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Gaining Initiative: Rapid Tactical Decision Making in the Iowa City Fire Department

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CERTIFICATION STATEMENT

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

Signed:_____

Abstract

The problem was that the officers of the Iowa City Fire Department were not trained to make rapid tactical decisions during stressful emergency operations. The purpose of the research was to determine what methodologies should be used to train Iowa City Fire Department officers to make rapid tactical decisions under stress. This research used the descriptive method to answer five research questions: (a) What models exist for rapid tactical decision making under stress? (b) What models for making rapid tactical decisions under stress are promoted by military ground combat tacticians? (c) What barriers exist to inhibit sound tactical decision making under stress? (d) What similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground? (e) What models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

A survey instrument was used to gather information about rapid tactical decision making under stress in the ICFD. Interviews with two experts were conducted to answer the research questions. Significant findings of the research were that different models for decision making under stress exist; some are suitable for high-tempo decision making under duress while others are not. Further, pertinent skills are based on the development of adaptive expertise and can be taught and cultivated.

Recommendations produced by the research included teaching and adoption of Boyd's O-O-D-A Loop, providing training on Recognition Primed Decision Making and the changes in neurological function when subjected to stress, and focusing training opportunities on realistic, scenario-based evolutions that are augmented by group post-performance decision making critiques.

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Introduction

At any moment of any day, officers of the Iowa City Fire Department are subjected to the risk of being summoned to mitigate mind-boggling emergencies. Individuals who possess varying levels of experience, education, composure and confidence can, in the blink-of-an-eye, be thrust into making critical decisions long before they are able to gather enough information to define their decision making process as comfortable or well-informed. These officers may be confronted with fractured information about a rapidly-escalating event, and are expected to make sound decisions while rebuffing stressors that are compounded by barriers to their understanding. Too often, these decision makers are propelled to the center of a conflict and expected to engage an enemy that has gained initiative, upon an unfamiliar battlefield, with a set of ground-rules that may seem immediately unclear. Von Clausewitz (1968) defines the aforementioned scenario as the “fog of war” (p. 45).

While the parameters that define a successful emergency operation may vary depending where and under what condition it occurs, it is most certainly the rapid tactical decisions, made under stress, that largely determine the extent to which injuries are sustained and lives lost. In a landmark study designed to identify common contributing factors in firefighter line of duty deaths (LODD), researchers at the International Association of Fire Fighters concluded that factors related to poor decision making contributed to 56.9 percent of LODD’s (Moore-Merrell, McDonald, Zhou, Fisher, & Moore, 2006, p. 21). It is incumbent that any firefighters responsible for making tactical decisions understand that decisions form the impetus for action. Therefore decisions made poorly, decisions made too slowly, and decisions that are deferred can produce the very worst consequence.

The problem is that the officers of the Iowa City Fire Department are not trained to make rapid tactical decisions during stressful emergency operations. The purpose of the research is to determine what methodologies should be used to train Iowa City Fire Department officers in rapid tactical decision making under stress. This descriptive research project seeks to answer five research questions: (a) What models exist for rapid tactical decision making under stress? (b) What models for making rapid tactical decisions under stress are promoted by military ground combat tacticians? (c) What barriers exist to inhibit sound tactical decision making under stress? (d) What similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground? (e) What models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

Background and Significance

The City of Iowa City is located in the southeastern part of Iowa, approximately 115 miles east of Des Moines and 220 miles west of Chicago. A population of 68,000 resides within the city's 30 square miles. Iowa City is comprised of a mix of residential, commercial, and both medium and heavy industrial occupancies. Iowa City is home to a Big Ten University, the University of Iowa, which increases the city's population by about 35,000 during the academic year. Iowa City is also home to the world's largest teaching hospital, the University of Iowa Hospitals and Clinics, as well as Proctor and Gamble, Oral B, and ACT, which develops and administers standardized testing solutions. The City of Iowa City is divided by the Iowa River and bordered by Interstate 80.

The Iowa City Fire Department is the oldest fire department in the state. Its roots go back to 1842, four years before Iowa's statehood, when the Legislative Assembly of the Territory of Iowa issued Council File 109, which authorized the formation of the Iowa City Fire Engine

Company, largely for the protection of the new territorial (and later State of Iowa) capitol building (Brown, 1993).

For the next 70 years, Iowa City would see the formation of several autonomous volunteer fire companies, generally funded by and named for a local benefactor. On October 12, 1912, the Iowa City Fire Department was formally established as a paid full-time fire department. The Iowa City Fire Department has maintained that status since and currently serves the city from three fire stations. Emergency and preventive services are provided by 67 uniformed personnel, including 42 Firefighters, twelve Lieutenants, three Captains, and three Battalion Chiefs. Administrative functions are performed by one Training Officer holding the rank of Lieutenant, one full-time Inspector holding the rank of Captain, one Fire Marshal, one Deputy Chief, and one Chief Officer.

Considerable department resources have been committed to improving the functional responsiveness of the organization. In 1997, the Iowa City Fire Department began a three-phase organizational planning process. Phase One included faculty from the University of Iowa's Tippie School of Business assisting department members in the formulation of a mission statement, a statement of core values, and a statement of organizational vision and values. Phase Two was comprised of department leadership embarking on the Commission for Fire Accreditation International self-assessment, which further led to the ICFD's pursuit of Accredited Department status. Phase Three focused on the design of a comprehensive strategic plan for the ICFD. In 2002, the Iowa City city council formally accepted the *Iowa City Fire Department Strategic Plan,* endorsing the goals and objectives detailed in the ten-year plan. The Iowa City Fire Department fulfilled the chief goal of the vision statement when the Commission on Fire Accreditation International conveyed an *Accredited Agency* designation in August 2008.

In the spring of 2010, the ICFD joined forces with the Center for Public Safety Excellence to form and implement a new five-year strategic plan (Iowa City Fire Department, 2010). As part of the strategic planning process, the ICFD engaged all personnel in developing a new mission statement, which is *the mission of the Iowa City Fire Department is to protect our community by providing progressive, high-quality emergency and preventive services.*

The Iowa City Fire Department provides the citizens of and visitors to the City of Iowa City with progressive emergency services that include fire suppression, emergency medical services, hazardous materials response, and technical rescue services that include the disciplines of high-angle, low-angle, confined space, building collapse, automobile and machinery extrication, and trench collapse. Similar to many other urban fire departments, members of the ICFD have been subject to numerous high-profile and extremely dangerous incidents. In the past decade, the department has dealt with a single occurrence of multiple tornados that cut wide swaths through heavily populated areas, as well as one of the worst floods in American history that caused monetary damage enumerated in the billions of dollars. Members have experienced close-calls at the hands of flashovers, smoke explosions, and building collapse. The Spence Research Laboratories at the University of Iowa, adjacent to ICFD Headquarters, was the site of an escalating hazardous materials incident following an attack by a domestic terrorist organization.

At high-profile incidents such as these, as well as at the scene of every routine emergency, ICFD officers know that successful mitigation depends largely on their own ability to make rapid decisions under stress. The officers tasked with making these decisions know that this is no easy task. A decision maker committed to de-escalating an emergency situation must first contend with the sense that the incident has possession of the initiative, creating a situation

where decision makers must observe all vital cues, make sense of the reality surrounding the incident, and employ actions designed to swing initiative in the decision makers favor. In the midst of this, officers must overcome physical, mental, cultural and environmental hurdles that work in concert to disorient the officer (Cannon-Bowers & Salas, 1998).

The problem first came to light when several members of the Iowa City Fire Department read Robert Coram's 2002 biography of USAF Colonel John Boyd. Coram (2002) succinctly depicts the fighter pilot as the most influential military tactician since Sun-Tzu. After reading the biography, several firefighters and officers – including the researcher – held discussions on Boyd's innovative model for rapid decision making in combat, and its apparent suitability to decision making at emergency scenes.

As these discussions continued, a level of concern was repeatedly voiced that the ICFD had no model for making rapid tactical decisions under stress. Among discussion participants, it was a matter of contention whether the ICFD provided very little training on decision making, or none at all. The commonly agreed-upon tenet, however, was that training was insufficient to prepare officers and prospective officers to make rapid tactical decisions in stressful environments, such as the fire ground.

One pertinent factor that was identified during the discussions was that the ICFD had not experienced the fatality of a firefighter in the line of duty in 4 decades, since Lt. Robert Hein was killed in an explosion while suppressing a fire at Iowa City's Mercy Hospital. Because the shift that the researcher commands engages frequently in the review of firefighter fatality reports issued by the National Institute of Safety and Health, most shift members understand that the causal and contributing factors in many line of duty deaths exist in their own organization. The sense that the ICFD was in no way protected against tragedy was tied to the researcher's belief

that a lack of focus on rapid tactical decision making under stress increased the likelihood of misfortune.

Similarly, the problem was further defined by the acknowledgment that the instrument used by the ICFD to critique incidents after they occur was insufficient, and served no purpose in reviewing, assessing, or learning from the process of making rapid tactical decisions under stress. This revelation lead Battalion Chief Brian Platz to complete a Applied Research Project in 2012 in order to refine the ICFD post-incident critique process.

The majority of firefighter fatalities occur while operating at the scenes of residential structure fires (USFA, 2010), and it can be deduced that this environment poses the greatest hazard to firefighters (Gasaway, 2009). Because risk, up to and including loss of life, is inherently present at the scene of any emergency, it is critical that fire ground incident command structures possess continuity, a common intent, and competence in order to best serve the community and reduce the risk of firefighter or civilian fatalities and injuries. It follows that decision makers at all levels within that command structure must implement sound and rapid tactical decisions in order to reduce risk (Davis, 2010).

The significance of this research project is defined by the terminal objective of the NFA's EAFSOEM program, which is to enable students "to analyze their department's and community's level of preparedness" and also by the enabling objective, which is to ". . .enhance the skills and abilities needed to manage the operational component of a fire department effectively" (National Fire Academy, 2011, p. 1-1).

The significance is further defined by association with goals 1-4 of the U.S. Fire Administration's Strategic Plan (2009) in that it seeks to reduce risk at the local level, improve

local preparedness, improve the capabilities of the fire service to respond to hazards, and improve the professional status of the fire service.

Literature Review

The literature review employed for this research project defined decision making under stress as a complicated multi-faceted endeavor subject to differing opinions, possessive of multiple models and methods, and ultimately fraught with barriers. Putnam (1995) indicates that austere conditions, such as those encountered during firefighting operations, may cause the collapse of both sound decision making and organizational structure by subjecting decision makers to stress, which may predictably grow into fear and panic. Further, Salka (2004) states that an incident commander must stay "one step ahead" of the fire by gathering and interpreting pertinent cues in order to make fast and accurate decisions (p. 103).

A wealth of literature exists documenting the experiences of decision makers in stressful situations. Military commanders and their biographers have recorded for centuries the best-practices for and pitfalls to strategic and tactical decision making under stress for many centuries. More recently, the processes used by military and commercial airline pilots have also received in-depth study. Psychology researchers and social scientists have such as Weick, Klein, Cannon-Bowers, and Salas have made significant contributions to the science and process of making decisions under stress. Ted Putnam, the Human-Behaviors Specialist writing for the United States Forest Service in 1995, finds it unfortunate that so much research exists, but the firefighting community has neither embraced nor contributed significantly to the research, noting that the common denominator in many firefighter deaths is human error.

According to the United States Fire Administration (2010), 1,420 firefighters were killed in the line of duty between 2001 and 2010; 720,163 firefighter injuries were incurred during the

same timeframe. The International Association of Fire Fighters published a research paper in 2006 identifying causal factors in 644 firefighter line-of-duty deaths (LODD) that occurred from 2000 to 2005. The researchers validate Putnam's years-old assertion regarding human error, finding that short-comings in the decision making process of commanders, and the actions that were predicated on those decisions and processes, may have been contributing factors in 43.9 percent of the LODDs studied (Moore-Merrell, McDonald, Zhou, Fisher, & Moore, 2006).

Gassaway's (2009) research reveals that decision makers at emergency incidents are frequently plagued by distractors that serve to slow, complicate, and oftentimes totally destroy the commander's ability to make sound decisions, exposing subordinates to greater levels of risk. Gassaway refers to the frequent inability of a decision maker to maintain situational awareness as the leading cause of near-miss incidents, and one of the leading contributing factors to LODDs. Gassaway hails existing research, as well as his own contributions, as an extraordinary opportunity for fire department leaders to "improve their understanding of the barriers that impact their perception and comprehension of what is happening on the fireground" (2009, p. 38).

Snowden and Boone (2007) buoy Gassaway's contention that awareness is critical to making sound and rapid decisions, and further contend that escalating situations require that decision makers transition between decision making methods. In their research, they developed the Cynefin Framework, which is predicated on the contention that many factors occurring in our environment are subconsciously interpreted by our own experiences and henceforth "influence us in ways we never understand" (Snowden and Boone, p. 68).

Further, Snowden and Boone (2007) identified five contexts within the Cynefin Framework: simple, complex, complicated, chaotic, and disorder. By way of introduction of

these contexts, they forward the belief that the modern world requires the traditional approaches to decision making be broadened, and leaders must become attuned to a transformative decision making paradigm that combines the cognitive sciences with what they term “complexity science” (2007, p. 68).

