Large-Scale Incident Decision Making for

Incident Commanders in the

Springfield Fire Department

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CERTIFICATION STATEMENT

I hereby certify that this paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

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Abstract

Decision making at routine emergencies differs from the type of decision making that occurs at large scale incidents.

Research indicates that naturalistic decision making (NDM) is used at quick moving incidents and is based on the incident commander’s experience. The incident commander rapidly chooses a strategy that “satisfies” the immediate needs of the situation, sometimes without regard for the best option. Generally, with an increase in experience the incident commander realizes an increase in decision making skill.

Traditional analytical decision making is a better choice when dealing with large scale incidents. Due to their infrequency and complexity large scale incidents require more emphasis be placed on choosing an “optimal” solution rather than selecting based on immediate need. Skill development must come by way of training.

The problem is that SFD does not offer large scale incident decision making training to its incident commanders. The purpose of this ARP is to research incident decision making and submit recommendations to the Fire Commissioner regarding the components that should be included in large scale incident decision making training for incident commanders in the SFD. Using descriptive research, surveys, and interviews, the following research questions will be answered: (1) What are the different models of decision making?, (2) Which decision making model is best suited for large scale incidents?, (3) What large scale decision making training are other similarly staffed fire departments in the US using for their IC's?, and (4) What components should the SFD include in its large scale decision making training?

The results indicated that the majority of similarly staffed fire departments in the US use mock incidents and table top exercises to train their incident commanders. It is recommended that the
SFD incorporate both mock incidents and table top exercises into their large scale decision making training.
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Introduction

Research has suggested that, based on the size and complexity of an emergency, incident commanders rely on different decision making skills.

At house fires and other routine incidents, where the incident commander is generally operating under extreme time constraints, the commander relies more on an intuitive based decision making model. At these incidents, the incident commander is generally operating under time constraints the incident commander, using past experiences, recognizes certain patterns in the and implements solutions chosen based on the first goal or strategy that comes to mind that is most likely to succeed (Klein, 1993).

Because they happen infrequently, the decision making process used during large scale incidents, like floods, hurricanes, earthquakes is not intuitive but more analytical. The greater complexity encountered at large-scale incidents generally requires a multi-agency approach, extended operating periods, and an increased emphasis on analyzing and selecting the best solution not merely the first one most likely to succeed (Fredholm, 1993).

The problem is that, the SFD has not offered large scale incident decision making training to its incident commanders. The purpose of the ARP is to research incident decision making using the descriptive research method and submit recommendations to the Fire Commissioner regarding the components that should be included in large scale incident decision making training for incident commanders in the SFD.

The research questions include, What are the different models of decision making?, Which decision making model is best suited for large scale incidents?, What large scale decision making training are other similarly staffed fire departments in the US using for their IC's?, and What components should the SFD include in its large scale decision making training?
**Background and Significance**

The City of Springfield, Massachusetts (City) is located in the southwestern part of the state approximately 5-miles north of the Connecticut border, and 90-miles west of Boston, the capital of Massachusetts. It is the 3rd largest city or town in Massachusetts and the largest city in Western Massachusetts. Springfield covers a geographic area of approximately 32-square miles and has an estimated 2009 population of 155,000 (Census.gov).

Transportation routes that pass through Springfield include two major interstates. Interstate 91 runs north to south beginning in the south in New Haven, Connecticut and ending in Vermont at the Canadian border. Interstate 291, a shorter highway, runs east to west and connects Interstate 91 to the Massachusetts Turnpike (Interstate 90). Interstate 90 runs east from Boston to West Stockbridge located at the western end of the state.

The region is home to two military, Barnes Air National Guard Base in Westfield, Massachusetts and Westover Air Force Reserve Base in Chicopee, Massachusetts that house active guard and reserve units as well as fighter aircraft including the F15 fighter jet and the C5 military transport aircraft. Barnes Air National Guard Base is located approximately 10 miles northeast of Springfield and Westover Air Force Reserve Base is about 10-miles north.

There are numerous industries operating in Springfield, many of which use hazardous materials in manufacturing their products. Included among these are 16 manufacturers in that use reportable amounts of extremely hazardous materials (City of Springfield’s Comprehensive Emergency Response Plan [CSCERP] 2003).

The SFD provides fire suppression, prevention, hazardous material, fire responder medical, and water rescue services to the City of Springfield’s 155,000 residents. Including firefighters and civilians there are 251 personnel within the SFD including. There are 3 major
bureaus within the SFD, the largest being the Operations Bureau which is comprised of 221 officers and firefighters all of whom are assigned to the SFD’s 7 fire stations and who on duty 24 hours a day among 4 separate shifts.

For the calendar years 2005-2010, the SFD averaged 12,000 responses a year with approximately 40% of those responses being calls for medical services. The other 60% are comprised of those types of calls that are typical of a modern fire department, structure and building fires, false alarms, and other service calls. Information provided by the SFD Firehouse Database™ indicates that for Calendar Year 2009, the SFD responded to 13,698 incidents including 5,992 calls (44%) for emergency medical service (SFD Annual Report 2009).

