefighter Joe Lightfoot. An experienced firefighter nearing the end of his career, Cornwell had served in Vietnam and had an almost legendary status on the department for fighting fires. He was also just returning to work after receiving chemotherapy treatments for cancer. “As the first senior fire officer from Arlington to arrive, Cornwell would be the incident commander, in charge of the operation. But he didn’t have a clear view of the scene at the edge of the building. He and Lightfoot ran around a construction fence that was blocking their view and were suddenly staring at bedlam” (Creed and Newman 47).

Finding something in that scene that looked familiar to him, Cornwell commented, “This is just like Vietnam” (Creed and Newman 47). He set up a command post, established himself as incident commander and tasked Lightfoot with being his scribe. But he stopped there. He did not focus on structure and process yet, and a full implementation of ICS positions did not come until much later in the response effort. Instead, Cornwell did two things: he asked for a police liaison to meet him at his command post and he “wanted to know if any firefighters had been in the building and could report what they saw there” (Creed and Newman 48). In these few actions, Cornwell displayed many of the ROEBs essential in good incident commanders. He ascertained information, communicated with others and co-acted to create ad hoc groups. He used his mental slides to make sense out of a fairly foreign event and began to look for leverage points that could be exploited. Cornwell set the scene for Jim Schwartz, Arlington’s Assistant Chief of Operations, who arrived next.

Schwartz was uniquely experienced for this situation. He “had overseen joint exercises with the Defense Department, the FBI, and neighboring fire departments well-schooled in terrorism, especially after the Oklahoma City

bombing. Plus, his wife worked for the CIA and offered her own worldly perspective on the threats fire and police officers were likely to face” (Creed and Newman 49).

Schwartz knew Cornwell very well. He knew Cornwell’s strengths as a firefighter and a leader and he knew that he would need his best men inside the building to help him make sense of what was going on. And so, he walked up to Cornwell and said, “Bobby, I’m taking command”....There are two priorities in the first stage of a fire: searching for victims and getting them out, and then knocking down the fire. Cornwell had already put the search-and-rescue mission into motion, and a few fire crews were preparing to get water flowing onto the fire and drag hoses into the building. But Schwartz needed a more specific plan. Most of all, he needed to know what he was dealing with. How deep was the fire? How wide? How many floors? Were victims trapped, or had most of them gotten out?” (Creed and Newman 49).

Clearly, these first responders from the Arlington Fire Department had asked themselves: what has happened here? What have I never seen before; what is completely foreign to me? What have I seen before; what is familiar to me? What do I know? What do I need to know? As the new incident commander, Schwartz did not stop to name section chiefs to ICS positions. Instead, he found that he needed to make sense out of the situation first and this is what he focused his energies on.

A little more than twenty-five minutes into the event, Arlington County Fire Chief Ed Plaughter arrived at the Pentagon. Making his way toward Schwartz, he thought of relieving him as incident commander. Having worked with him for many years, though, he knew Schwartz was up to the task. He was also painfully aware that traffic had caused him to arrive very late, so as Schwartz attempted to hand him the blue incident commander vest, Plaughter looked at him and asked, “Is everything under control here, Jimmy? Do you know the magnitude of what we’ve got?” (Creed and Newman 89).

Just minutes earlier, Schwartz had tried to staff the incident command positions but found the situation still too chaotic to accomplish that. He briefed Plaughner on what he knew, and what he still needed to know. Because Schwartz knew what he *wanted* to do, what he *could* do and what he *had* to do, Plaughner decided not to take over as incident commander. “The situation at the fire ground was still extremely fluid, bordering on chaotic. But Plaughner could tell that Schwartz had a grasp of the challenge” (Creed and Newman 89).

Plaughner also realized the politics of crisis management would soon bear down upon them. This was “an extraordinary event that would require a top fire official to deal with dozens of other government agencies, Pentagon leaders, and the press. If those pressures landed on the incident commander—whose most important job was to oversee the firefighting plan—they could interfere with the fire and rescue efforts. They would need a buffer between the incident commander and the frantic outside world” (Creed and Newman 88). Plaughner reserved this job for himself.

At this point, FBI agent Chris Combs joined the command post. Network relationships so vital to incident success came into play here as “Combs knew Schwartz from planning and training sessions they had attended together. He spotted Schwartz and ran up to him. ‘Thank God you’re here, man,’ Schwartz replied, putting his hand on Combs’s shoulder. ‘You know we’re under attack?’ Combs asked. ‘Yeah.’ [Schwarz responded] ‘Okay, whaddya got here?’ Combs asked” (Creed and Newman 90). In this brief exchange, the established relationships between experienced first responders set the stage for successful command post operations.