While the Cynefin Framework details a format within each increasingly complex domain by which decision makers must adapt their decision making models, the one notion that remains common is that of “sense-making” (Snowden and Boone, 2007, p. 70). The researchers define the importance of sense as being the degree to which a decision maker can observe and remain oriented to the changes in their environment, so that any change in context may be either anticipated by the leader or observed. In even the simplest domain, Snowden and Boone explain that complacency, a measure of success, corrupts sensemaking. The subsequent lack of situational awareness will most often cause the context to become more chaotic. What ensues is a disruption in the decision making process where the problem seizes initiative away from the decider, which can lead the domain of the decision maker to “collapse into chaos” (p. 70).

In 1993, Weick analyzed the Mann Gulch wildfire of 1949, where 13 members of an elite 16-person smoke-jumping crew were killed when they were overrun by fire. In his detailed analysis of the organizational breakdown which led to the tragic outcome at Mann Gulch, Weick borrows the philosophical term “cosmology” as a way to explain the steps leading to disaster. Weick defines cosmology as “a branch of philosophy often subsumed under metaphysics that combines rational speculation and scientific evidence to understand the universe as a totality of phenomena” (p. 4).

At Mann Gulch, the highly-trained 16-person crew was deployed to attack a wildfire that was reported to be insignificant. While hiking in the bottom of the gulch in a straggling single-

file line that made communication difficult, the subordinates in the crew become surprised when their foreman suddenly withdraws from the safety of the river bed and begins angling up the impossibly steep embankment of the gulch. While the subordinates did not realize it, the foreman had witnessed the fire jump the river bed into the crew's path. Weick (1993) relates how stress and panic began to compromise their organization when the crew realized the fire was racing toward them along their only route of escape. Subsequently, the foreman shouted for the crew to drop their tools, an order that Weick suspects was meant to hasten escape as 30-foot flames approached the crew at more than 600-feet per minute (p. 2). The foreman, realizing that escape from the flames was not possible, shouted for the members of his crew to "Join me!" (p. 6). The members of the crew were incredulous as the foreman lay in the grass and lit an opposing fire in front of him. Weick relates how discipline in the organization fully disintegrated as the confused crew members heard their second-in-command exclaim "To hell with that, I'm getting out of here!" (p. 6).

Ultimately, Weick (1993) offered that each individual was faced with the dilemma of obeying orders that they didn't understand in a situation that they could not comprehend. Panic ensued, and all but the foreman tried to outrun the fire. The foreman survived, as did two others who luckily escaped through a deep fissure in the rock. The remaining 13 people were killed by the fire storm (Weick, 1993).

Weick (1993) refered to the breakdown in order and decision making as a cosmology episode because these occur when people "suddenly and deeply feel that the universe is no longer a rational, orderly system. What makes such an episode so shattering is that both the sense of what is occurring and the means to rebuild that sense collapse together" (1993, p. 6). Weick continues to say that "stated more informally, a cosmology episode feels like vu jade': I've never

been here before, I have no idea where I am, and I have no idea who can help me" (p. 6). Weick concludes that the generalization associated with identifying the lack of awareness as a causal factor in these deaths is that decision making is rooted in strategic rationality while sense making is rooted in contextual reality, with the former being predicated on the latter (p. 9). The importance of identifying both the distinction between the two, as well as their dependence, is that "organizations can be good at decision making and still falter. They falter because of deficient sense making" (Weick, 1993, p. 9).

Weick's research (1993) identified the improvisation displayed by the foreman in lighting the escape fire – which subsequently saved his life – as a resilient act borne from intuitive decision making (p. 4) and creativity in the face of life threatening pressure (p. 10). Weick found the foreman's action exceedingly interesting in the context that it should not have happened because "there is good evidence to suggest that when people are put under pressure, they regress to their most habituated way of responding" (1993, p. 10).

In his research designed to prepare battle commanders for future wars, Colonel Marshall (1978) contends that the training of men in combat arms must be primarily geared toward conditioning the mind – through exposure to knowledge and generating of experience – so that they are prepared to anticipate the conditions that will be present on the battlefield. The problem presented in past wars is related to insufficient appreciation for the impact of human nature, according to Marshall. He states that troops deployed to the battlefield in past conflicts have been unable to match the reality they experienced with the reality they expected, with the end result being increasing loss of order. Knowledge and experience, then, are the hallmarks that defend a soldier's awareness from being darkened by unexpected circumstances, and can prevent hesitation which leads to inaction and ultimately loss (Marshall, 1987, p. 48-49).

Many authors, social scientists and military tacticians alike, refer to the importance of the subconscious in making sense and determining action. Salka (2004) referred to "a hunch, or a gut-feeling" actually being an individual's subconscious mind "as it analyzes our previous experiences and tells us how those experiences relate to what is happening right now" (p. 111). Colonel Nye (1986) referred to a "special vision" or "acute sense of the possible" which strikes master tacticians when they seek to make a decision (p. 72). Nye also referred to Napoleon's "coup d'oeil," meaning a single glance that forges a tactician's knowledge and experience, instantly generating a series of rapid decisions (1986, p. 72). He further explained this sense as a "predilection of the mind that occasionally says now is the time" (p. 72) Nye (1986) also speaks of the "fingerspitzengefuehl" of the German Blitzkrieg commanders, which implies an intuitive, fingertip feel that generates an instinctive and intuitive sense of what must be done (p. 72), and concludes by saying that these two senses are what defines the "master tactician" (p. 75).

Von Clausewitz (1968) spoke of the importance of instinct and sense making by calling the former "feeling" (p. 143) and the latter "presence of mind" (p. 144). The master tactician contended that "in momentary emergencies one is swayed more by his feelings than his thoughts" and goes on to detail the importance of "its kindred quality, presence of mind, which in a region of the unexpected like war must act a great part, for it is nothing but a great conquest over the unexpected" (p. 143-144). Clausewitz indicated that the synthesis of feeling and presence of mind produce a rapid discovery of truth that is not cognizant to the ordinary mind, and might only be otherwise revealed after protracted analysis and consideration (1968, p. 142).

Klein (2003) referred to the ideas of sense and fingertip-feel by calling it intuition, and explained that it is the most essential part of the decision making process, irreplaceable by analysis or obedience to procedures (p. 3). Nearly 30 years ago, Klein conducted a ground-

breaking research study of decision making under stress. He chose as his subjects fireground decision makers, because he wanted “to see how they could make high-stakes decisions in just a few seconds despite all the confusion and uncertainty inherent in their work” (2003, p. 1). Klein was surprised to find that experienced fireground decision makers never systematically compared options, and generally only considered a single course of action. His subjects related that they never felt as if they considered anything, rather they acted instinctively. Klein relates that he was amazed at this revelation, because the firefighters he observed routinely made “very challenging decisions, many with life-or-death implications – and yet they were unaware they were doing it” (2003, p. 1).

An example of this subconscious intuition is related by Salka (2004). Battalion Chief Gallagher of the FDNY was in command of a working structure fire. According to Salka, everything was going according to plan, and the fire crews were “holding their own” (p. 112). Suddenly, BC Gallagher began to feel strongly that something wasn’t right, although he could not articulate it. He immediately ordered everyone from the building, and within three minutes the structure had collapsed. According to Salka, Gallagher’s “gut knew” that his subconscious was receiving several pieces of distressing news and synthesizing it into an intuitive alarm that Gallagher would recognize (2004, p. 112).

In the earliest existing written records of military strategy and tactics, Mao Zedong and Zhang Yu refer to the ideas of intuition, sense making, and flexibility (Tzu, 2001). Mao Zedong asserts that flexibility is “the very life of an army and, once it is lost, the army is close to defeat or destruction” (p. 95). Flexibility is subsequently defined as a characteristic of the commander, and his ability to make appropriate and well-timed measurements based on observing conditions after “judging the hour and sizing up the situation” which results with “ingenuity in varying

tactics" (p. 95). Similarly, Zhang Yu notes that "What the aware individual knows is what has not yet taken shape, what has not occurred" (p. 90).

Cleary's compilation of Taoist wisdom reveals that the notion of intuition was still valued by Taoist strategists and philosophers 18 centuries after Sun Tzu, when it was written that "Deep knowledge is to be aware of disturbance before disturbance, to be aware of danger before danger, to be aware of destruction before destruction" (2003, p.25).

Following Klein's research (2003) of decision making patterns in firefighters, he launched subsequent efforts to better define the science behind intuitive decision making. He defines the power of intuition as "the way we translate our experiences into action" (2003, p. 4). While Klein laments that some consider intuition to be a magical force akin to ESP, he explains that intuition can be understood, developed, and refined, and should be viewed not as magic but as "a natural outgrowth of experience and preparation" (2003, p. 4).

While critics of intuitive decision making say that they would never desire to trust important decisions to instinct in place of rational analysis, Klein (2003) states that the human immune system is a classic example that invalidates their criticism. Klein gives a synopsis of how the human immune system continually makes decisions as it scans the body and comes into contact with foreign entities. The immune system catalogues its experiences in order to respond more effectively over a lifetime, and Klein states that nobody would substitute the automatic, informed and prepared response of their immune system for an alert to the individual asking for analysis and guidance. In a fashion, our immune system makes life-and-death decisions frequently, and does it according to a model that favors intuitive response in favor of research, analysis, and comparison (2003, p. 6-7).

In furthering his contention, Klein (2003) identifies the Classical Decision Making model (CDM) as a routine that is based in solid analysis and logic. It seems comforting, according to Klein, and works well in research laboratories and for insignificant decisions. It meets a shortfall, however, in that a sound CDM process requires an environment of known constants, absent from elements of confusion, time sensitivity, increasing complexity, and absence of information (2003, p. 20)

As an effective alternative to CDM, Klein (2003) has identified the Recognition Primed Decision Making Model (RPD). With RPD, the decision maker identifies patterns to make sense of a situation, recognizes what cues are providing important information to the observer, develops goals that drive the selection of action, and synthesizes the three to formulate an expectation of future events (2003, p. 22).

Klein's research indicates that once experienced intuitive decision makers recognize a pattern, "any decision they have to make is usually obvious" (2003, p. 22). Further, the process of pattern recognition and matching with an action script usually happens both instantaneously and absent of any conscious thought process, "we're not aware of how we arrived at an intuitive judgment. That is why it seems so mysterious to us" (p. 24).

Klein (2003) recalls a previously mentioned 1985 study of firefighters, commissioned by the United States Army to understand tactical decision making under stress. Klein and his counterparts expected to find that fireground commanders, subjected to the constraints of both time and pressure, would compare two options and select the best one. The researcher was surprised when he found that the firefighters only considered one option, and he was further shocked when he debriefed the firefighters and found that they universally believed they had only acted as opposed to comparing any options. Klein's research revealed that the firefighters

were able to trust the first option they considered because the internal catalogue of their previous experience had allowed them to instantly recognize a set of patterns and intuitively select a course of action using RPD (2003, p. 25).

In curriculum designed to train officers in fireground decision making, the National Fire Academy (NFA) and United States Fire Administration (USFA) note the importance of the divergence in decision making models and their suitability for stressful situations (2010, P. 3-5). The course curriculum does not specifically refer to Klein's RPD, but rather confers another name to a similar process when they refer to Naturalistic Decision Making as an alternative to the Classic Decision Making model (p. 3-5). The NFA (2010) refers to CDM as a model to be employed when the decision maker has "little or no previous experience or training with an incident with the variables that are now present" and that CDM is rarely suitable to be used in emergency situations because "the classical process is used during evaluation and planning when time is not a factor" (p. 3-9). Poorly developed experience and incorrect learning are also detailed as being equivalent to no experience (p. 3-8).

The NFA (2010) curriculum offers NDM as a more effective alternative because "the expert way of making incident-scene decisions is cue based" (p. 3-5), is based on cue-recognition that accesses previous experience, and provides "almost instant recall of previously learned information" (p. 3-11). To further define the demarcation between models, the NFA likens the use of CDM during stressful situations as being reactive, which allows the incident to have the initiative and entrenches the decision maker in a reactive mode (p. 3-6), which jeopardizes the safety of civilians and firefighters, undermines strategy and tactics, and increases growth of the incident (p. 3-7). Conversely, NDM enables a proactive response which builds overall incident stability by allowing the development of sound objectives, strategies, and tactics (p. 3-6).

Perhaps the hallmark research on the subject of rapid tactical decision making was a seven-year study, commissioned by the United States Navy in 1989 in response to an incident where the USS *Vincennes*, a guided missile cruiser, destroyed an Iranian commercial airliner after mistakenly identifying it as an aggressor. Iranian Air Flight 655, under fire from the advanced weapons systems of the *Vincennes*, exploded over the Persian Gulf, killing all 290 people on board (Cannon-Bowers & Salas, 1998, p. 3).

The justification for the Tactical Decision Making Under Stress (TADMUS) study outlines the barriers to rapid tactical decision making under stress and the tragic results that can occur when those barriers cause the system to fragment. The researchers identified several cues that led to the mishap, including two armed attacks by Iranian naval vessels earlier that day, intelligence that indicated a large attack by Iranian forces may be imminent, an Iranian military observation plane in the vicinity of the *Vincennes*, and the failure of the crew of the airliner to adhere to flight path, answer radio communication, or operate the required Identify Friend or Foe (IFF) transponder (Cannon-Bowers & Salas, 1998, p. 5). As a result of these factors and others, levels of stress in the command center of the USS *Vincennes* were abnormally high. When the airliner assumed a course aimed directly at the *Vincennes*, the Iranian observation plane also turned directly toward the ship. Radar operators mistakenly identified the radar signature of the Airbus as that of an Iranian F-14, and reported to the Captain on two occasions that the radar signature was descending toward the ship, when in truth it was gaining altitude. The researchers also concluded that these factors, occurring within only seven minutes, further hampered the decision making process (Cannon-Bowers & Salas, 1998, p. 5).