Historically, the SFD responds to very few large-scale incidents. Of the 12,000 average calls for service per year (2005-2010) the majority involve routine incidents. The most recent large-scale incidents were manmade and involved multiple operating periods. These incidents included an ammonia leak at a food distribution plant in 2002, that lasted for 4-days, a 2-day event involving a fire on a major interstate involving a tractor trailer carrying uranium dioxide in 1991, and a fire at a swimming pool chemical plant in 1988, All 3 of these incidents required multiple operating periods and required coordination between several federal, state and local response agencies (interview, Deputy Chief John J. O’Shea, September 20, 2010).

Regarding natural disasters, while the city is susceptible to a variety of natural hazards in part due its location and climate, it appears that the primary catalysts for large scale incidents are manmade. With little experience handling manmade large-scale incidents and the susceptibility of the City to natural disasters, there is a sense of urgency placed on the SFD and its incident commanders to ensure that they will be ready to assume a role in the response and mitigation of these types of incidents. A major step in readying the SFD for that role is the development and
implementation of a formal and comprehensive decision making training program for its incidents commanders.

The research problem presented in this ARP is supported by the course content presented in the EAFSOEM class. After a capability assessment of the competencies of incident commanders in the SFD the author determined that, due to the infrequency of large scale incidents and subsequent lack of experience in handling such incidents, research was needed on order to identify the methods of training that would improve the SFD’s ability to command these types of emergencies. Additionally, any training in decision making would stress the need to be able to operate in an Emergency Operations Center (EOC) and under a Multi-Agency Coordination Systems (MACS), all topics covered in the EAFSOEM delivery.

The development and implementation of a large scale decision making training program for incidents commanders in the SFD supports 4 out of the 5 United States Fire Administration’s (USFA) strategic goals. By increasing the competency of SFD incident commanders operating on large scale incidents risk is reduced at the local level by way of prevention and mitigation since through training the risk of poor decisions will be reduced, local planning and preparedness is improved, the SFD’s capability for response and its role in recovery efforts is improved, and the professional status of the SFD is improved. These local improvements will no doubt have an impact on the fire and emergency services as a whole since the example given by the SFD will serve to positively influence the entire profession.

**Literature Review**

For the purpose of the ARP, the author will focus on the type of decision-making that will best serve an IC who is command of what can commonly be defined as a large-scale incident. Throughout this ARP the terms *large-scale incident, disaster, non-routine incident* are
used are intended to be interchangeable. Furthermore, the term, *routine* is also used and is intended to be synonymous with those incidents that can normally be handled by local resources and generally do not go beyond one operational period. These types of responses are typically incidents that are recognizable to the incident commander and are the garden variety of incidents that the commander has had some previous experience handling. While there will be a cursory review of literature that covers the type of decision making that occurs at the routine type of incident, it is the intent of this ARP to spend considerable time researching large-scale incident decision making in order to develop the large-scale decision making skills of incident commanders in the Springfield Fire Department.

*Crucial Role of the Incident Commander*

The incident commander is an extremely complex position and requires that those that fill the position have a somewhat extensive experience in handling emergency incidents and an ability to think holistically (Massachusetts Executive Office of Public Safety, 2009). Depending on the size and complexity of the emergency the incident commander has to be prepared to manage the goals and objectives the incident. Within the SFD, more times than not the burden of command falls on chief level officers, and even more so during large scale incidents. In either scenario, the skills and ability of the incident commander will determine the quality of decision making.

The complexity of the role of command demands that chief officers assuming the incident commander role maintain a level of decision making proficiency. Daniels (2006) as reported in Curia (2009) emphasizes the need for chief level training stating that historically chief level training is a result of situations involving poor decision making and is generally
lacking in its forward thinking. Furthermore, not paying needed attention to chief level training allows for a deterioration of skills, impacting the individual and the organization (13).

While there have been several technology advances that have occurred in the fire service, including the introduction of thermal imaging and personal safety devices, there has been little or no technological advancement in improving how incident commanders make decisions. McLennan, Omodei, Holgate, Wearing, (2003) noted that, over the last several years, while there have been advances in the technologies for physically combating emergencies the management of the emergency scene has fundamentally been unchanged and unaffected by technology. Incident command remains a fundamentally human endeavor involving hierarchical teams of trained individuals, using specialized equipment, whose efforts must be coordinated via command, control, and communication processes to achieve specified objectives under conditions of threat, uncertainty, and limited resources, both human and material. Responders today, assigned to the role of incident commander, whether they be a fire department incident commander or an emergency management director are still required to make decisions without the benefit of technology. The command and control function exercised by the incident commander is crucial to success.

The early decisions decisions made by the incident commander are probably some of the most important that will be made during the incident. Flin (2001) stated that it has been well recognized that decisions taken in the opening minutes of a site incident can prevent an emergency escalating into a crisis (107). Trakofle et el. (2000) researching decision making on the emergency scene concluded that the decisions made by an incident commander during the early stages of an incident are critical and that those early decisions, be they good or bad, will ultimately have an impact on any subsequent mitigation efforts (pg 4). McKinney (2010) in his
paper, *On Improving Tactical Decision Making* opined that for the last 30 years, over 70% of all aviations accidents were a result of poor decision making. Since the early decisions made by the IC on the emergency scene will ultimately determine whether an incident will be quickly brought to a successful conclusion or escalate into a drawn out larger incident, it is vital that the incident commander have a comprehensive understanding of the decision making process, so that the incident commander can control the course of the incident.