Arriving firefighters were quickly grasping the severity of the situation. Arlington Fire Department Captain Dennis Griffin turned to his crew and warned, “This is going to be something we’ve never seen before. We’re really going to have to pace ourselves” (Creed and Newman 91).

C. MOVING FROM CHAOS INTO COMPLEXITY

Forty-five minutes after Flight 77 crashed into the Pentagon most of the emergency workers had evacuated to the underpass of I-395, safely waiting out the threat of a second hijacked plane still in the air, believed to be headed their way. This lull in the action gave the incident commander and his team a chance to finish “sizing-up” the situation. In a stroke of innovation and creativity, Plaughner commandeered the police helicopter to get an overhead view of the incident. Back at the command post, this allowed the team to begin “sketching out what they knew about the fire, and figuring out how to use all the units that were showing up” (Creed and Newman 128). Multiple federal and local agencies along with media began to arrive. Plaughner was spending a great deal of time reaching out to Pentagon officials, FBI, other fire agencies and police departments in an attempt to keep politics out of the rescue efforts. One firefighter muttered, “Man, what a mess” (Creed and Newman 129).

With the second plane grounded in another location at 10:40a.m., it was time to go back to work. “The command post was preparing to resume firefighting operations—but this time it was going to be orderly, more or less, with a thorough accounting of which units were in the building. Doug Insley, operating the radios, told Gibbs, near the helipad, and Smith, in the courtyard, that he needed an ‘accountability check’—a list of all units on the scene under their command” (Creed and Newman 131). As the event began to emerge out of the chaos and into complexity, the firefighters had a clearer understanding of the situation and were able to begin a more informed plan of attack. “What they needed to do, Smith argued, was continue to look for victims, but switch from a rescue phase to offensive firefighting. It was time to start beating back the fire and reducing its spread” (Creed and Newman 132). At the command post, “They had barely started fighting the fire and Plaughner was already thinking days ahead” (Creed and Newman 145).

And so chaos began to give way to complexity, and order began to emerge. Ancillary parts of the response effort were not needed anymore. “Except for firefighters who needed attention for injuries, heat exhaustion, or smoke inhalation the medical operation in the courtyard was winding down” (Creed and Newman 164). Offensive firefighting became the focus of the operation.

D. COMPLEXITY INTO COMPLICATED

At 11:30a.m., almost two hours after Flight 77 crashed into the Pentagon, “Schwartz found Randy Gray, another Arlington battalion chief. ‘Randy, I want you to be my operations commander,’ he told Gray. ‘I want you to start a planning section too. If you could figure out what units we have here, that would be a good start. This is really confusing us’” (Creed and Newman 166). Gray knew that by being named Operations, he was really being placed in charge of the entire incident. “Gray slipped on the vest that said Incident Commander over his dark blue light-duty polo shirt, and started gathering other officers to tell him what they knew about the fire” (Creed and Newman 167).

ICS became a very useful tool for managing the event response efforts through the intelligence, planning, logistics and operations components.

With the help of Cornwell, Gibbs, Defina, and others, Gray sketched out a plan of attack. They’d send in the larger groups that Gibbs had been organizing. One group would go into the E Ring with hoses to push the fire back toward the path of the airplane. Another group would go into the D Ring, and do the same thing, with a third group attacking the fire in the C Ring. Fresh groups would rotate in and relieve the prior group in place, so the hose lines could simply be handed off, without losing momentum against the fire. And they’d keep pouring water into the building from outside, using deluge guns at ground level and nozzles affixed to ladder trucks to hit it from high and low. (Creed and Newman 169)

ICS was used very effectively throughout the remainder of the incident. By 1:30p.m. “the firefight had become more organized after each evacuation, as

commanders used the time to refine their plans, prepare fresh crews, and gather intelligence about the fire conditions inside” (Creed and Newman 194).

E. RETURNING TO SIMPLE

By Tuesday, September 18, 2001, “the nation was starting to get back to normal, or at least adapting to a ‘new normal’, as commentators were starting to say” (Creed and Newman 444). And on September 21, 2001, “the Arlington County Fire Department formally relinquished control of the Pentagon incident site to the FBI” (Creed and Newman 453).