Similar to the NFA curriculum, the TADMUS study identified NDM and CDM as two of the main decision making models to which people generally revert. The study identifies CDM as

a theory that was commonly accepted by many social scientists for many years, defining CDM as "a theory that tended to be prescriptive in nature, suggesting that decision makers should use a rational approach to decision making (1998). The research contends that while CDM remained a popular theory for years, CDM does not enable the decision maker to contextualize their experience, which makes CDM an inefficient model for most real-life decisions (p. 23).

As an alternative to CDM, the TADMUS researchers focus on the theory of NDM, which had only then been identified as a decision making process for a few years (1998, p. 23). Regarding NDM, the researchers suggest that "expertise develops over time on the basis of the decision makers' experiences" and that is characterized "as one involving the study of real-world task performance and action in which decisions happen to be embedded" (Cannon-Bowers & Salas, 1998, p. 24). TADMUS subsequently identifies RPD as "a major theoretical approach to decision making that falls under the general heading of naturalistic decision making" where people make decisions by interpreting a situation by comparing it with previous experiences (p. 24). The RPD theory is unique from NDM, because the "RPD theory itself has important implications as a basis on which to design training and decision support" (p. 25).

At the time that the TADMUS study was being concluded, Klein (2003) was completing similar research focusing on naval commanders and their decision making under stress. He concluded that, like firefighters, these military tacticians utilized RPD more than 95 percent of the time, and that they seldom engaged in analytical decision making (p. 28). This discovery led Klein to further contextualize the way RPD is utilized is high-stress situations where difficult decisions must be made quickly.

Previously mentioned in this ARP is the way Klein's subjects subconsciously scan their environment for cues, which are screened by the decision maker's experience, expertise, and

knowledge, producing a pattern (2003, p. 25). The pattern provides the decision maker with environmental orientation, which allows the decision maker to recognize an "action script," or potential course of action (2003, p.26).

Klein (2003) discovered that while firefighters and military commanders rarely compare one option with another, the RPD process does not always provide them with the desirable action script the first time. He first observed in firefighters that the RPD process, after arriving at an action script, employs a "mental simulation" which allows decision makers to take the simulation and scenario they are envisioning, "playing out in their heads what they expect would happen if they implemented the decision in a particular case" (Klein, 2003, p. 26). Klein states that his subjects envision the environment and what they expect will happen when their decision is enacted, instantaneously modifying the action script if they envision a problem that can be solved, and starting from scratch if they envision a problem that can't be solved (p. 26-27).

Another component of RPD identified by Klein (2003) is a "mental model." He explains that mental models are pictures of "how things work," and are representative of how expertise translates to effective action. He explains by saying that firefighters cannot verify the effectiveness of an action script without mental models of how fire burns and spreads, how ventilation influences the profile of a fire, and how certain building construction types can withstand both fire and firefighting operations. In this way, Klein contends, mental models and mental simulation are dependent on one another to reassure the decision maker that a particular action script will positively influence a situation (p. 27-28).

Dr. Gassaway's (2009) research on decision making and situational awareness for fire fighters revealed that fireground emergency decision making environments are characterized by "high workload demands, changing conditions, incomplete or misunderstood communication,

distractions, interruptions, staffing challenges, uncertainty, ill-defined or competing goals, time constraints, and high stakes" (p. 128). Gassaway (2009) classifies environments with these factors as Naturalized Decision Making (NDM environments), and states that RPD is critical in these environments (p. 129).

The very conditions and variables that define NDM/RPD environments serve as barriers to those decision making models (Gassaway, 2009). Gassaway identified 93 specific barriers to the decision making process that were divided among 11 barrier categories including communications, data/information, physical and mental stress, workload management, attention management, staffing, mission, mental model, human factor, team performance, and command location (p. 451-457).

Col. Boyd (Coram, 2002) referred to the decision maker's ability to observe unfolding circumstances, outside information, and unfolding interactions with the environment as potential barriers to a rapid decision making process. Further, a decision maker's inability to orient to the categories of previous experience, new information, genetic heritage, cultural traditions, analysis and synthesis can cause the decision process to slow down (p. 344).

Klein (2003) also identified organizational barriers to decision making. Klein refers to the role that organizational policies can have in trumping experience and minimizing coaching opportunities as impediments to the process. Rapid turnover, lean staffing policies, and absence of succession planning reduces organizational knowledge and minimizes opportunities to foster expertise (2003, p. 32)

Klein (2003) also refers to the ability of "pace of change" to compromise RPD where "historical ways of doing business are pronounced obsolete, and the experience of seasoned employees is discounted" (p. 32). Proven methods are subsequently referred to as "legacy

problems" and "the specialists who have mastered those approaches are then part of the legacy problem" (2003, p. 32).

Klein (2003) identified barriers that may be presented by procedures. Klein stated that our culture desires to develop procedures for nearly every type of work, making it easier for inexperienced workers to accomplish tasks, and making it easier for supervisors to verify that procedures were obeyed. Klein contended that procedures become barriers when they minimize opportunities to build intuition and eliminate opportunities to make judgment calls (2003, p. 33).

Klein also refers to metrics and information technologies as barriers. He states that metrics, or reducing decisions and judgments by implementing measurable objectives leads managers to "make decisions based on numbers alone" and that they "run the risk of eroding their institutions" (2003, p. 33). In the case of information technologies, Klein contends that we are becoming increasingly prone to simply inputting and observing data, at the expense of developing expertise and using intuition. Klein relates problems observed in Neonatal Intensive Care Units where his research has concluded that nurses "are given much more training to operate the monitoring equipment than in how to detect the subtle signs of illness in the infants" (p. 34).

Klein's research also revealed human factors that serve to impede decision making (2003). Klein refers to the barrier of complex and uncertain tasks as occurring when a situation is so complex that as to disallow pattern recognition and make intuition difficult to use accurately (p. 67-68). The research also identified experience as barriers to decision making, specifically in cases where the decision maker has had no opportunity to acquire experience. Also, experience may be distorted in cases where feedback has been untrustworthy (p. 68-69).

Expertise itself can serve as a barrier, according to Klein (2003). Referred to as the "mindset problem" (p. 70), experts may solidify their perception of an environment predicated on past experiences. Because expertise enables a decision maker to subconsciously ignore or invalidate cues that they believe are insignificant, the mindset problem may "lead experts to miss relevant but novel cues, to ignore potentially useful strategies, and to fail to notice important opportunities" (p. 70).

Clausewitz (1968) refers to "friction" in war as being a barrier that complicates the decision making of leaders (p. 165). The friction that Clausewitz describes "is impossible to calculate" and is caused by a combatants realization of the dangers of war and the related "bodily exertions." The friction is best defined as reducing all activity in war to "movement in a resistant medium" (p. 165). This is similar to doing everything while moving in water, according to Richards (2004). He describes an individual trying to outrun a sheriff's posse, who falls off a cliff and plunges into a stream. With the sounds and activities of the chase increasing anxiety, the escapee finds that the faster he tries to move in the water, the harder and slower his flight becomes. Although the life of the escapee relies on moving faster, he is increasingly unable. Eventually, the ability to make effective decisions decreases as panic increases – not expressly because the escape is being hindered by the water, but because panic and failing situational awareness lead to the realization that the current effort is not succeeding, and the escapee is running out of ideas (p. 68). Essentially, Clausewitz and Richards contend that the friction, represented by performing activity in Clausewitz' "resistant medium," cause a slippery slope that impedes decision making at every step (Clausewitz, 1968; Richards 2004).

The United States Marines refer to friction in their warfighting manual as having four contexts: mental, physical, external, and self-induced (Warfighting, 1994). In the mental context,

impediments may be related to indecision, while physical friction may be represented by effective enemy fire or difficult terrain obstacles. External friction is characterized by enemy action, weather, and many factors of chance, while self-induced friction may be caused by the "lack of a clearly defined goal, lack of coordination, unclear or complicated plans, complex task organizations or command relationships, or complicated communication systems" (p. 5). The Marines recognize the importance of recognizing these barriers in order that they might be overcome (p. 6).

Two interrelated factors that are critical to overcoming barriers to decision making are developing relevant experience through both realistic training and dedication to professional education . Training must reflect the realities of war to the greatest extent possible, according to Col. Marshall, so that "the mind of the infantry soldier should be conditioned to an understanding of its reality through all stages of training (1978, p. 36). Marshall comments that military training too often provides a lop-sided focus on drill and ceremonies, courtesies, and traditions at the expense of preparation for the realities of war in a way that has "outstripped all common sense" (p. 37). He further states that personal survival and unit efficiency are significantly eroded when training does not approximate combat, and the subsequent price is gross inefficiency, overlooked tactical priorities, and lost time, manifested at all levels of the organization (p. 37). The unmitigated presence of these factors spawns "demoralization and immobility of the line" and culminates in a paralyzed command element mired inaction, which is a slippery-slope to "grievous losses" which will defines for a combat unit "the worst hour they will ever know" (p. 48-49).

In summarizing the importance of relevant training in promoting situational awareness and decision making under stress, Marshall (1978) finds that it is not necessary that combat

leaders experience these circumstances simply because of their inexperience in battle. Rather, according to Marshall, “it is possible that the infantry soldier can be trained to anticipate fully the true conditions of the battlefield; it is possible that units can be schooled to take full and prompt action against the disunifying effect of these conditions” (p. 37). Fear is ever present, Marshall concludes, but it is uncontrolled fear that leads to organizational failure. This can and must be managed by quickly anticipating and understanding dangers and distractions (p. 37), which requires “men who can think through their situation and steel themselves for action according to their situation” (p. 40).

Col. Nye (1986) has a great deal to say about the correlation that exists between education and experience, and their role in developing a complete military leader whom he characterizes as a “thinker and a doer” (p. 8). These leaders, according to Nye, are “not trapped into the thinker vs. doer syndrome that has provided the lazy and arrogant with an excuse for mental mediocrity” (p. 8). Nye details how these leaders understand that the process of solving problems and making decisions is the defining component of competency, and they commit themselves to both study and practice the decision making process.

Nye (1986) promotes the idea that before an officer can lead, he must first become an expert in all areas that will eventually fall under his authority. To that end, young officers ought to spend time assigned in different positions that will allow him to gain expertise in the use and maintenance of all technologies that he may someday have at his command, from vehicles to weapons, to communication equipment. Nye states that the question has always existed regarding how much knowledge is enough. To that end, he offers the anecdote that in warfare, and therefor in training, officers were never allowed a “do over” because weapons jammed or vehicles malfunctioned in the absence of expertise that allowed for rapid troubleshooting and repair

(1986, p. 64). Nye subsequently refers to several high-ranking Army officers who revolutionized warfighting doctrine because they had endeavored to become experts in their field. Nye surmises that the answer to the question "how much knowledge is enough?" is always "more than anyone else around" (1986, p. 65).

Nye also confessed to a reality that decision makers must understand: that well-trained peacetime decision makers often are neutralized in combat by confusion and disorientation (1986, p. 67). A wide line of demarcation exists between the theoretical realities of tactical training in peacetime, and the realities that exist in warfare (Clausewitz, 1968; Warfighting, 1994; Nye, 1986). Nye contends that efforts must be made to ensure peacetime training is as realistic as possible, so that experience and expertise may be gleaned. Officers must therefore engage in voracious professional reading, because "each officer has the personal responsibility to understand the doctrine and the historical basis that guides the profession of arms. . .to give officers who had never been in combat an appreciation for its reality" (p. 71). Being grounded in reading as an instrument of professional development, in Nye's experience, assured that "future military officers be exposed to the history of a broad variety of battle situations and to a method of battle analysis designed to provide critical thought about the employment of military forces" (1986, p. 68).

Nye (1986) wishes to impress upon the reader that reading is critical to developing the experience and knowledge of an expert tactician. "Inquiring commanders, by definition, are determined to expand their universe through reading" according to Nye, and the most durable reason for reading as a professional development tool is "that the professional can parlay this. . .into a better understanding of how to build fighting units and to nourish one's technical and tactical competence" (p. 1).

The USMC believes that training as a means to develop expertise is the main determinant in achieving victory in combat (1994, p.60). Because of the divergence between most peacetime training and real warfare, “training programs should reflect practical, challenging, and progressive goals beginning with individual and small-unit skills and culminating in fully combined arms” (p. 62). Exercises should endeavor to approximate the conditions of actual combat to the greatest extent possible, in order to generate friction “in the form of uncertainty, stress, disorder, and opposing wills. This last characteristic is most important; only in opposed, free-play exercises can we practice the art of war” (p. 62-63).

The USMC (1994) also highly values the concept of analytical critique, defining it as essential to improvement, even in the face of success. In order to draw out the lessons of both success and failure, all hands should participate in critiques as soon as the training is complete, with members of all ranks encouraged to share open and frank dialogue. Because we learn as much from failure as from success, and because no two circumstances in war are the same, the USMC encourages leaders to focus these critiques on why decisions were made, rather than on the actions that followed from the decisions (p. 63).

The USMC (1994) also instructs officers to view professional military education as having an equivalent importance to physical conditioning. The USMC model of education as a method for building experience is three tiered: formal education in the art and science of war delivered through formal education establishments, a senior/subordinate mentoring system, and dedication to self-education.

Of formal schools, the USMC states that the primary goal is “developing a talent for military judgment, not on imparting knowledge through rote learning.” The goal of a mentoring program is “developing military judgment and decision making” (1994, p. 66). Finally, special

emphasis is given to the concept of self-study, of which the USMC holds that "a leader without interest in or knowledge of the history and theory of warfare – the intellectual content of his profession – is a leader in appearance only." This is impressed with particular firmness upon officers, because "after all, an officer's principle weapon is his mind" (p. 67).