*Decision Making*

In order to begin to understand how decisions are made on the emergency scene, there has to be a study into the steps or processes that an incident commander uses when making these decisions. Flin (2001) suggests that decision making on the emergency scene is actually a two stage process. The first stage involves a situational assessment or size up where issues such as risk are determined. The second stage involves the selection of the appropriate strategy that will be employed to combat the emergency. The 4 main categories of decision methods are (1) intuitive/recognition primed, (2) analytical option comparison, (3) rule/procedure based, and (4) creative (110). For the purpose of this ARP the author will limit the review to (1) intuitive/recognition primed, and (2) analytical option comparison (pg. 110).

*Intuitive/recognition primed decision making*

It is only within the past 2 decades did the study of experienced based decision making begin to make its way into the forefront of scientific study. Up to that point not much scientific attention was paid to the subject. Klein (1990) refers to intuitive/recognition primed decision-making that occurs under circumstances that he has deemed “real-life” and demanding, as “recognition-primed” or naturalistic decision-making (NDM). Contracted by the US Army to present findings on how to improve decision-making by battle field commanders Klein (1990)
set out to research those that make decisions under real-life and demanding events that most closely mirrored those made by military commanders (pg 7). In the original study, fire ground commanders were studied in order to develop an analysis method that would aid in the study that experience had on decision making (32).

Klein (1997) in his later research into rapid decision-making on the fire ground emphasized the features that define a situation where NDM was be the appropriate decision making would involved an experienced decision makers operating under: time pressure, high stakes, inadequate information, ill-defined goals, poorly defined procedures, cue learning, dynamic conditions (page 4). Orasanu and Connelly (1993) describe the following common factors that characterize NDM domains, when there is an experienced decision maker: ill-structured problem, uncertain and dynamic environment, shifting, ill defined or competing goals, action/feedback loops, time stress, high stakes, multiple players, organizational goals and norms.

Klein (1997) stated that where conventional decision making generally dictates that decision makers identify several alternative plans of action, consider the risks and benefits of each alternative and then implement the one that provides the highest benefit for the lowest risk, found that fire-ground commanders did not follow this conventional wisdom when making decisions (139). Instead what was found during interviews with these fire ground commanders was that the fire ground commander felt that they were not making choices among a list of alternatives but instead they “intuitively,” knew the best course of action to take since they recognized the type of incident. The RDM strategy for making decisions involves first recognizing the incident as typical and familiar. Klein (1993) found that fire ground commanders perform certain exercises in order to help them recognize an incident as familiar. These exercises include goal prioritization, recognizing important cues in the incident, how the incident can
expected to progress, and what “typical” actions will be successful in bringing the incident to a conclusion (24).

Similar work has been performed on intuitive/recognition primed decision-making by other groups as well. Gick and Holyake (1980) described this type of decision making as pattern recognition. Pattern recognition is the ability to recognize a particular type of incident and relate it to a previous experience using those strategies and tactics that may have brought previous similar incidents to a successful conclusion. Gick et al (2000) also agrees that fire ground commanders do not follow the traditional decision making tree by stating that after an extremely limited amount of time considering a strategy the incident commander would implement the decision most likely to succeed, monitor the incident to see how the incident would unfold using the particular strategy, and make any necessary modifications when encountering any perceived problems. Flin et al.(2001) in reviewing the 1988 Piper Alpha Oil Rig Disaster, found that “a fundamental skill sought out in incident commanders across many professions, should be the ability to make decisions under pressure…” and that the skill necessary to manage a “crisis” could not be developed by the study of traditional academic decision making theory. On the contrary, traditional or analytical decision making would not serve the IC when dealing with these fast moving, “real world” incidents (Flin 2001, Murray 1994). The need to understand the type of decision making that would be needed to deal with these types if incidents gave birth to the study of naturalistic decision making.

*Analytical option comparison*

Opposite from NDM is the traditional model of decision making, the analytical style. With analytical decision making, time is generally not as compressed as with NDM and instead
of implementing the first solution that will work, the incident commander has the opportunity to analyze several alternatives and select the optimal solution.

Pascual and Henderson (1997) found that while experienced decision makers relied more on naturalistic decision approaches, it was only under circumstances when they were operating in scenarios that were familiar to the decision makers. However, when dealing with situations that lacked familiarity and subsequently where the decision maker had limited or no experience handling, Pascual felt that these were situations where the decision maker had access to full information, had clear goals, and time pressure was low.

Fredholm (1993) found that for large-scale incidents, the analytical model was the better decision making model since generally, these types of incidents would not be resolved in minutes, and will require a longer operation period over an extended site. Traditional analytical decision making was distinct from intuitive based opinionating that those that were directly involved in the "damaged area" of an incident were better suited using intuitive thinking versus those that were in overall command. Incident commanders operating at large scale incidents are serving at higher levels of command, where their primary role is to determine incident priorities and goals should make use of a more analytical, synthetic style of thinking rather than trying to use an intuitive based model.