F. PROPERTIES OF SENSEMAKING

While the firefighters who responded to the Pentagon on 9/11 were experienced, that experience can be understood in terms of sensemaking properties. Schwarz, Plaucher and Cornwell were *grounded in identity construction*. They all thought and acted based on what had shaped them as people—past experiences, Vietnam, cancer survivor, respected leaders in their department. Whether they knew it or not, they were *enactive of sensible environments* because as they focused on certain aspects of the firefight, their men saw missions that needed to be accomplished. Their focus created action. They became *retrospective* leaders and forged new operational plans based on looking back at successes and failures of past periods.

They were cognizant of the *social aspect* of their orders while remaining *focused on and by extracted cues*. For example, Schwartz sent an order to remove Cornwell from the front lines. He knew, based on how both he and Cornwell had been socialized, that Cornwell would disobey the order and refuse to leave. He also knew that the few words he used to utter this order carried with them a much broader meaning—he was really telling Cornwell he was concerned about his health. He was offering Cornwell a gracious way out in front of his men, should he need to take it, and he was establishing Cornwell as an even more effective leader to his men by allowing Cornwell to stay at his post. All of

this intricate social play created a cohesive team of firefighters Cornwell took into the Pentagon to fight back the fire successfully.

Finally, they all realized their orders were *ongoing* and competing for attention with other projects. It was extremely difficult to establish a scribe log so resources inside the Pentagon could be tracked. Understanding the ongoing nature of their talk about tracking resources focused the incident commander on repeating the order multiple times throughout the event until a log was finally created. And, overall, the first-responding incident commanders to the Pentagon on 9/11 were *driven by plausibility rather than accuracy*. They practiced sensemaking and asked themselves the following questions to the point where they knew enough to get on with their project. Throughout the initial phase of chaos, they worked to determine:

- What has happened here?
- What have I never seen before; what is completely foreign to me?
- What have I seen before; what is familiar to me?
- What do I know?
- What do I need to know?

From that, they were able to answer:

- What do I *want* to do?
- What do I *have* to do?
- What *can* I do?
- ***What am I trying to accomplish here?***

G. IMPORTANT ANCILLARY CONCERNS

The ten-day Pentagon incident can be dissected into the cynefin domains of chaos, complexity, complicated and simple. As the response to this event proves, the sensemaking framework used by first responding incident commanders displaying ROEBs and working in networks formed of solid, pre-established relationships able to employ innovation, creativity and courage allowed them to find leverage points they could influence in order to work through the chaos.

Along with this, two other points bear mentioning. This thesis has discussed finding the right people for the right jobs, much as Schwartz and Plaughter did at the Pentagon. Perhaps even more important than finding the right person is weeding out the decidedly wrong ones. The following anecdote provides an excellent example. Firefighters who had commandeered a Pentagon motorized cart were heading to the command post picking up other firefighters along the way. “They passed a female firefighter who was walking in the same direction and stopped while she piled on too. Anderson noticed she didn’t have an air bottle. ‘Where’s your Scott pack?’ he asked her. ‘You think I need it?’ she asked. ‘Whoa! Stop!’ Griffin hollered, realizing she was in over her head. Usually, he was patient with rookies. But this wasn’t the time for a training session. ‘You,’ he said pointing to the woman. ‘Off!’” (Creed and Newman 148). While opportune to find the best people for jobs at the scene of large-scale events, most people have some amount of talent. What must be avoided at all costs is allowing decidedly wrong people to fill positions their skill sets are incapable of handling.

The response to the Pentagon also offers one final comment on the unavoidable fact regarding the politics of crisis management.

Many organizations had an obvious role at the incident, like the Defense Department, FBI, National Transportation Safety Board, and local police. But it seemed that every agency with inspectors or investigators was sending them: The Drug Enforcement Administration; the Bureau of Alcohol, Tobacco and Firearms; even NASA. In the command post, Plaughter saw one man he didn’t recognize, credentials draped around his neck. ‘Who’s that guy?’ he asked. ‘What’s he here for?’ Somebody told him the man was a disaster expert from the Department of the Interior. Plaughter told a police officer to escort him out. Complicating the juggling act, top officials at the White House and other parts of the government were calling frequently, asking for situation reports. (Creed and Newman 185)

A good incident commander will keep these politics away from the operation. A brave incident commander will stand up to political pressure and

shield his troops while they perform their job. In fact, the ability and backbone to do so probably differentiates a *good* incident commander from a *great* one.