Coram (2002) details how Col. Boyd and Col. Wyly worked to overturn the modern military establishment's theory of warfare. Struggling against an establishment that Nye equates to "a stifling bureaucracy" that "has inherent barriers to the growth of creativity in commanders" (1986, p. 73), Boyd lamented that "We have the most exciting subject in the world: warfare. And we make it boring" (Coram, 2002, p. 380).

To help generate excitement about warfare theory, develop expertise and increase education, Boyd and Wyly were able to convince the Commandant of the Marine Corps to institute a comprehensive professional-development reading list for Marines of every rank. This was a radical step for the USMC, characterized by Coram (2002) as being the "least intellectual branch of the U.S. Military at that time" (p. 380). The reading list, according to Coram, soon had an exhilarating effect among officers in the USMC, reflected first in a proliferation of animated discussions about the theory of tactical decision making and progressing to the Marines themselves recommending many more books be added to the reading lists.

DeRue and Wellman (2009) found that experience and education can and should be simultaneously developed by exposure to developmental opportunities that are increasingly challenging. The authors found that increasingly challenging developmental opportunities corresponded in a positive and linear fashion with leadership skill development because they provided "a platform for individuals to try new behaviors or reframe old ways of thinking and acting" (2009, p. 860). Further, DeRue and Wellman championed "activation theory" and found

that “an individual’s activation level (the degree of arousal in cognitive processing) increases when an individual is unfamiliar with a task or situation” (2009, p. 860). Characteristics of developmental challenge found within their training framework included unfamiliar responsibilities, creating change, high levels of responsibility, working across boundaries, and managing diversity or subordinates (2009, p. 861).

The U.S. Navy’s TADMUS study (Cannon-Bowers & Salas, 1998) revealed that training evaluations could be developed and instituted to refine critical thinking skills, and subsequently increase the speed of effective decision cycles for decision makers regardless of experience level. TADMUS determined that classical decision making frameworks are not “cognitively compatible” (p. 156) with the way experienced decision makers work because laborious and protracted inputs, processing times, and outputs cause problems.

TADMUS researchers determined that “proficient decision makers are recognitionally skilled; that is, they are able to recognize a large number of situations as familiar and to retrieve an appropriate response” (Cannon-Bowers & Salas, 1998, p. 158). The research further determined that people who use recognition-primed models augment their process by rapidly probing for weaknesses and flaws that are then fixed and evaluated. These skills are referred to by the TADMUS researchers as metarecognitional. While the metarecognitional process is generally employed by individuals with expertise based in experience, the researchers found that “proficient” and “skilled” readers use a similar model to scan their decision making process for problems and inconsistencies. These processes (p. 159) are rooted in their comprehension, spawned from reading rather than experience, that indicate that a learned but relatively inexperienced decision maker can succeed within a NDM framework.

TADMUS research found that four segments of training existed to develop the critical thinking skills necessary to make rapid tactical decisions under stress. They involved creating, testing and evaluating stories, developing a hostile-intent story template, critiquing stories, and determining when to think more. The TADMUS study identifies this as the Recognition / Metarecognition model (R/M). (Cannon-Bowers & Salas, 1998, p. 165-176).

In the first segment, *Creating, Testing, and Evaluating Stories*, the decision maker uses the STEP process to enhance understanding of an uncertain situation by developing a Story, Testing their assessment by comparing expectations to known observations, Evaluating the result for problems while subsequently Planning against the possibility that the current assessment is wrong (Cannon-Bowers & Salas, 1998).

In the second segment, *Hostile Intent Stories*, the decision maker assesses whether the constructed story represents a hostile intent. This assessment includes determining what risk is posed to the decider's forces, how it will be manifested, when it will arrive, and when "it will arrive at a position suitable for engaging it" (Cannon-Bowers & Salas, 1998). The researchers contend that the training model "teaches officers by practice and example how to discover story components and to let the stories guide them to relevant evidence about intent" (p. 164).

The third segment is called *Critiquing Stories*, and allow a decision maker to evaluate a story's plausibility (Cannon-Bowers & Salas, 1998). This segment of the decision making process allows for a "devil's advocate technique" that allows for "uncovering hidden assumptions in a story and generating alternative interpretations of evidence" (p. 164).

The fourth step, *When to Think More*, reminds the decision maker that critical thinking does not always provide a benefit. Because officers should never accept extreme risk at the expense of choosing a course of action, this step identifies a parameter for gauging the time

remaining to make a decision before taking “irreversible action” (Cannon-Bowers & Salas, 1998, p. 165). This segment trains decision making students to focus on how experienced decision makers arrive at conclusions when extreme risk hangs in the rapid decision making balance. Experienced decision makers tend to “use more subtle estimates of how much time is available, which are based on the specifics of the situation,” they “focus more on longer term objectives in estimating the costs of error,” and they “show greater sensitivity to the mismatch between the situation and familiar patterns” (p. 165).

Klein (2003) found that the key to using intuition effectively in rapid decision making is meaningful experience, so that a decision maker is more adept at recognizing patterns and building mental models. Problems arise, according to Klein, when a decision maker does not get enough opportunities to accumulate the experience that leads to expertise, or when a compressed time frame does not allow one to learn from mistakes in practice before doing it for real. To that end, Klein developed an intuition skills training program that allows for the repetitive practice of decisions making, based on job requirements, that allow for the gradual build-up of intuition (2003).

Klein’s research revealed that most people are not acutely aware of what decisions they are required to make routinely as part of their job, and therefore cannot enumerate the difficulties that plague those decisions or the insights that might improve the decision making process (2003). Klein contends that one must first identify the decisions that repeatedly arise, so that an individual can seek feedback from resident experts regarding how they make similar decisions.

Subsequently, Klein (2003) recommends that once a decision is identified, a decision maker can list the variables that make the decision difficult, the kinds of errors that are often made with this sort of decision, and a list of cues and strategies that detail how experts would

make this decision differently from a novice. Utilizing these decision making projections allows a decision maker to obtain practice and feedback, and subsequently build experience at making real decisions with more accuracy and speed (Klein, 2003).

Another method Klein (2003) supports is Decision Making Exercises (DMX). Klein recommends that decision makers "seize on a type of judgment or decision where staff members seem to be repeatedly struggling" or a personal experience, and turn it into a scenario (2003, p. 50). Members of a team can subsequently list the difficulties associated with the decision, as well as the common errors encountered, and project how decision making might be done in the future (2003, p. 50). According to Klein, "the most important reason for using DMXs is to provide simulated experience, because most of us don't get many opportunities to compile the experience we need" (2003, p. 51).

Similarly, DMXs can be used "to evaluate or rehearse a plan, to identify potential problems and their solutions before problems arise" (Klein, 2003, p. 51). Within a team, DMXs are also used to build trust, understanding, and a familiarity with how other team members may react in certain decision making environments.

Klein also found that a valuable way to transform pertinent experience into expertise is to have decision making frequently critiqued (2003). Situations where intuitive decision making were used should be debriefed; Klein cites that a decision making critique can "work best when it can be very specific" (p. 60). Klein's research revealed that organizations currently practicing these sorts of critiques often make them unprofitable by getting "into debates about facts and details, and ignore the intuitive decision making perspective" (p. 61). Klein refers to these critiques as "blamestorming sessions" and likens them to "giving people feedback on their driving by listing the cars they hit, without checking their vision" (p. 61). A proper critique may

include a discussion of what was done, but should focus on observed cues that led to pattern recognition, and an in-depth analysis of why decisions were made, versus a critique of what actions and reactions occurred as a result of the decision. The development and employment of a proper decision making or post-incident critique allows the decision maker to receive appropriate feedback and subsequently improve the quality of decisions. Further, an appropriately conducted critique of a particular decision making process exposes others to repetition and experience that will serve to garner a higher level of organizational expertise.

Perhaps the figure that most revolutionized the theories of military engagement in general, and the practice of rapid tactical decision making under stress specifically was Col. John Boyd. Boyd's research was initially founded on the hypothesis that fighter aircraft maintained by the United States were inferior to those of enemy arsenals because U.S. fighters were larger, slower, and as a result lacked the ability to lose and gain potential energy at the rate of an adversary, making the former less maneuverable. Through dogged determination and thousands of hours of computer simulations, Boyd developed what he called his "Energy Maneuverability Theory, or E-M Theory" (Coram, 2002, p. 144).

Hammond (2001) identifies Boyd's E-M Theory as "revolutionary" because "it was a fundamental definition of maneuverability, expressed in mathematical terms using physics constructs" (p. 59). In synopsis, Boyd's initial contribution to warfare was a theory and corresponding chart that, when given variables such as a plane's weight, speed, drag, altitude and G-force load, could quantify for any fighter pilot whether his aircraft, in any specific situation, had more energy at his disposal than did his adversary. This allowed the pilot to instantly determine which aircraft had the tactical advantage, and enabled him to recall what maneuvers would allow him to gain the upper-hand. At the time that Boyd made his discovery, he was

prophetic in saying that E-M theory "will enable fighter pilots to devise new tactics. It will enable America to dominate air combat" (Coram, 2002, p. 145).

Boyd's E-M Theory did four things for military aviation, according to Coram (2002): it provided a quantitative context from which fighter tactics are taught, it revolutionized the way aircraft are operated in combat, it provided a scientific means to evaluate the maneuverability of aircraft, allowing tactics to be developed to minimize design problems and eliminate the superiority of enemy planes, and it became the most important tool used in the aeronautical engineering of new fighter aircraft (p. 444).

E-M Theory was a genesis for Boyd, serving as the foundation from which he would transform the way the armed forces of the United States thought about and conducted war. While Boyd was a perfectionist who continuously revised and refined his educational briefings (Coram, 2002), E-M Theory can be identified as the catalyst that caused Boyd to transform himself from fighter pilot and engineer into "one of the premier military strategists of the twentieth century and the *only* strategist to put time at the center of his thinking" (Coram, 2002, p. 445). Because of his theories on battleground tactics that were spawned from E-M Theory, Coram concludes that "Boyd was the greatest military theoretician since Sun Tzu" (p. 445).

Boyd became a voracious analyst of all documented military conflict to have occurred in the past two millennia. The focus of his research became the factors that allowed commanders to achieve victory against numerically or technologically superior forces. Of particular interest to Boyd were studies of Sun Tzu, Mushashi, Mao Tse Tsung, Genghis Kahn, Napoleon, and T.E. Lawrence. Of singular interest to Boyd were the tactics of the German Blitzkrieg (Boyd, 1986).

Also known as "maneuver warfare" (Richards, 2004, p. 49), Blitzkrieg tactics define a significant deviation in military tactics that were common for centuries. Discarding the ideas of

attrition warfare, where two enemies stand toe-to-toe and fight until one side (generally the one with superior numbers) wins, the Blitzkrieg utilizes speed, surprise, and careful coordination to achieve victory. Blitzkrieg units move quickly and under cover, exposing themselves briefly to test and probe enemy positions. Often using feints to deceive and distract, blitzing units search for a weakness in an enemy position and then thrust through like a spear, creating surprise and confusion among enemy ranks. Ultimately, the Blitzkrieg seeks to disorient their foe until its coordination and creativity to overwhelm the ability of the opposition to maintain awareness of the situation (Richards, 2004). Boyd's research revealed four key attributes that solidified the Blitzkrieg's success against superior opponents: Einheit, Auftragstaktik, Fingerspitzengefühl, and Schwerpunkt. Einheit meant "mutual trust, unity and cohesion" while Auftragstaktik was defined as "mission, generally considered as a contract between superior and subordinate." Fingerspitzengefühl meant "intuitive feel, especially for complex and chaotic situations" while Schwerpunkt meant "any concept that provides focus and direction to the operation" (Richards, 2004, p. 51). It was Boyd's belief that the Blitzkrieg was successful because it allowed leaders to "shape the environment" by manifesting four qualities: "variety, rapidity, harmony and initiative." He also found that "A commander must have a series of responses that can be applied rapidly; he must harmonize his efforts and never be passive" (Coram, 2002, p. 336).

While the four attributes of the Blitzkrieg were important to Boyd's developing theories on rapid decision making under stress, his most important finding was related to how fast people could think. Boyd concluded that both the decision process and the orders that result must be implicit rather than explicit. He further revolutionized and advanced the idea that this particular skill set was intuitive and dependent on an individual's ability to orient themselves to their changing environment. Boyd's contention was that the primary focus while preparing for victory

in conflict was the cerebral development of the individual, and rarely technology, logistical, terrain, or many of the other factors that influence success or defeat on the battlefield (Coram, 2002).

Boyd did not limit his research to the strategies, tactics, successes and failures of history's conflicts (Coram, 2002). He also immersed himself in the studies of philosophy, psychology and sociology as a means to understand the cerebral influence of decision making under stress. Boyd found that the perception of physical reality - and particularly the relationship between an observer and what is being observed – is paramount to rapid decision making (Coram, 2002). Boyd found that two significant principles existed that influenced decision making processes: that individuals will observe an environment differently, and what is being observed tends to behave differently because it is being observed. Boyd forwarded the idea that it was important that the former was influenced by previous experiences, genetic heritage, cultural traditions, and the ability to interpret new information, while the latter was described as a person that will modify his behavior because he knows he is being observed by a television camera, or a security officer (Coram, 2002; see also Hammond, 2001).