Klein (1997) describes the analytical decision making model as the "rational choice model (RDM)." The RCM is a process that is not dependent on experience, but instead allows for a systematic and orderly process for solving complex problems, that the decision maker may have little or no experience handling. RCM allows for extensive study into generating and selecting the best option for a particular situation. In the area of incident command large scale disasters are the type of complex problems that make the analytical model superior to the NDM.
Klein (1997) states that generally, these types of incidents present circumstances that include those situations that require, (1) the incident required documented justification for decisions, (2) where there was conflict among the priorities of the different stakeholders, (3) when time allows for the best or optimal solution to be chosen from a list of alternatives, and (4) if the incident is complex requiring in depth analysis of the best strategies (96).

The use of the analytical decision making model is not limited to just the fire service. There are several other disciplines that rely on analytical reasoning. Vowell (2004) states that the analytical model is the current doctrine used by the military in training would be commanders to be better decision makers. The military refers the analytical model as the Military Decision Making Process (MDMP) and uses it as a planning tool for establishing techniques for analyzing a mission, developing, analyzing, and comparing courses of action against criteria of success and each other, selecting the optimum course of action, and producing a plan or order in those environments that are unfamiliar and complex. Vowell (2004) states that the MDMP is a rational choice model that serves organizations and individuals that lack experience by offering a “standard” way of making decisions.

In an October 12, 2010 interview with Robert J. Hassett, the Emergency Preparedness Director for the City of Springfield, Hassett states that emergency management uses analytical decision making. Primary among emergency management’s principles is “preparing” for the impact that a range of disasters could have on the community. Hassett states that the emergency manager need not wait for the disaster to occur to start formulating a plan for responding. Finally, Hassett goes on to state that, “with major incidents making up a very small proportion of any community’s response efforts preparation, the lack of experience makes the analytical style the better model for the IC, since it is an effective model for preparing for future response.
Historically, the City of Springfield has had very few large scale incidents occur within its boundaries. One of the most memorable examples of a large scale incident involved a 1988 chlorine fire in a swimming pool chemical plant. The incident was a result of rain leaking into stored chemicals that produced chlorine gas and ignition of the contents of the building. The mitigation took 27 days to control from extinguishment to clean-up, involved just over $2 million dollars damage to the building, $500,000 to extinguish (overtime and damage to equipment), $700,000 in other costs to the City of Springfield, and the evacuation of 6000 civilians (USFA TRS). Litigation involved in the incident took several more years and involved testimony from many of the personnel present on scene, including several of the incident commanders who were in command at various times during the incident. A significant issue that faced the City faced was the inexperience of the emergency services organizations to handle an incident of that magnitude.

Flin (2001) argues that fire ground commanders have less experience with the analytical style of decision making due the emphasis placed on intuitive decision making. With the infrequency of major events and the less than probable chance that they will occur, it makes sense that there is more attention paid to intuitive decision making. However, as the primary response agency for emergencies in the City of Springfield, the SFD must always be prepared to be involved in the successful mitigation of every incident it is called to, regardless of its scale.

A review of the incident history of the SFD for calendar years 2005-2009 indicate that over 99% of responses, required only 1 alarm and a mitigation period of 1 operational period (SFD Annual Report 2005-2009). With the majority of calls for service involving single alarm responses there is little debate surrounding the SFD’s experience with recognition based decision-making at smaller scale incidents. The SFD’s weakness lays not in decision-making
during small, routine incidents but rather their inexperience and minimal decision-making training at larger-scale incident response. Due to the lack of experience training must fill in the gap that experience has left.

**Summary**

Research has shown that there are generally two processes of decision making used by decision makers on the emergency scene, intuitive and analytical. Intuitive decision making involves “recognition” of certain familiarities present at an incident scene, which the IC may have experienced before. Based on these familiarities, the IC begins an extremely quick strategy selection process whereas the first best solution that will provide results is chosen and implemented. This experienced based decision making is generally used at incidents that are fast moving and present dynamic conditions. Routine incidents such as building and structure fires are examples where an IC may use intuitive decision making.

For larger incidents that involve extended operating periods, due to their infrequency, they do not allow any measurable level of experience. In these cases the analytical method is the more appropriate choice for making decisions. Examples of these types of incidents include natural disasters such floods and hurricanes, as well as manmade emergencies involving nuclear waste and chemicals. The length of time that large scale incidents generally involve and the long range impact that the decision made by the IC will have made the analytical method the preferred style. Unlike the intuitive method, the IC does not have to make any quick decisions but instead has time to gather information, generate a series of alternatives, and after careful consideration and selects and implement the alternative that provides the best outcome while at the same time presents the lowest risk. Both the military and emergency preparedness use the analytical style of decision making.
Experience has shown that the City of Springfield is susceptible to large scale disasters, both manmade and natural. The 1988 response to a chlorine storage facility emergency is just one example of the type of manmade incidents that can happen. While there has not been a natural disaster that has affected the City of Springfield in decades, the city’s close proximity to the Connecticut River and its climate do make natural emergencies a possibility. Whether the large scale incident is manmade or a result of nature, these types of incidents happen so infrequently that it is difficult for the IC to rely on experience when making decisions. This lack of experience makes intuitive decision making a less effective process to use. The IC, when dealing with large scale disasters, is better served by making the analytical process the primary tool for making decisions.