Plaugher faced such a situation when General John Keane called to demand access for Terry Maude, the wife of the highest ranking military officer killed at the Pentagon, to visit the site and lay a wreath where her husband had died. While others in the military had to give in to the request of this ranking officer, Plaugher did not. He held his ground and explained his reasons for refusing access. The General understood and the visit did not occur.

H. CASE STUDY CONCLUSION

This case study allows a retrospective dissection of response efforts to a large-scale incident. Clearly, large-scale incidents can be mapped onto a cynefin framework and understood in terms of chaotic, complex, complicated and simple phases. An initial phase of chaos does exist in a crisis. How first responders make sense of this timeframe and how they structure their actions based on that understanding will translate into positive or negative outcomes. This will lead the responding rescue machine down a path that will either save lives or could, ultimately, destroy them.

“The final death toll at the Pentagon was 189: 125 people who were working in the building, 59 passengers and crew members aboard Flight 77, and five hijackers” (Creed and Newman 468). No firefighters or police officers died at the Pentagon on 9/11. Those in command of the incident arrived to a scene of utter chaos and took a few minutes first to understand what they were facing and then grouped together to find innovative, creative solutions. They operated as thinking practitioners who, once the event became manageable, applied ICS to achieve a stated purpose. Probably because of this, all of their men went home that night and many military and civilian workers inside the Pentagon were saved.

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VII. RECOMMENDATIONS

As Arjen Boin and his fellow researchers discovered through studying decades of crisis management at large-scale, volatile events, “The initial phase of crisis coordination can do without rules, but successive phases require a few key rules that facilitate the interaction between the various actors and structure information flow” (63). NIMS provides those rules that, if used effectively, form the needed framework to structure event response in successive phases of an incident. The area that remains unexplored by NIMS, however, is, as this thesis repeats, the initial phase of the crisis. What are the characteristics of this phase? Are there any consistent, recurrent, predictable pieces? Or is the chaos of this phase the only predictable part of it? If so, how can we understand the nature of chaos in ways that will better prepare first responders to work it to a point where NIMS becomes applicable?

The Boin research team also found that “A truly effective crisis response cannot be forced: it is to a large extent the result of a naturally evolving process. It cannot be managed in linear, step-by-step and comprehensive fashion from a single crisis center, however full of top decision makers and stacked with state-of-the-art information technology” (Boin et al. 64). These discoveries suggest the need for an exploration of that unsettled place sorely lacking in clearly defined rules, set policies, procedures, protocols and cause-and-effect constructions. In other words, Boin’s discoveries regarding the nature of crisis response lead to an area where most police officers and firefighters fear to tread.

First responders spend a majority of their careers training for specific events. This is their known world. If a fire happens, determine the type (chemical, wood, wildfire) and apply the proper solution. If facing an active shooter adversary in a high school, police officers will form emergency action teams and move toward the threat using the best possible cover and practicing such proven building search techniques as “pie-ing” around corners. But who

knows how to respond to planes being flown into buildings? Who can prepare for the mass chaos of attempting to manage a response to Hurricane Katrina?

There is certainly no suggestion here that NIMS be abandoned and training for specific, known events be halted. But the first-responder community would greatly benefit from an addition to the NIMS literature recognizing the initial, edge-of-chaos phase existing at the beginning of large-scale events. This chaos is normal and to be expected. First responders initially arriving at a scene should not believe they are ineffective if they cannot issue direct orders that end the chaos immediately. Instead, they should realize that it might take some time to work through the chaos and that their barometer for success is not whether they can immediately end the chaos, but rather, how quickly and effectively they can manipulate all elements to work through it.

While there are no checklists for working through chaos, evidence suggests that sensemaking is useful for first responders who find themselves in these situations. While NIMS currently teaches organizational structure, it is silent regarding how an incident commander comes to determine what that structure should be trying to achieve and the direction in which it should be moving. Some work with sensemaking as a strategy for determining mission, path and direction for the ICS structure created to handle subsequent phases of the event would be invaluable. In fact, it is everything. A well-functioning team is useless if they have mis-identified the problem and are, therefore, following the wrong path.

As Boin found, “Leaders are important not as all-powerful decision makers but rather as designers, facilitators, and guardians of an institutional arrangement that produces effective decision-making and coordination processes” (64). These concepts cannot be taught by simply including them in the current NIMS checklists written for each section position.

Because of this, NIMS should also recognize that not every person has the innate skill set necessary to perform well in crisis situations. Not every first

responder will be able to grasp and apply the concepts of sensemaking, chaos and techniques of effective manipulation, nor will they display the behaviors human resource management science has identified as those ROEBs that imply success in high-reliability organizations.