The ability to understand the principles of observance, according to Boyd, was the ability to analyze and synthesize information in order to understand the present reality and develop intuitive responses (Coram, 2002). Boyd summarized his ideas by saying that without "genetic heritage, cultural traditions, and previous experiences, we do not possess an implicit repertoire of psychophysical skills shaped by environments and changes," and that "without analyses and synthesis across a variety of competing/independent channels of information, we cannot evolve new repertoires to deal with unfamiliar phenomena or unforeseen change" (Boyd, 2010, p.1).

The result of Boyd's research was the decision cycle for which he is best known, referred to as the OODA Loop or "Boyd Cycle" (Hammond, 2001, p. 3). The OODA Loop consists of four components of a rapid decision cycle that is meant to speed orientation and decision making during conflict, resulting in a process that seizes initiative away from an adversary by making decisions at a faster tempo while simultaneously achieving adaptability and harmony in one's own effort (Richards, 2004; see also Boyd, 1986; Coram, 2002, and Hammond, 2001).

The OODA acronym describes the four steps of the decision making process, and the order in which they are conducted. The steps are Observe, Orient, Decide and Act. The observation step, according to Richards (2004) is where the decision maker should quickly absorb as much information about the environment as possible, including about "himself, his opponent, the physical, mental and moral situation, and potential allies and opponents" (p. 62). The orientation step is where the decision maker performs "many-sided, explicit cross-referencing" (Boyd, 2010, p. 1) which forms a new orientation and determines for the decision maker what it all means. Richards (2004) refers to the orientation step as "the key to the process" (p. 63).

The third step, where the decision is dependent on how well the previous steps were performed, should call upon intuitive competence to implicitly make a decision. Richards (2004) found that "most decisions can and should be implicit, and that quite often, orientation controls action directly without the need for explicit decisions at all" (p. 64). The fourth step, which calls for action, is where the decision maker carries out the decision or decisions that were identified by the previous three steps of the OODA Loop (Richards, 2004).

Situational awareness is critical to the rapid tactical decision making process defined by the OODA Loop (Richards, 2004; see also Coram, 2002; Gassaway, 2009; and Hammond,

2001). A commander must always be wary of the presence of ambiguity, because "if life is at stake, losing track of a deadly threat in the fog of ambiguity can quickly lead to confusion, panic, and terror, which will cause the less-agile to break-down" (Richards, 2004, p. 67).

To protect against ambiguity, Boyd found that the commander must constantly look for mismatches between the environment he is observing and the reality to which he is oriented. The initiative could be lost when unrecognized mismatches occur, because disorientation will cause the OODA Loop to slow, subsequently surrendering the initiative to the opponent. It is important for the decision maker to look for "bad news" that signals mismatches, and Richards (2004) warns that a lack of bad news and mismatches signals that "orientation is detached from reality" and that "since decision and action flow from orientation, your decisions will be flawed and your actions will not have the effects you intend." Further, because the decision maker will not understand why the process is failing, "breakdowns in groups and individuals can be expected. You will have lost the initiative, and the conflict" (Richards, 2004, p. 66).

The results of the literature review revealed that the ability to make rapid tactical decisions under austere conditions is associated with relative experience and education, but entirely dependent upon intuition on human and psychophysical elements. The literature defined methods and models of pertinence to those elements, including Naturalistic Decision Making process (TADMUS, 2000), Recognition Primed Decision Making (Klein, 2003; see also TADMUS, 2000), and intuition (Klein, 2003; see also Boyd, 1986; Coram, 2002; Hammond, 2001; Richards, 2004).

Procedures

The research problem and purpose were identified by the researcher's experience as a United States Marine, a member of the Iowa City Fire Department command staff, and a

company officer who has responded to thousands of incidents where decisions were required to be made under stressful conditions. The descriptive method of research was used to answer the following questions related to rapid tactical decision making under stress: (a) What models exist for rapid tactical decision making under stress? (b) What models for making rapid tactical decisions under stress are promoted by military ground combat tacticians? (c) What barriers exist to inhibit sound tactical decision making under stress? (d) What similarities exist between rapid tactical decision making in combat and rapid tactical decision on the fire ground (e) What models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

A literature review was initially used to gather information on the subject of rapid tactical decision making. Literature from military commanders of varying countries and eras was studied, as was literature from fire service practitioners (both structural and wildland), as well as researchers in the fields of sociology, psychology, neurology, and human behavior.

Components of original research associated with this project took the form of two personal interviews and one survey. The first interview was conducted with Major Jason Brezler of the United States Marine Corps. Major Brezler is a seasoned veteran of warfighting, having served in the most dangerous engagements of the wars in both Iraq and Afghanistan. Major Brezler is an expert in rapid tactical decision making under stress, having served as a USMC infantry commander at the platoon, company, and battalion levels. Major Brezler is both a skilled practitioner and expert instructor of combat decision making, and therefore is a valuable resource to consult for this project. His expertise and project value are both augmented, however, in the fact that he also serves as a firefighter in the Fire Department of New York’s Special Operations Command.

The interview with Major Brezler was conducted in-person on April 19, 2012, when the research project was near completion. A transcript of the interview is included in this project as Appendix A. During the course of the interview, the researcher posed the following questions to Major Brezler:

1. In the fire service, how do we train our people to create a cohesion where we possess the characteristics of maneuver warfare and the Blitzkrieg: understanding of intent, mutual trust, and implicit direction that will create good rapid tactical decision makers?
2. How do you define the importance of reading in developing expertise?
3. For officers that have little relative experience, or have developed poor experience over time, should their rapid tactical decision making skills be predicated on first learning tactical and task-level proficiency, or can the two skill sets be developed simultaneously?
4. What are 5 important resources to use when creating a training program to enhance rapid tactical decision making under stress?
5. In terms of furthering exploring this topic in future research projects, what would you recommend as the next step for my research?

The design of the first question was influenced significantly by the principles of maneuver warfare as they were defined in the literature review. The intent of the question was to determine if Major Brezler had identified, as a result of his experience and expertise, a way to instill the foundational characteristics of battleground decision making into the fire service culture. This interview question was directly related to the fourth research question, which was:

(d) what similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground?

The design of the second, third, fourth and fifth interview questions was also influenced significantly by the literature review, and further influenced by the statistical fact that structure fires are becoming less frequent, thereby diminishing opportunities to gain experience and develop expertise. The questions sought to determine if Major Brezler believed that alternative methods to developing experience and expertise were profitable. These interview questions were directly related to the fifth research question, which was: (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The second interview was conducted with retired fire chief and well-known fire service instructor Dr. Richard Gasaway. Dr. Gasaway has pioneered significant research regarding neurological function under stress, the importance of maintaining situational awareness, and the barriers to situational awareness that lead to firefighters being injured or killed. Dr. Gasaway is the leading authority in the fire service related to neurological function under stress, and the subsequent negative impact to decision making ability.

The interview with Dr. Gasaway was conducted by telephone on April 26, 2012, when this research project was near completion. A transcript of the interview is included in this research project as Appendix B. During the course of the telephone interview, the researcher posed the following questions to Dr. Gasaway:

1. When we are talking about creating a training program to increase situational awareness and better enable people to make rapid tactical decisions under stress, we can talk about assimilating cues that lead to better situational awareness and decision

making, and we can talk about identifying barriers to the process. Are they different, and how do you define the importance of teaching people to recognize barriers?

2. My literature review has revealed processes for making rapid tactical decisions under stress, and my understanding is that the most effective and efficient models rely heavily on intuition. If our subconscious is managing these processes without us being aware that it is taking place, do you believe that it is important to teach students about the subconscious process in an effort to improve rapid tactical decision making under stress?
3. Is it important to teach people about their psychological and physical reactions to stress in order to better enable them to make rapid tactical decisions under pressure?
4. Intuition and the speed with which we assimilate and process information is critical to success in rapid tactical decision making. If we are consciously thinking about a process when we are making decisions, are we creating a barrier for ourselves?
5. In the USMC, fatalities are classified as either ‘hostile’ or ‘non-hostile.’ This helps to define the context in which the death occurred, and it is something we do not do in the fire service. After researching the topic extensively, could you make a generalization about what percentage of ‘hostile’ line-of-duty-deaths – those that exclude medical emergencies and apparatus collisions – can claim a compromised rapid tactical decision making process as a contributing factor?
6. If good intuition is predicated on good experience and profitable experience, and opportunities to gain realistic experience are waning in my fire department, what is the value of professional development reading as a component of developing expertise?

7. What training models or methods do you believe are most effective in teaching rapid tactical decision making?
8. How would you quantify the impact that this research is currently having on the fire service, relative to its potential?
9. In my survey of ICFD officers, I selected about 30 of your barriers that I believe exist commonly on the firegrounds of my fire department. The barriers were assigned categories of increasing frequency and severity, and officers were asked to identify which barriers they encountered, how frequently, and whether the barrier was significant or insignificant. The majority of responses indicated that officers believe the barriers they encounter are manageable and do not occur frequently. Might you assume that this represents an under-appreciation for barriers that could compromise future incidents?
10. Should the fire service be paying more attention to the decision making lessons that are coming out of the military?

The first interview question was designed to determine to what degree, if any, Dr. Gasaway defined teaching rapid tactical decision making as distinctly different from identifying and managing the barriers to rapid tactical decision making. This question was directly related to the fifth research question, which was: (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The second interview question was designed to determine if teaching students about the neuroscience and psychology behind the intuitive decision making process might ultimately yield a better practitioner of rapid tactical decision making under stress. This interview question was directly related to the fifth research question, which was: (e) what models or methods should

be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The third interview question was designed to determine if teaching students about the psychophysical effects of stress improved understanding of the rapid tactical decision making process. This interview question was related to the fifth research question, which was and (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The fourth interview question was designed to determine if conscious thought about an intuitive decision making process necessarily constitutes a barrier to rapid tactical decision making under stress. This interview question was directly related to the third and fifth research questions, which are: (c) what barriers exist to inhibit sound tactical decision making under stress, and (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The fifth interview question was designed to further define the research problem by determining to what degree Dr. Gasaway's research indicated poor situational awareness and rapid tactical decision making as a contributing factor in line-of-duty-deaths that occur during emergency operations.

The sixth interview question was designed to determine to what extent collateral initiatives, and professional reading initiatives in particular, were determined by Dr. Gasaway to promote the ability of fire department officers to make rapid tactical decisions under stress. This question was influenced significantly by the literature review, where military practitioners of tactical decision making were determined to be stout proponents of expertise gleaned through reading. This interview question was directly related to the fifth research question, which was (e)

what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress? It was also related to a lesser degree to the fourth research question, which was (d) what similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground?

The seventh interview question was designed to determine, from Dr. Gasaway's perspective, what training models might be the most effective in developing effective practitioners of rapid tactical decision making in austere conditions. This interview question was directly related to the fifth research question, which was (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

The eighth interview question intended to determine whether Dr. Gasaway's research, as well as the research analyzed in the literature review, had begun to realize a change in the fire service paradigm of rapid tactical decision making.

The ninth interview question was designed to solicit Dr. Gasaway's opinion regarding the results of one question from the researcher's survey of ICFD officers. The survey question seemed to indicate that ICFD officers did not routinely experience significant barriers to their rapid tactical decision making process. Dr. Gasaway's expert opinion was used to determine if the results of the survey question revealed a significant shortcoming in the ICFD's decision making paradigm, and if that shortcoming defined a significant threat to firefighter survival.

The tenth interview question was designed to determine if the research and practice of combat-arms rapid tactical decision making had a fire service application. This interview question was directly related to the second, fourth and fifth research questions, which were: (b) what models for making rapid tactical decisions under stress are promoted by military ground

combat tacticians? (d) what similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground? (e) what models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress?

Finally, an electronic survey instrument was developed to help further define the research problem and reveal the following: (a) tactical decision making tendencies within the ICFD, (b) attitudes toward tactical decision making within the ICFD, (c) the effectiveness of current tactical decision making training in the ICFD, (d) the proliferation of barriers to rapid tactical decision making at ICFD emergency scenes, and (e) recommended training initiatives to further develop rapid tactical decision making skills within the ICFD.

The survey instrument was delivered electronically to ICFD chief officers who routinely function in a command role at incidents, recently retired chief officers who possess a great deal of experience in commanding incidents, and those company officers who routinely serve in a command role – either as an initial incident commander or when acting out-of-rank at a higher level within the chain-of-command. A total of 19 surveys were distributed. 19 respondents completed the survey in part, for an overall response rate of 100 percent, while 17 respondents completed the survey, for an overall completion rate of 87 percent. The survey instrument is included as Appendix C.

The final results of this research project were impacted by significant limitations. The first limitation of the project was that the literature reviewed caused the researcher to conclude that the project scope was far too broad. A stark dichotomy in proliferation of resources was identified immediately during this research, in that there has been very little attention given to the topic in the fire service, while a myriad of resources exist outside the fire service. The former

is defined by exceedingly few EFOP ARP's and fire service resources available, while the latter is defined by the more than 6,000 pages of literature reviewed from sources mostly outside the fire service. Time was a major limiting factor as the researcher continued to identify subsequent resources that might have been of great value, but could not be reviewed thoroughly. Complexity was also a relative hindrance in regard to project scope, as many of the resources available were highly technical and scientific. Some neurological, psychological, and military research was difficult to or impossible for the researcher to understand well during the time constraints of the project.

The second limitation was related to the personal interview with Major Brezler. The researcher had scheduled a time to conduct the interview following a workshop that Major Brezler taught at FDIC 2012 in Indianapolis. Major Brezler's workshop generated a great deal of excitement among attendees, and more than 90 minutes of available interview time was lost due to students wanting to speak with the Major following his period of instruction. Because available interview time was significantly curtailed, the researcher was unable to ask Major Brezler more than half of the interview questions, which compromised the results yielded from a brilliant and dedicated practitioner-trainer of rapid tactical decision making under stress.