**Procedures**

The beginning stages of this ARP began in the Learning Resource Center (LRC) during the author’s attendance at the June 2010 offering of the EAFSOEM course at the National Fire Academy. Using the descriptive research method, initial information was gathered on decision making specific to emergency services using the LRC’s card catalog. Printed material on decision making included both books and periodicals. The internet was also used to gather information on decision making both at the NFA and during the later stages of the information gathering stage.

It was determined that other fire departments experience with large scale incidents would play an important role in shaping any training program the SFD would develop for its incident commanders. A survey instrument was developed and forty-eight “participant” fire departments were sent a cover letter and 10 questionnaire surveys through an internet survey service (Appendix A). It was determined that the most efficient and cost effective method of distributing
the survey was by email with a internet link enclosed in the email guiding the participants to the internet service. The service provided a collection point for the responses and an analysis of the results. The cover letter and survey was seeking information related to the participant department’s experience as it relates to large scale incidents, the type of training used to develop large scale decision making in their incident commanders, and the different costs associated with each training effort.

The 48 departments were selected to participate in the survey was based on each department’s staffing levels in comparison to the SFD staffing level of 249, as of December 31, 2009. It was determined by the author that information on staffing levels of the fire departments in the US were regularly reported in the trade magazine, Firehouse. Using the national run survey for 2009, an analysis was made of the 279 departments that participated in the 2009 annual run survey (Firehouse 2010). Due to the limiting number of departments that had staffing levels at or around 249, a wider staffing range (200-399) was employed in order to have an ample number of departments. The use of a staffing range of 200-399 resulted in 48 department being chosen as peer departments (Appendix C). The mean staffing level of the 48 departments sampled was 295. Of the 48 surveys that were sent out 9 departments failed to respond (Appendix B).

An analysis of the large incident response history for the SFD was conducted using 2 separate methodologies, interviews and a database review. Interviews were used by the author to determine the SFD’s experience with large scale incidents and the type of decision making used at large scale incidents.

On September 20, 2010 then Deputy Chief John J. O’Shea, was interviewed in his office at Fire Headquarters at 605 Worthington Street, Springfield, MA 01105. Deputy O’Shea was
chosen for the interview based on his 32 years of experience with the SFD. O’Shea was interviewed for approximately 30-minutes and was asked to describe his experience with routine incidents.

On October 12, 2010, an interview with Robert J. Hassett, the Emergency Preparedness Director for the City of Springfield, was held in his office at 1212 Carew Street, Springfield, MA 01109. Mr. Hassett was chosen and interviewed based on his position in the City of Springfield and his previous experience responding to large scale incidents. Mr. Hassett was interviewed for approximately 30 minutes and was asked to recall the most recent large scale incident that he responded to and to describe the decision making used at the incident.

The second methodology, a database review, was completed using the SFD’s Firehouse Software Records Management System (FHS). The review was completed to provide historical information regarding the percentage of SFD incidents that required more than 1 operational period. To narrow the search and ensure that there was little wasted effort the review was conducted using the query tool provided in the FHS for calendar years 2005-2010. Using the “amount of time spent on scene” criteria the author was able to determine the number of responses that required more than 1 operational period.

Results

With the ultimate purpose of this ARP being creating recommendations regarding the components to be included in a formal, large scale incident decision making training program, the research began with the identification of the different types of decision making models. The research then sought to find out the model best used for large scale incidents and what types of training similarly staffed fire departments in the US were using the ready their incidents a for managing large scale incidents.
The literature review indicated that the study of decision making on the emergency scene has been a topic among researchers for many years. The review showed that research has been conducted across a broad range of disciplines located within both the public and private sector. Oil refineries, nuclear facilities, and medical establishments as well as fire, police, emergency management, and the military all have studied to determine the processes used to make decisions (Flin (2000), Klein (2000), Fredholm (1993)).

*What are the different types of decision making models?*

Klein (2000) provided the most comprehensive study into the decision making that takes place on the routine emergency scene. Klein (2000) states that this type of decision making, naturalistic decision making, provides the best decision making model for the dynamic incident where the IC is working under the pressures of time and there is limited information available for goal setting (pg 95). The basic strategy that is NPM is that through experience, the incident commander recognizes the situation as typical or familiar imagines a plan of action unfolding, implements the plan, and modifies the plan, if necessary. Again, this is all done under the extreme pressure of time.

Decision making at a large scale incidents differs from that occurs at routine emergencies and requires a more analytical approach. Generally, the circumstances and demands facing an incident commander at a large scale incident are unfamiliar. This is primarily due to an experience gap caused by the infrequency of large events. When faced with these types of incidents, the commander will rely more on an analytical or conventional decision making model. Inexperience generally dictates that decision makers identify several alternative plans of action, consider the risks and benefits of each alternative and then implement the one that provides the highest benefit for the lowest risk (Klein 2000).
Each of the decision making models have their pros and cons. For fast moving, a routine incident where immediate life safety is high and there is little time for picking out the best strategy, the intuitive or naturalistic decision making model is the better choice. In these circumstances to try to use the traditional analytical model will not work since time is short, generally minutes, and the incident commander does not have the luxury of picking the optimal solution. On the other hand when faced with limited knowledge about the incident and where time is not measured in minutes but hours and days the incident commander is better served making use of the analytical approach.