In any local first responder community, though, are people who do have those innate skills. These people should be sought out and developed. A federal approach to supporting and standardizing some of the education these people undergo would create a nationwide community of best practices. As these experienced first responders come together to talk about how to work an edge-of-chaos situation, they contribute to the reality of the literature on the subject and to creating and broadening the education that could lead to lives saved in future large-scale events, terrorist or naturally driven.

Thousands of years of warfare teach us extremely salient points regarding the importance of the leader at a crisis event. As Philip II of Macedon said, “An army of deer led by a lion is more to be feared than an army of lions led by a deer” (Heal 39). Decades of law enforcement experience have found that leaders must possess the one trait that cannot be taught or acquired: courage; for “everything rests upon courage” (Heal 38). What can be acquired, though, is experience. And experience is another vitally necessary component to effective leadership in an edge-of-chaos event because it helps first responders recognize component pieces imbedded in the overall chaos. These pieces, if thoughtfully considered, can help them make sense of an unusual situation and begin to formulate plans to restore order.

“It has been said that a warrior’s most formidable weapon is his mind. It follows then that the sharper the commander’s mind, the sounder the decisions” (Heal 39). The most effective way to sharpen the mind is through education built on realistic scenarios that force the student to become actively involved in the course of study. NIMS currently hosts large area-wide events in different parts of the nation meant to bring varying local agencies and disciplines together to participate in a table-top exercise. Scripted and publicized well in advance, they

allow agencies to practice using the NIMS organizational framework to manage the event, allocate and track resources. While there is certainly value to these exercises, perhaps a few adjustments to this practice could leave first responders better prepared to deal with the initial phase of chaos inherent in large-scale events.

A small group of people should be brought together to research this idea of “edge of chaos” further. This group should include experienced, open-minded practitioners along with the right mix of academically-focused teachers. Together, this group should craft the most realistic scenario possible evolving in actual time. This is no small undertaking. It means having a physical facility where some type of chaos can be convincingly played out. The coordination alone of resources and role-playing “actors” will be challenging. First responders will then be let loose in this environment to interact in the chaos and attempt to bring about resolution. This will not be a controlled, table-top exercise in the safety of an Emergency Operations Center.

Along with what happens during the scenario itself, the de-brief and observation of the instructors afterwards will be invaluable. This type of continuous discussion and learning focused on a sensemaking approach will create a body of knowledge about how first responders can best work within the edge of chaos known to exist at the outset of large-scale events. Truly devious instructors who craft the scenarios their unsuspecting students will “live through” at this training facility will undoubtedly add to the mental slides of every student they affect. Because of this, first responders who arrive at the scene of what would otherwise have been a completely new experience to them might feel more confident beginning their sensemaking work of the situation because they had experienced something close to it or analogous to it in their scenario work.

Ultimately, this type of education provides the all important *why* because as General A. M. Gray found, “Tactics is not whether you go left or right, tactics is why you go left or right” (Heal 71). Understanding the chaos of an event enough

to piece together *why* certain things need to be accomplished will allow first responders to make the best decisions possible.

Finally, these small classes participating in the realistic scenarios must include cross-discipline and multi-jurisdictional students. The value of pre-existing relationships cannot be emphasized enough for effective event response. Personal relationships that have created a level of trust among parties provide the foundation for the strong bonds necessary to achieve a coordinated response to any event. As the *9/11 Report* found:

While no emergency response is flawless, the response to the 9/11 terrorist attack on the Pentagon was mainly a success for three reasons: first, the strong professional relationships and trust established among emergency responders; second, the adoption of the Incident Command System; and third, the pursuit of a regional approach to response. Many fire and police agencies that responded had extensive prior experience working together on regional events and training exercises. (314)

These findings sum up the recommendations of this thesis. NIMS and ICS are an invaluable tool for a structured event response and provide an organization that best handles the complicated nature of a coordinated response effort. But in the initial, chaotic phase inherent in every large-scale event, the organizational structure of ICS is not yet useful. First responders with the inherent skill set to “function in an environment fraught with uncertainty, friction, and risk” will have “the most profound impact on the successful resolution of a conflict” (Heal 39). These first responders must be educated through participation in reality-based scenario training that will help them practice sensemaking techniques, add to their library of mental slides, and foster relationships with each other across disciplines and jurisdictions so that, if the unthinkable does occur yet again, those men and women will be as ready as possible to insert themselves into chaos and wrestle it back to normalcy.

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