The third limitation was related to the survey instrument of ICFD officers. Many of the terms used in the survey were defined by the literature review to have deep and significant meaning with regards to important components of the rapid tactical decision making process. Terms such as intent, explicit communication, implicit communication, intuition, situational awareness and barriers are terms that all officers could be expected to understand as abstract concepts. When discussed in terms of rapid tactical decision making however, the researcher came to realize that survey results may have been much different if respondents were educated

on their definition as important components of tactical decision making. It is reasonable to believe, for example, that a respondent might have defined intuition as a magical or mystical concept, rather than "a natural extension of experience" (Klein, 2003, p. xvii). Understanding intuition as the former rather than the latter may have skewed the researcher's interpretation of some survey results, as suggested by Dr. Gasaway (personal communication, 2012).

The fourth limitation was related to the scope of the second research question. By attempting to determine what decision making models are promoted by military ground-combat tacticians, the researcher subjects himself to the models employed by tens of thousands of commanders over a great many centuries. The scope of this question left the researcher to determine which examples represent the most pertinent models – a determination that was significantly impacted by the limitations of the researcher's understanding.

The fifth limitation was related to the third research question. In attempting to identify the barriers to rapid tactical decision making, the researcher segued into an entirely separate area of research. Dr. Gasaway (2009) conducted a comprehensive research project that included many hours of expert interviews, analysis of 580 firefighter near-miss reports, and references to 157 resources in determining that more than 100 barriers to situational awareness existed across 12 categories. This represents only one research project related to decision making barriers, and the third research question was much too broad to possibly replicate, or even effectively summarize the existing research.

The sixth and final limitation – and perhaps the most significant – is that the research and theories of Col. John Boyd are the foundation of this research. John Boyd is identified by numerous credible and expert sources as being one of the most revolutionary minds in the history of warfare theory, and the greatest modern mind in the area of rapid tactical decision making

under stress. The problem is defined by the fact that Boyd was a non-conformist who distrusted the modern military and political establishments, as well as an individual who was wholly consumed by his research, growing increasingly more reclusive with age. He was protective of his work, and published very little, with the exception of slides to his complicated briefings that were dozens of hours in length. The researcher exploring John Boyd in any depth, therefore, is left to consider the writings and observations of second-hand sources.

Results

The literature review, two personal interviews, and a survey instrument revealed answers to all of the research questions. The first research question was: (a) what models exist for rapid tactical decision making under stress? The TADMUS study conducted by the United States Navy revealed that there were two overriding models for tactical decision making under stress, referred to as Classical Decision Making and Naturalistic Decision Making (Cannon-Bowers & Salas, 1998, p. 117-119). TADMUS defined the Classical Decision Making model as "assuming single decision events" and containing "a problem domain that is clearly bounded" p. 117). The CDM applies to scenarios that unfold in a predictable pattern, are exceedingly rational, and are sufficiently structured so that the gathering and analysis of data can be compared with knowledge and experience to reveal a single decision (p. 117). Klein (2003) identifies CDM as a routine that is based on solid analysis and logic, and further contends that CDM has application in research environments, cases where decisions are insignificant, and instances where time sensitivities are not present (p. 20).

TADMUS (Cannon-Bowers & Salas, 1998) identified another model for rapid tactical decision making called Naturalistic Decision Making. NDM applies to "dynamic and emergent, responsive to decision maker actions, but also subject to unpredictable shifts" (p. 118). In these

environments, diagnostic information is often not obtainable, difficult to obtain, ambiguous or conflicting. In environments where NDM applies, routine application of well-learned expertise is insufficient to solve emerging problems. These problems require what is referred to as “adaptive expertise” that entails “a deep comprehension of the conceptual structure of the problem domain. Knowledge must be organized, but the structure must be flexible” (p. 119). TADMUS further defines NDM environments as possessing significant time constraints, pressures, and the possibility of costly mistakes.

The National Fire Academy contends that the NDM process is “the expert way of making incident-scene decisions,” (2010, p. 3-5) because it is based on cue-recognition that accesses previous experience, and provides “almost instant recall of previously learned information” (p. 3-11). To further define the demarcation between models, the NFA likens the use of CDM during stressful situations as being reactive, which allows the incident to have the initiative and entrenches the decision maker in a reactive mode (p. 3-6), which jeopardizes the safety of civilians and firefighters, undermines strategy and tactics, and increases growth of the incident (p. 3-7). Conversely, NDM enables a proactive response which builds overall incident stability by allowing the development of sound objectives, strategies, and tactics (p. 3-6).

Klein’s research revealed another theoretical perspective when he studied the decision making processes of fire department commanders and found that these decision makers never compared options or balanced potential outcomes, but rather instantly and intuitively arrived at a single decision that defined the course of action (2003). Klein’s research further identified that the fire department commanders did not believe that they utilized any decision making process at all; rather the commanders believed that they simply knew the course of action to take.

As a result of this research, Klein identified the Recognition Primed Decision Making model (2003). In RPDM, the decision maker orients himself to his environment and makes sense of a situation by subconsciously recognizing numerous cues that result in situational awareness. Klein's research revealed that the subconscious process, utilizing NDM as a foundation, almost instantly cross-referenced the recognized patterns and cues with the commander's previous experiences and expertise, and revealed a single course of action (p. 22; see also Cannon-Bowers & Salas, 1998).

The TADMUS study concluded that Klein's RPDM model had unlimited potential to augment and develop the Naturalistic Decision Making process (Cannon-Bowers & Salas, 1998). An intuitive process, absent of conscious and rational thought, lies at the heart of both theories, and is entirely dependent on a significant level of experience to generate successful decisions. Klein defined the intuitive RPDM process as "the way we translate our experiences into judgments and decisions" (Klein, 2003, p.23). The TADMUS study subsequently revealed that Klein's RPDM model was significant because "expertise develops over time on the basis of the decision maker's experiences" (Cannon-Bowers & Salas, 1998 p. 24). The goal of any decision making training program should be to accelerate the development of experience, and subsequent expertise, in the decision maker. RPDM is based in the effective recognition of cues and patterns, and these skills can be developed by practicing Klein's "practice-based interventions such as simulation and training that is embedded into the task environment" (p. 24).

TADMUS concluded that expertise could be developed through managed experiences that provided for feedback opportunities, by performing event-based training that was set within the context of realistic events (Cannon-Bowers & Salas, 1998). Klein (2003) refers to these evolutions as "deliberate practice" (p. 36).

The survey distributed to ICFD incident commanders asked respondents to identify what sort of decision making process they use. 18 of 19 respondents answered the question, for a response rate of 95 percent.

Figure 1. Officer preference for decision making.

7. How do YOU generally make rapid tactical decisions under stress? Create Chart Download

	Response Percent	Response Count
Analyze all information available to me and arrive at a decision	50.0%	9
Consider all feasible options and choose the best one	16.7%	3
Compare 2 feasible actions and choose the best one	0.0%	0
Intuitively choose a single course	33.3%	6
Comment Show Responses		5
answered question		18
skipped question		1

6 respondents representing 33 percent answered that they make decisions intuitively, which implies a Naturalistic Decision Making model. 8 respondents representing 44 percent answered that they make decisions based on selecting the best option from all available options, which implies a Classical Decision Making model. 6 respondents representing 33 percent answered that they make decisions by following ICFD Operational Guidelines, which also represents a Classical Decision Making model.

The results of the literature review and the ICFD survey instrument reveal that three models exist for tactical decision making. The Classical Decision Making model is defined as being not suitable for use in stressful situations where parameters change, time is critical, and the

possibility of costly mistakes exist. (Cannon-Bowers & Salas, 1998; see also Klein, 2003; NFA, 2010).

Naturalistic Decision Making is the practice of "real-world task performance and action in which decisions happen to be embedded" (Cannon-Bowers & Salas, 1998, p. 24) and is a practice well-suited to emergency response decision makers because it brings to bear experience and expertise to make rapid tactical decisions in changing environments (NFA, 2010).

Recognition Primed Decision Making is an intuitive process very similar to NDM, except that it is rooted firmly in pattern and cue recognition that allows the subconscious to access experience and expertise, which subsequently leads to the formation of mental models and action scripts. RPDM is an intuitive process, defined by Klein (2003) as "a natural and direct outgrowth of experience" that "allows us to translate our experience into action" (p. xiv). This process serves a practical purpose in that it allows a decision maker to arrive at good decisions without deliberate thought (Klein, 2003) and a developmental purpose in that it allows for the implementation of a realistic, event-based approach to training that accelerates the development of expertise (Cannon & Bowers, 1998).

The second research question asked: (b) what models for rapid tactical decision making under stress are promoted by military ground-combat tacticians? The literature review revealed that military tacticians have set forth both examples and literature in sufficient quantity to make significant contribution to the research.

The earliest recorded primer on strategy and tactics was recorded by the Chinese ruler Sun Tzu, who ruled nearly 2,500 years ago – at roughly the same time that Confucius lived, and two centuries before Alexander of Macedon's tactics would forever change the planet's geopolitical landscape (Tzu, 2001). According to a forward by Professor Norman Stone, the

wisdom of Sun Tzu was important enough that “reading Sun Tzu would have saved many subsequent commanders from absurd misjudgments” (p. 7).

Central to Sun Tzu’s theory of warfare were concepts that encompassed the ideas of a commander’s initiative, flexibility, orientation, and knowledge. These ideals are synthesized to define both their individual and collective importance in Sun Tzu’s contention that wise commanders have already achieved success before occupying the field of battle (Tzu, 2001).

A commanders’ ability to achieve and maintain initiative is a critical factor of battlefield success, according to Sun Tzu (2001). The ability to achieve initiative is predicated on his orientation to his environment and situation, as well as his ability to gauge the strengths and weaknesses of both his army and his opponent’s, and the advantages and disadvantages that the situation poses to each commander. “Losing the initiative means to be defeated, to be annihilated,” (Tzu, 2011, p. 56). This initiative is further defined by the Chinese leader: “The energy of troops skillfully commanded in battle can be compared to the momentum of round boulder which roll down from a mountain thousands of feet in height. . .when torrential water tosses boulders, it is because of its momentum; when a hawk strikes swiftly and breaks the body of its prey, it is because of timing. Thus, the momentum of a good commander is overwhelming and his attack precisely timed” (p. 36).

Sun Tzu (2001) contended that a commander’s ability to gain this type of momentum was a more cerebral trait than one vested in force. He defines an enemy’s vulnerabilities and disadvantages as low points in a landscape, and professes that a commander’s ability to identify those weaknesses and generate exploitive tactics is like water that runs to those low points. “As water shapes its flow in accordance with the nature of the ground,” Sun Tzu explains, “an army manages to be victorious in relation to the enemy it is facing. As water retains no constant shape,

so in war there are no constant conditions" (p. 56). The importance of a commander to maintain awareness of his environment is paramount to this effort, because "One who can modify his tactics in accordance with the enemy's situation and succeed in gaining victory may be called divine" (p. 56). In saying that water retains no constant shape on differing terrain, Sun Tzu contends that no constant conditions can ever exist, and therefore no predetermined tactical formula may ever be thought to contribute to victory.

Sun Tzu (2001) lays the foundation for other tacticians and scientists who talk about the importance of intuition, knowledge, experience, and expertise – four concepts that he summarizes as the "foreknowledge" of the commander. Sun Tzu hails the conceptual importance of this characteristic by saying that the one who has knowledge of himself and his enemy "is invincible" and that the commander who has foreknowledge is a "wise general" who "wins the battle when they move, and their achievements surpass those of ordinary men" (p. 67). Sun Tzu further explains that foreknowledge is not obtained by magic or mysticism, nor is it obtained from spirits, gods, or astrological formulae. Foreknowledge, according to Sun Tzu, can only be obtained from men who know the situation. Foreknowledge, then, for Sun Tzu constitutes the chief principle that enables a commander to achieve initiative, which leads to sure victory. The importance is defined by the ability to predict the end-result, according to Sun Tzu: if the commander is knowledgeable about both the enemy and himself, he will never be defeated. If he has knowledge about one or the other, the odds of victory become even. If the commander is ignorant of both himself and his enemy, defeat is subsequently guaranteed.

If Sun Tzu constitutes the one historical bookend of tactical brilliance, John Boyd constitutes the other. Col. John Boyd began his career as a fighter pilot, and later evolved into an aeronautical engineer in an effort to refine his Energy Maneuverability Theory, which was used

to quantify the specific strengths and weaknesses of any aircraft in the world, at any stage of flight. While as a combat pilot and flight instructor Boyd pioneered a decision making model that allowed him to win any aerial encounter in 40 seconds or less – earning him the nickname "40-second Boyd" (Coram, 2002, p. 5), his further work with aerial tactics and his E-M Theory "changed the way every air force in the world flies and fights" (p. 5).

Boyd's work in the tactics of aerial combat and in the military applications of aerospace engineering transformed Boyd into a rabid researcher of the science of decision making. The defining work of his life, which Boyd painstakingly revised for years, was called "Patterns of Conflict" and over the course of a decade became "A Discourse on Winning and Losing" (Coram, 2002, p. 328)

Boyd was a pioneer in the theory of time-based conflict and rapid tactical decision making (Coram, 2002). His earlier ideas that revolutionized the theory of aerial combat was rooted in a pilot's ability to quickly transition from one maneuver to another – particularly at a rate that the opponent was unable to defend against. Boyd called the idea of thinking and acting faster than an opponent an "asymmetric fast transient" (p. 327), a decision cycle and subsequent action cycle that allows one opponent to operate at a faster tempo than his enemy can sustain, and "suggests that he must stay one or two steps ahead of his adversary; he must operate *inside* his adversary's time cycle" (p. 327).