*What large scale decision making training are other similarly staffed fire departments in the US using for their incident commanders?*

The first question of the survey inquired as to the experience that the department had with large scale incidents such as tornados, hurricanes, floods, earthquakes during the previous 5-years. The results showed that out of 29 responses to this question 70% had experienced a flood, 20% had experienced a tornado, and 10% had experienced a hurricane. Fifty percent responded experience with “Other” types of large scale incidents.

The second question of the survey dealt with the probability of large scale incidents such as tornados, hurricanes, floods, earthquakes happening in the next 5-years. Of the 14 respondents to this question 50% felt that it was probable that their department would experience a large scale incident, while 36% felt it was not probable, and 14% felt it was more probable that they would experience a large scale incident.

The third question asked for the average years of experience that the departments ICs had managing large scale incidents. Of the 29 respondents 50% stated that their ICs had 11-20 years
of command experience. Thirty six percent stated that their ICs had between 5-10 years of large scale command experience and 14% indicated that their ICs had over 21 years of experience. The fourth question asked if the particular department offered decision making training to their ICs who would manage a large scale incident. Of the 29 respondents, an overwhelming 86% indicated in the affirmative that they offered this training to their ICs.

The fifth question asked for the average number of hours of large scale decision making training offered to their ICs. Of the 29 departments that responded to this question, 62% stated that they offered an average of between 1 and 20 hours of annual training. Thirty-one percent offered 21-50 hours of annual training and 8% offered no training.

The sixth question dealt with the type of large scale training offered. Of the 29 respondents, 86% used incident command training, 79% offered table top exercises, 64% used mock incident training, 29% used a computer based model for training, 21% indicated that they offered training other than those listed, and 7% offered no training.

The seventh question asked the respondents to rate the success of their large scale training. Of the 29 respondents, 90% felt that their table top exercises were successful, 83% found that their incident command training was successful, 78% stated that their mock incident exercises were successful, 75% felt that their computer based training was successful. No department reported that any of their training was unsuccessful.

The eighth question asked for respondents to describe their approach to decision making training. Twenty nine responded with 57% indicating that they felt their department efforts were more formal. Forty three % of those that responded stated that their department training was more random than formal.
The ninth question asked for the involvement of other emergency agencies such as police, fire, DPW, etc. Of the 29 respondents 92% indicated that they involved other agencies in their decision making training.

The final question asked for the amount of financial resources expended on training. Of those 29 departments that responded 56% indicated that they spent more than $1000 on mock incident training. Another 50% spent between $0 and $100 computer based training. Forty five percent spent over $1000 on incident command training, and 40% spent between $101 and $500 on table top exercises.

*What components should the SFD include in its large scale decision making training?*

The survey results support several types of large incident decision making components, including incident command training, table top exercise and mock incident training. The SFD has in the past 2-years completed extensive incident command training through the Federal Emergency Management Agency’s National Incident Management System (NIMS). As of the date of this research study the SFD continues to maintain its NIMS accreditation. A high percentage of surveyed fire departments indicated success in the use of table top exercise and mock incident training. Costs associated with table top exercise and mock incident training range from $101 – over $1,000.

At the time of the interview the Operations Bureau was headed by a Deputy Fire Chief and was responsible for several divisions including Suppression, Emergency Preparedness, and Training. Deputy Fire Chief John O’Shea was interviewed in order to determine his overall experience with routine incidents and, having served as an incident commander for 10 + years. Regarding routine incidents, O’Shea indicated that he did not notice any formal decision making occurring at incidents such as house fires and building fires. With these routine incidents he
stated that there was very little time to “mull” over the different alternatives, due to what he described as, rapidly developing conditions. O’Shea felt that his experience was the factor that predominately guided his goals and strategies. Regarding frequency, the interview supported the fact that large scale disasters are not the norm in the SFD. Having served as both a line officer and an incident commander during his tenure in the SFD, the information gathered from the interview with O’Shea not only provided evidence of the infrequency of the type of incidents that are the focus of this ARP, but also shed light on the lack of a formal training program for incident commanders whose responsibility it is to command large scale incidents (Interview September 20, 2010).

To contrast the findings of Deputy O’Shea’s interview, the City of Springfield’s Emergency Preparedness Director (EPD), Robert Hassett, was interviewed on October 12, 2010. As the EPD for the city one of Hassett’s responsibilities is to respond to emergency incidents and his experience primarily addresses the non-routine incident. The most recent example incident occurred in 2009 involving a high hazard dam in Springfield, MA that held back a 3-4 acre lake. Hassett states that the incident was a result of 3-4 days of heavy rains that created an increased water load that cracked the spillway and threatened to breach the dam and flood a local trailer park. In addition, a family of beavers had built their own dam a few feet in front of the runoff tunnel. Not having a previous background in dam control Hassett states the incident required collaboration between several Federal and State agencies. The entire incident, which ultimately involved a controlled breach of the dam, required 2 ½ days of collaborative decision making. In describing the decision making process, Hassett states that just the decision to initiate a controlled breach took 4 hours of deliberation before it was agreed to.
Discussion

During the research into decision making several types of decision making processes were identified. While there are 4 main categories of decision methods, including intuitive/recognition primed, analytical option comparison, rule/procedure based, and creative fire ground commanders make use of primarily intuitive or analytical (Flin, 1993). According to the literature, the primary variables that differentiate situations where the models would apply include the experience of the incident commander and the time available to mitigate the incident.