The theories related to fast transients led Boyd to study decision making related to all forms of conflict. Boyd became increasingly interested in the history and theory of ground warfare, and Coram suggests that "Boyd dove into the history of warfare as few men ever have" (p. 330). He studied every commander of every engagement ever recorded, and Coram's

contention is supported by the fact that Boyd's resource list for his final Patterns of Conflict research included 323 different works (p. 330).

While Boyd studied numerous commanders and even more conflicts, his research revealed that concepts of particular interest existed in the theories of both the German *Blitzkrieg* and guerilla warfare. A time-based theory of conflict, particularly one that enables one commander to operate a faster decision making tempo than the opponent can match, was revealed by Boyd to be a common element in determining battleground success. A faster decision cycle not only builds initiative and momentum for the commander who is executing it, but it sows panic and uncertainty in the opponent, causing him to lose initiative. Boyd found that this represented a vicious cycle that often became a slippery-slope from which the slower opponent could not recover. Some well-known commanders – including Sun Tzu, Napoleon, T.E. Lawrence, Von Clausewitz and Rommel – employed a fast-transient decision cycle that invariably allowed numerically inferior forces to achieve victory (Coram, 2002; see also Hammond, 2001; Richards, 2004; Salka, 2005).

While the scope of Boyd's study was exceedingly broad, Coram (2002) contends that no commander influenced the history of warfare theory – and subsequently Boyd's developing theories, than Sun Tzu. The cerebral aspects of Sun Tzu's theories represented a unique perspective among the theoreticians of the following two millennia, and "Boyd found that Hannibal, Belisarius, Khan, Napoleon, and Von Clausewitz all demonstrated an understanding of Sun Tzu" (p. 331). Among the commander's that applied Sun Tzu's tenets of initiative, flexibility, orientation, and knowledge, Boyd found definitive evidence that there existed "many victories by numerically inferior forces when they used speed, fluidity of action, and strength against weakness" (p. 332). One of the primary reasons that these distinguished commanders

achieved success, Boyd found, was they never deployed their forces head-to-head with the forces of their opponent. Boyd concluded that the strategy and tactics related to attrition warfare were precursors to defeat.

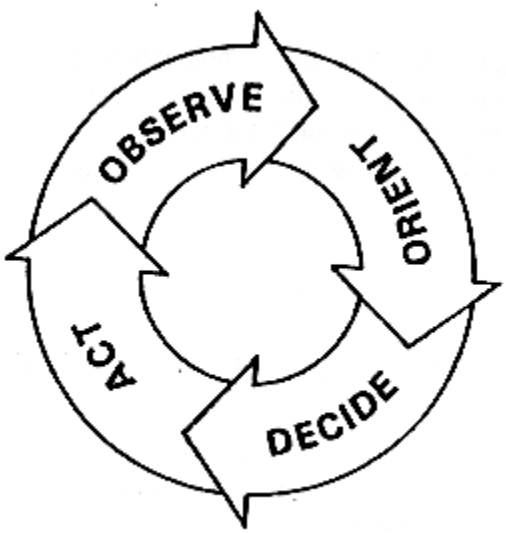
In addition to Sun Tzu, Boyd exhaustively studied Von Clausewitz, Rommel, and the principles of the German Blitzkrieg. Also known as "maneuver warfare" (Richards, 2004, p. 49), Blitzkrieg tactics define a significant deviation in military tactics that were common for centuries. Discarding the ideas of attrition warfare, where two enemies stand toe-to-toe and fight until one side (generally the one with superior numbers) wins, the Blitzkrieg utilizes speed, surprise, and careful coordination to achieve victory. Blitzkrieg units move quickly and under cover, exposing themselves briefly to test and probe enemy positions. Often using feints to deceive and distract, blitzing units search for a weakness in an enemy position and then thrust through like a spear, creating surprise and confusion among enemy ranks. Ultimately, the Blitzkrieg seeks to disorient their foe until its coordination and creativity to overwhelm the ability of the opposition to maintain awareness of the situation (Richards, 2004).

As defined in the literature review, Boyd identified four key attributes of the Blitzkrieg that consistently achieved success against superior opponents: Einheit, Auftragstaktik, Fingerspitzengefühl, and Schwerpunkt. Einheit meant "mutual trust, unity and cohesion" while Auftragstaktik was defined as "mission, generally considered as a contract between superior and subordinate." Fingerspitzengefühl meant "intuitive feel, especially for complex and chaotic situations" while Schwerpunkt meant "any concept that provides focus and direction to the operation" (Richards, 2004, p. 51). These attributes spawned within the warfighting organization a number of key characteristics that created an optimal environment for making rapid tactical decisions under stress: namely flexibility of command, low-level initiative, superior tempo and

mobility, mutual trust, rapidity, variety, and harmony of purpose (Hammond, 2001). Essentially, these characteristics and foundational attributes created an environment where a commander could maintain situational awareness and make rapid decisions, while he compromised his opponent's ability to do the same.

Boyd synthesized the results of his research into a decision making model referred to as the O-O-D-A Loop, where the acronym refers to the four steps of the process: Observe, Orient, Decide, and Act (see Figure 2).

Figure 2. Boyd's simplified OODA Loop.



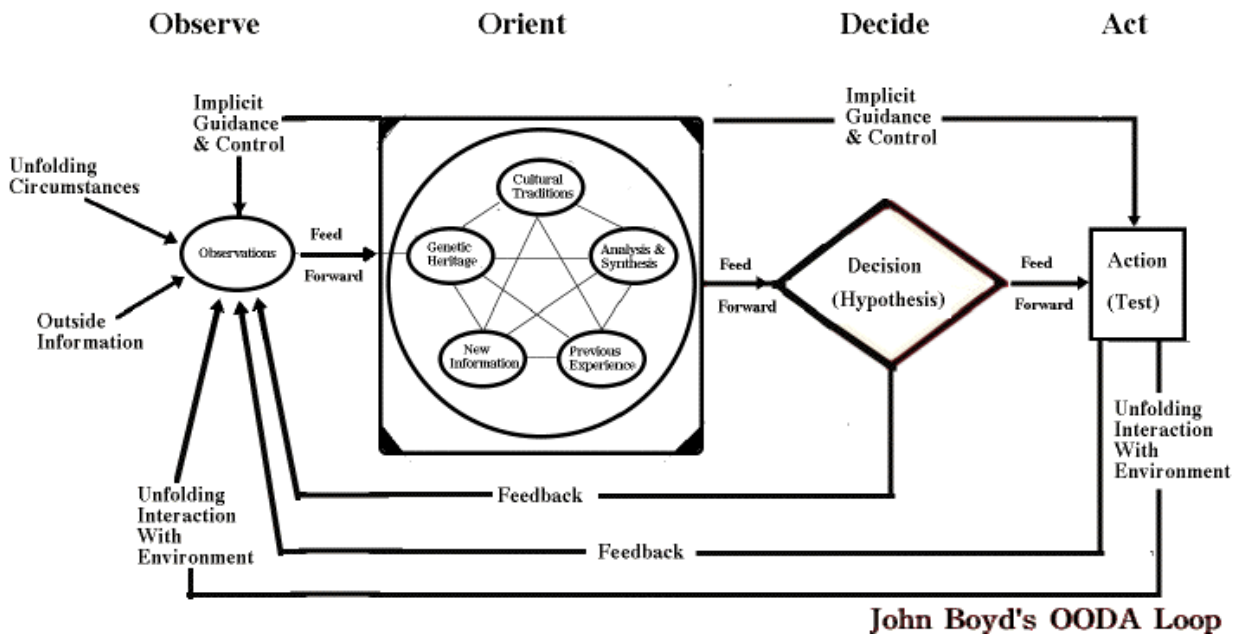
The decision making loop depicted in Figure 2 shows the simplest rendering of the OODA Loop, or Boyd Cycle. The first element is the step of observation, and represents the act of obtaining and processing cues about yourself and your environment, or the world around you. The second step is orientation, and calls upon experience, knowledge, genetic heritage, and cultural predispositions to synthesize the observations from step one, and enable the subject to orient himself to a specific context. The third step is where decisions are made by selecting a hypothetical course of action, and the fourth step is transforming the hypothesis into action. The

idea behind the Boyd Cycle is that it does not stop, rather it must be immediately run again and again, with the intention of a faster process conducted each subsequent time the loop is performed (Hammond, 2001; see also Coram, 2002; Richards, 2004; Salka, 2005). Coram (2002) states that “a crucial part of the loop is that once it is started, it must never slow” (p. 338).

The model represented in Figure 2 is in fact much too simple, according to Coram (2002). The loop should not be considered a one-dimensional cycle, and should never be employed in a mechanical sense. Understanding the loop as a simple mnemonic, according to Coram, is to not understand it at all. An example Coram (2002) uses is related to the speed at which the cycle must be executed. Boyd did not intend that the decider should simply endeavor to do it with increasing rapidity by force of will; rather Coram concluded that the steps of the loop should be performed simultaneously and instantly, stating that “the speed must come from a deep intuitive understanding of one’s relationship to the changing environment. This is what enables a commander to seemingly bypass parts of the loop. It is this adaptability that gives the loop its awesome power” (p. 336).

This understanding of the compression of time, and the decision making advantages it yields, is best described by what Boyd called “Implicit Guidance and Control” (Hammond, 2001, p. 190). Figure 3 constitutes a better representation of the OODA Loop, and the concept of Implicit Guidance and Control”

Figure 3. Boyd's detailed OODA Loop.



Coram (2002) describes Boyd's concept of Implicit Guidance and Control as being the essential element to building rapidity in the cycle, and is dependent upon the decider's appropriate orientation, the degree to which he can assume the "finger-tip feel" concept of the Blitzkrieg, and then subconsciously rely on his experience, expertise, and intuition to move almost instantly from the first step of the process to the last, and then beginning the process again.

Boyd's work was fostered and ultimately adopted by the United States Marine Corps, and his theories regarding decision making in warfare formed both the impetus and foundation for the USMC's combat doctrine (Warfighting, 1994). The pages of the Marine Corps book of strategy cover in detail the nature of war, the theory of war, preparing for war, and the conduct of war, and represents Boyd's synthesis of all four subjects. The document pays special homage to the concepts of the Blitzkrieg, the cerebral components of warfare, and models for rapid tactical decision making under stress. In short, Boyd's research forms the beating heart of America's

most aggressive and most frequently deployed combat organization. General Gray (1994), the Commandant of the Marine Corps at the time of the document's publication, succinctly summarizes the doctrine as representing "not just guidance for actions in combat, but a way of thinking in general" (p. xiii).

The third research question was (c) What barriers exist to inhibit sound tactical decision making under stress? Weick (1993) identified that a lack of experience, failure to make sense of a novel situation, inability, poor communication and deterioration of structure as factors that led to deteriorating intellectual resilience, panic, and ultimately the deaths of wildland firefighters in the Mann Gulch disaster.

Putnam (1995) found that the failure of the wildland fire service to follow the examples of the military and aviation industry to understand and augment the psychological and sociological processes of firefighters promoted barriers that led to fatalities on the Storm King Mountain fire. Failure to study and understand human factors that promote and detract from decision making spawned a breakdown of trust in the organization, disunity of command, poor and infrequent communication, fragmentation of the group into smaller informal groups, failure to act on important cues and underestimation of the potential of the fire behavior.

Col. Nye (1986) found that a lack of knowledge, also referred to as experience or expertise, is the key factor that inhibits a leader's ability to deploy, fight, and troubleshoot problems in austere environments. Col. Marshall (1978) found similar results and concluded that the failure to prepare the minds of men for conditions and situations encountered in war inevitably generated a slippery-slope toward chaos when novel, stressful situations were encountered. The lack of realistic training designed to build experience left soldiers enveloped in darkness, according to Marshall, and caused "men to go into action the first time haltingly and

gropingly, as if they were lost at night in the deep woods. Lives are wasted unnecessarily. Time is lost. Ground that might be taken is overlooked" (p. 37).

Boyd determined that several critical and complicated factors severely diminished an effective tactical decision making process (Hammond, 2001; see also Coram, 2002; Richards, 2004). An inability to orient to an environment severely compromised subsequent decisions, and was based in a relative lack of experience and expertise.

Von Clausewitz, often referred to ". . .as the greatest of military theoreticians" (Coram, 2002, p. 332) found environmental and human factors were barriers to decision making when he identified terrain, weather, confidence issues, exertion, and lack of information as elements that served as impediments to the commander. Of those elements Von Clausewitz (1968) said "These difficulties produce a friction which no man can imagine who has not seen war. Friction is the only concept which in general distinguishes real war from war on paper" (p. 164). Von Clausewitz also implies, then, that experience is at the root of being able to anticipate and prepare for friction.