The intuitive decision model works well for the routine or typical incidents encountered by the incident commander. These incidents, like fires and other common emergencies, present the average incident commander with a wealth of experience that can be drawn on. The circumstances generally presented to the incident commander at routine incidents demand that decisions be made quickly due to time constraints. The experience of the incident commander allows for the timely recognition of certain cues that help the commander generate solutions that while they may not be the best, do work (Klein, 1997).

The intuitive model does not as well at large scale incidents. Large scale incidents do not happen as often as fires and other emergencies so there is less experience that the incident commander can rely on when making decisions. In addition, large scale incidents are generally not going to reach a conclusion in a short period of time such as the response to a house fire. More than likely, a large scale incident is going to impact a larger geographical area and involve a larger response than the response to a routine incident. It is not unusual to have such an incident impact several neighborhoods and involve a response of both state and federal resources. The 1988 chlorine emergency in Springfield, MA is a good example of a large scale
incident that involved a response outside the parameters generally present at a routine emergency (O’Shea interview).

With the infrequency of large scale incidents there needs to be an effort made to make up for this lack of experience so that when these types of incidents do occur the incident commander is able to function effectively and bring the incident to a successful conclusion. The City of Springfield, historically, has been susceptible to manmade large scale incidents and to a lesser extent, natural events. Regardless of the probability of these events happening, as the primary response agency for the city, it falls within the mission of the SFD to make sure that its incident commanders are up to the task if the city were to be experience such an emergency. Many similarly staffed fire departments in the US have recognized a need to train their incidents commanders in large scale decision making.

Research suggests that, in order of success, table top exercises and incident command training were the best methods used by those fire departments surveyed, to ready their incident commanders for making decisions at large scale incidents. Mock incident exercises and computer based training were listed as almost as successful and no fire department surveyed felt that any of their efforts were unsuccessful. The costs of implementing these methods ranged from $0-$100 for computer based training to over $1,000 for sponsoring a mock incident. With all fire departments rating their efforts successful, overall it could be said that any of the above mentioned models could serve to bridge the experience gap presented at a large scale incident. With regards to cost, it appears that there need not be extensive financial resources expended to train incident commanders in large scale incident decision making. Some training can be done at little or no cost.
With no current program in place to train incident commanders in large scale decision making, this study, including the input from these similarly staffed fire departments, will provide valuable information in developing a formal training program for incident commanders in the SFD. It is the opinion of the author that, within the SFD, very little is known about how decisions are made on the fire ground and even less how they are made on scene of a large scale incident. The information collected and presented in this study concerning the different decision making methods and when they are relevant will serve as important introduction to decision making to the SFD’s incident commanders. It is the expectation that this introduction will make the incident commanders more aware of how they make decisions at incidents and how these decisions can be improved upon.

**Recommendations**

Research indicates that the SFD is behind its peer fire departments when it comes to providing large scale decision making training to its incident commanders. Additionally, the study indicates that many of these departments are not spending large amounts of money training their commanders. Based on an overall review of the literature and survey results, the information suggests that the components of a formal large scale incident decision making program would include the prioritizing of large scale incident decision making for incident commanders, a pilot training program which would primarily include an introduction into decision making and the differences between intuitive and analytical methods. Subsequent to the introduction component, incident commanders would focus on large scale incident decision making exercises in order to improve their ability to effectively handle these incidents.

The prioritizing of the decision making training would require the support of the Fire Commissioner. If the program is going to be successful the decision maker at the top of the
organization needs to send a message of the importance of the effort. Ideally, as a likely incident commander himself, the recommendation would be to have the Fire Commissioner be among the first to attend the training. The Fire Commissioner’s attendance would set the tone for the program and go a long way in showing the incident commander rank of the importance of the training.

It is further recommended that the actual training program be handled on a “pilot” basis to ensure that the training is flexible enough to allow its participants to provide input, in the form of ideas and concepts, into the evolvement of the training delivery. With the limited academic knowledge of how decisions are made in the SFD this flexibility will allow a more collaborative approach for those that make decisions on the incident scene and the training staff who are charged with developing decision making curriculum. This will allow for the ideas and concepts to be captured, formally, and to be presented to future incident commanders. There should be an introduction into both intuitive and analytical decision making, but the focus should be on the analytical model. It should be noted that it is not the author’s intent to suggest that incident commanders in the SFD do not make good decisions on the incident scene. On the contrary there are many examples of, had it not been for the leadership of the SFD’s incident commanders, larger losses of life and property would have resulted. The recommendations here are instead meant to emphasize the awareness component of how incident commanders make their decisions and to provide tools for improving those decisions especially at large scale incidents. It is due to the infrequency of large scale incidents, both manmade and natural, that place incident commanders at a disadvantage. It is the opinion of the author a focus on awareness and input from actual incident commanders will make the SFD’s training program a successful effort.
Finally, it is recommended that the SFD’s large scale decision making program contain one or more exercise component. Research suggests that there are several methods that have been used to varying success by similarly staffed fire departments in the US. The highest rate of success has been experienced by those fire departments using mock incident exercises. But the research also suggests that these types of exercises are among the most expensive to conduct. Costs associated with conducting mock incident exercises can run in excess of $1,000 and depending on the size of the department’s budget could put a significant dent in the overall training line item. There are less expensive methods for training incidents commanders including incident command training and table top exercises. It is recommended that the SFD use a combination of several training methods in their program. First, due to the cost and possible logistics in conducting a mock incident exercise the author suggests that these types of training efforts be conducted annually and in good weather when possible. The New England area experiences all of the seasons and past experiences shows that the Spring would the opportune time to conduct a mock incident. Mock incidents generally involve outside operations and the temperature in the Spring is more amiable for extended exercises. In addition, due to the cost saving measures that are usually incorporated throughout the budget year it is about April or May when excess funds are identified in the budget and pressure put on the expend these resources before the end of the fiscal year. During the rest of the year, which do not require outside operations, incident command training and table top exercises can be conducted.

Overall, all of the costs associated with these recommendations including the different training methods, written materials needed (handouts), personnel costs, including overtime for participants and replacement expenses, need to be forecasted and presented to the appropriate decision makers. The Fire Commissioner, the city’s chief financial officer and budget director all
need accurate financial information in order to judge the impact that such a program will have on the SFD’s budget and its core mission. With the scarcity of financial resources and the increased accountability placed on government operating units by its taxpayers, there is an increased need for accurate and reliable results driven data. If the SFD’s large scale decision making program is going to be successful it has to be organized in a manner that shows a measurable connection between the results the program expects to produce and the impact that it will have on the SFD’s mission to provide the highest quality emergency response services to the City of Springfield.
Reference List


Appendix A

Large Incident Decision Making Survey

1. Please check the types of large scale incidents that your department has responded to in the last 5-years.
   1. Tornado
   2. Hurricane
   3. Flood
   4. Earthquake
   5. Other

2. Based on previous experience, how would you rate the probability of the types of incidents mentioned in Question 1 happening in your community in the next 5-years?
   1. More Probable
   2. Probable
   3. Not Probable

3. How would you describe the average years of command experience held by your current complement of incident commanders. (Please note that this question pertains to those most likely to command a large scale incident).
   1. Less than 5 years
   2. 5-10 years
   3. 11-20 years
   4. 21 years

4. Do you offer decision making training to the incident commanders referenced in Question 3?
   1. Yes
   2. No
5. If you answered yes on Question 3, on average how many hours of decision making training have they completed in the past 5-years?

1. None
2. 1-20
3. 21-50
4. >50

6. What type of decision making training do you offer your incident commanders?

1. None
2. Incident Command
3. Table Top Exercises
4. Computer Based Training
5. Mock Incident Training
6. Other

7. If you answered other than "none" to Question 6 how would you rate the success of each the training conducted?

Somewhat successful  Successful  Unsuccessful

1. Incident Command
2. Table Top Exercises
3. Computer Based Training
4. Mock Incident Training
5. Other
8. How would you best describe your department's approach to decision making training?

1. Formal
2. Random
3. Almost never

9. If you conduct training mentioned in Question 6, do you involve other emergency agencies (Police, fire, DPW etc)?

1. Yes
2. No

10. If you conduct training mention in Question 6, how much is spent on materials and employee time, in dollars?

$0-100  $101-500  $501-1,000  >$1,000

1. Incident Command
2. Table Top Exercises
3. Computer Based Training
4. Mock Incident Training
Appendix B

Large Incident Decision Making Survey (Results)

1. Please check the types of large scale incidents that your department has responded to in the last 5-years. (15 responses)

   1. Tornado 33.3%
   2. Hurricane 33.3%
   3. Flood 80%
   4. Earthquake 0%
   5. Other 40%

2. Based on previous experience, how would you rate the probability of the types of incidents mentioned in Question 1 happening in your community in the next 5-years? (20 responses)

   1. More Probable 20%
   2. Probable 55%
   3. Not Probable 25%

3. How would you describe the average years of command experience held by your current complement of incident commanders. (Please note that this question pertains to those most likely to command a large scale incident). (20 responses)

   1. Less than 5 years 5%
   2. 5-10 years 35%
   3. 11-20 years 45%
   4. 21 years 15%

4. Do you offer decision making training to the incident commanders referenced in Question 3? (20 responses)

   1. Yes 85%
   2. No 15%
5. If you answered yes on Question 3, on average how many hours of decision making training have they completed in the past 5-years? (19 responses)

1. None 10.5%
2. 1-20 57.9%
3. 21-50 31.6%
4. >50

6. What type of decision making training do you offer your incident commanders? (20 responses)

1. None 10%
2. Incident Command 85%
3. Table Top Exercises 80%
4. Computer Based Training 25%
5. Mock Incident Training 60%
6. Other 20%

7. If you answered other than "none" to Question 6 how would you rate the success of each the training conducted? (18 responses)

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8. How would you best describe your department's approach to decision making training? *(20 responses)*

1. Formal 60%
2. Random 35%
3. Almost never 5%

9. If you conduct training mentioned in Question 6, do you involve other emergency agencies (Police, fire, DPW etc)? *(19 responses)*

1. Yes 89.5%
2. No 10.5%

10. If you conduct training mention in Question 6, how much is spent on materials and employee time, in dollars? *(17 responses)*

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Appendix C

Participant Departments with Staffing Levels in the range of 200-399

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