Dr. Gasaway, the fire service researcher who is a pioneer in the field of situational awareness and fireground decision making, conducted research that identified 116 different barriers to rapid tactical decision making that were parsed into 12 categories: attention management, human factors, data/information, physical/mental stress, communications, workload, mental model, command location, staffing, mission/goal, team/crew performance, and command support. Dr. Gasaway (2009) found that Situational Awareness was the foundation of effective tactical decision making because it represented how well an individual understood information that defined what was happening around them and to depict what that information meant relative to what was happening now and what would be happening in the future. When SA

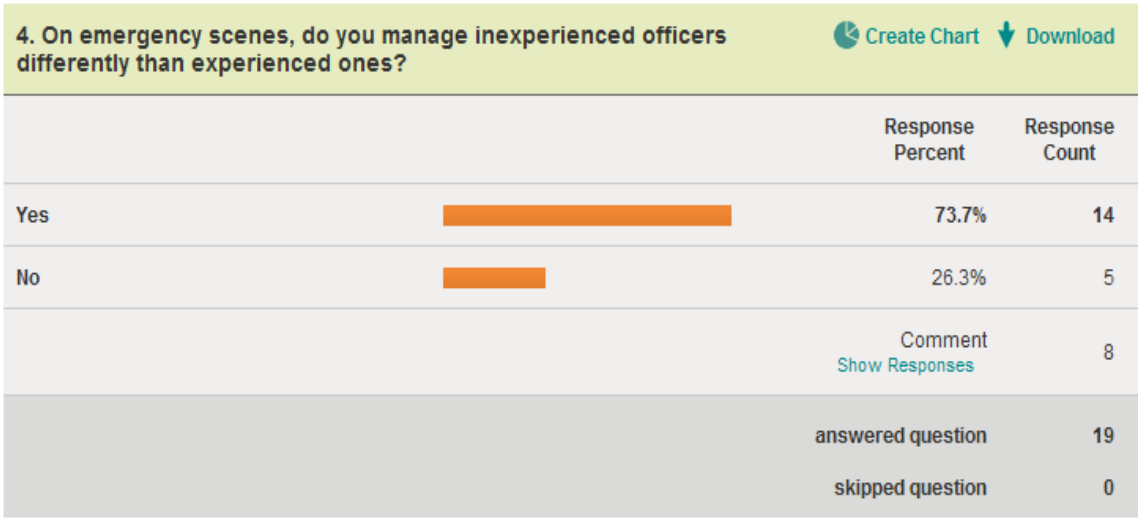
is impeded, the resulting negative effect on subsequent tactical decisions is evident and often catastrophic. Gasaway cited his review of 580 firefighter near-miss reports that had compromised SA as the leading contributing factor (p. 21). In a recorded interview, Gasaway told this researcher that his research experience would lead him to surmise that compromised Situational Awareness could be implicated in 100% of firefighter fatalities that occurred as a result of firefighting activities (personal communication, April 26, 2012).

Major Brezler, an experienced Marine combat leader and urban firefighter, identified issues related to properly-developed experience as creating (personal communication, April 19, 2012). He said that the fire service has migrated from realistic, scenario-based training that closely approximates real emergency scenes, and therefore leaves firefighters with a dearth of relevant experience. The lack of experience contributes negatively to rapid tactical decision making, according to Brezler, because orientation begins to decline when firefighters encounter novel situations. When firefighters encounter novel situations, they are subject to stress and confusion, which may negatively impact operations, and spreads throughout the fireground to the incident commander, thereby compromising the ability to make effective and rapid decisions at all organizational levels (personal communication, April 19, 2012).

Further, Major Brezler stated that an incident need not in itself be novel, but that an unexpected occurrence in a routine environment - such as a burst hoseline at a residential structure fire – could transform a situation from routine to novel if firefighters have not been trained to be resilient problem solvers. In situations such as this, according to Brezler, even routine emergencies can become chaotic and lead to a rapid deterioration of sensemaking and rapid tactical decision making (personal communication, April 19, 2012).

A survey was conducted of Iowa City Fire Department officers who serve routinely as incident commanders. In order to determine if barriers to rapid tactical decision making are present in ICFD operations, and if decision making models themselves might constitute a barrier, the researcher asked respondents if, on emergency scenes, they manage inexperienced officers differently than experienced ones?

Figure 4. Difference in managing experienced vs. inexperienced officers.



4. On emergency scenes, do you manage inexperienced officers differently than experienced ones?

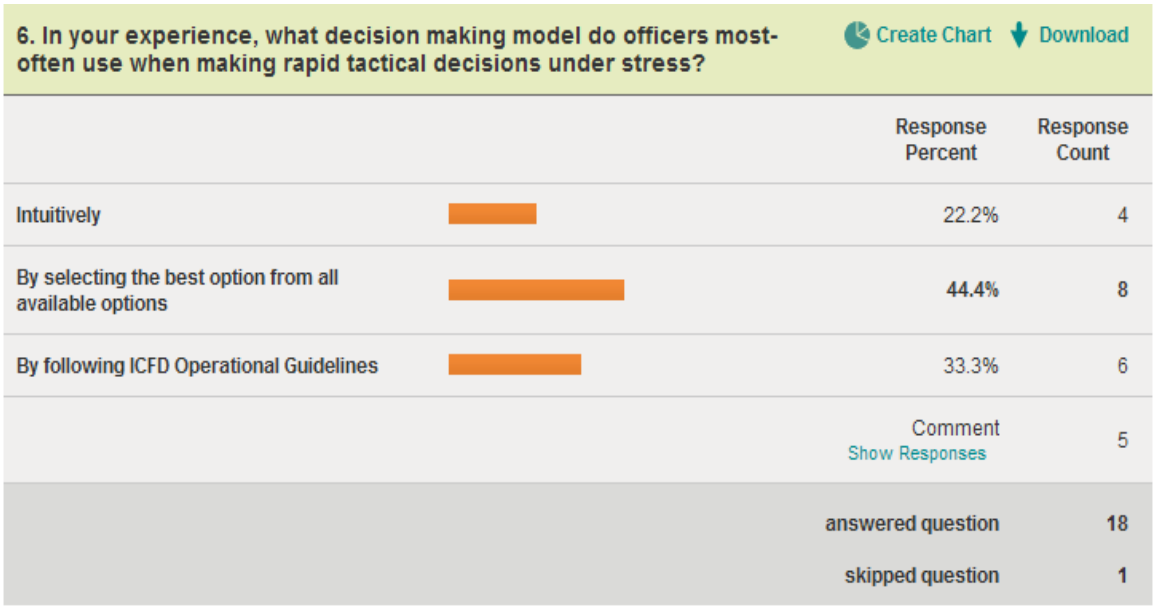
Create Chart Download

	Response Percent	Response Count
Yes	73.7%	14
No	26.3%	5
Comment Show Responses		8
answered question		19
skipped question		0

Figure 4 depicts the response of 19 fire officers, representing a response rate of 100%. 14 of 19 officers, or 73.7% of those surveyed, answered that they did manage inexperienced officers differently. 8 comments reflected that command officers prefer to “micro-manage,” “stay on-top of,” or “require more frequent updates of” inexperienced officers.

To further determine if barriers existed in ICFD operations, the researcher asked respondents to identify the most proliferate decision making model among the three that were most referred to in the literature review (Figure 5):

Figure 5. Decision method most-often used by ICFD.



6. In your experience, what decision making model do officers most-often use when making rapid tactical decisions under stress?

Create Chart Download

	Response Percent	Response Count
Intuitively	22.2%	4
By selecting the best option from all available options	44.4%	8
By following ICFD Operational Guidelines	33.3%	6
Comment Show Responses		5
answered question		18
skipped question		1

18 of 19 survey respondents, or 95% of officers who began the survey answered the question. It was an unexpected finding that only 4 respondents, or 22.2% of officers surveyed believed that intuitive decision making was the most-used model, while 77.7% believed that some form of Classical Decision Making was most often used.

A similar question was asked of respondents (see Figure 6), wherein officers were asked to identify what method they most often used for rapid tactical decision making.

Figure 6. Officer preference for decision making.

7. How do YOU generally make rapid tactical decisions under stress? Create Chart Download

	Response Percent	Response Count
Analyze all information available to me and arrive at a decision	50.0%	9
Consider all feasible options and choose the best one	16.7%	3
Compare 2 feasible actions and choose the best one	0.0%	0
Intuitively choose a single course	33.3%	6
Comment Show Responses		5
answered question		18
skipped question		1

Of 19 officers surveyed, 18 responded to the question for a response rate of 95%. The results were that 6 officers, or 33.3% of respondents believed they employed an intuitive method that revealed a single course of action. 12 respondents, or 66.7% believed they employed some form of Classical Decision Making.

A third question related to decision making models as potential barriers asked what type of decision making process ICFD officers believed should be used by fireground decision makers (Figure 7).

Figure 7. Most important method of decision making.

8. Which decision making model do you believe is most important for officers to cultivate for use when making rapid tactical decisions under stress? Create Chart Download

	Response Percent	Response Count
Making sound tactical decision intuitively	33.3%	6
Making sound tactical decision by deliberate, rational analysis	50.0%	9
Making sound tactical decision by remaining obedient to Operational Guidelines	16.7%	3
Comment Show Responses		7
answered question		18
skipped question		1

Figure 6 shows that 18 respondents of the 19 officers surveyed answered the question, for a response rate of 95%. 6 of the 18 respondents, constituting 33.3%, answered that they believed intuitive decision making was most important for cultivation in ICFD officers. 66.7% answered that some form of the Classical Decision Making Model should be promoted and used. Further, written responses as addendums to individual answers showed that 7 of the 7 who wrote a response believed that only a very deliberate analysis of information should be trusted in decision making, or that only strict obedience to operational guidelines should be considered when making decisions.

The final survey question utilized to determine to what extent ICFD incident commanders experience barriers to rapid tactical decision making under stress identified some of the key barriers that were revealed by Gasaway's research (2009). The researcher selected some of

Gasaway's most common barriers as options, and also selected some barriers that his experience had indicated might be present on ICFD emergency scenes.

The survey question listed 23 barriers to rapid tactical decision making under stress. The researcher asked the respondents to identify those barriers that they experienced, and to subsequently rate them on a scale that identified both the frequency and severity of the barrier. The scale identified six options for each barrier. The options for barrier frequency and severity were manageable barriers that were experienced rarely, sometimes, or frequently, and significant barriers that were experienced rarely, sometimes, or frequently.

17 officers of the 19 surveyed responded to this question, for a response rate of 89.4%. With the exception of one barrier that 16 officers identified as affecting them, all barriers were identified by all respondents as impacting their ability to make rapid tactical decisions under stress. Of those barriers that were most often identified as being significant ones, the following were categorical leaders:

1. Staffing – not enough. 12 of 17 respondents, or 70.5% identified this as a significant barrier that they encountered.
2. Communication – can't understand radio transmissions from the interior of the fire building. 12 of 17 respondents, or 70.5% identified this as a significant barrier that they encountered.
3. Communication – malfunctioning radio equipment. 12 of 17 respondents, or 70.5% identified this as a significant barrier that they encountered.
4. Communication – missed radio traffic. 10 of 17 respondents, or 58.8% identified this as a significant barrier that they encountered.

5. Communication – insufficient updates from company officers. 8 of 17 respondents, or 47%, identified this as a significant barrier that they encountered.
6. Data – toll little information. 8 of 17 respondents, or 47%, identified this as a significant barrier that they encountered.
7. Experience – unfamiliar with capabilities of mutual aid companies. 7 of 17 respondents, or 41.1% identified this as a barrier that they encountered.

The interviews conducted with Dr. Gasaway and Major Brezler, as well as the results of the survey instrument completed by ICFD officers, supported the findings within the literature review and answered the research question (c) What barriers exist to inhibit sound tactical decision making under stress? Many barriers to rapid tactical decision making under stress exist in both human factor and environmental categories. Compromised situational awareness, panic, confusion, fear, uncertainty, fatigue, poor communication, incomplete or too much data, and staffing elements were all identified to be barriers to some degree, and the research reveals that there is often a synergistic effect that causes one barrier to spawn others.

The common contention, however, particularly throughout the literature review and the personal interviews, is that the development of intuition and well-formed experience that leads to expertise is the primary enabling component of a rapid tactical decision making process.

Three research questions posed to ICFD officers regarding what decision making model they used, what decision making model they believed others in the ICFD used, and what model they thought should be promoted within the ICFD generated some unexpected findings. A majority of nearly 75% believed that they used a Classical Decision Making Model, believed that others did as well, and believed that a sort of Classical Decision Making Model should be further cultivated on the ICFD (Figures 4, 5, & 6)

This was unexpected because numerous sources in the literature review (Klein, 2003; see also Richards, 2004, Canon-Bowers & Salas, 1998; National Fire Academy, 2010) earnestly contend that a Classical Decision Making Model – here identified as both deliberate, rational analysis of all information, or adherence to published guidelines, is strictly contra-indicated for use in high-stress, high-consequence environments.

The fourth question the research endeavored to answer was (d) What similarities exist between rapid tactical decision making in combat and rapid tactical decision making on the fire ground? The literature review, both interviews, and the ICFD survey instrument all revealed that similarities exist between the two environments that would allow battlefield lessons to better prepare fire officers for decision making in stressful emergency situations.

In 1985, the U.S. Army commissioned decision making expert Gary Klein to perform a study of how battleground commanders make decisions in stressful environments. Because authentic and observable conflicts were scarce at the time, and because Klein (2003) determined that combat was not a safe environment for researchers to conduct study, the project moved to what Klein determined to be the most closely-related environment to study decision making under stress – fire commanders directing fireground operations.

Klein (2003) concluded as a result of his research that decision makers who must make rapid tactical decisions under stress observe a situation that generates cues, which result in the experienced decision maker identifying patterns. The identified patterns subconsciously reveal action scripts – commonly referred to as a decision – that is then tested and refined by using mental models to perform a rapid mental simulation, which generally identifies the decision as one that will have a positive or negative impact on the situation. Klein referred to this process as the “recognition primed decision (RPD) model (p. 27). He subsequently used the 1985 research

as a foundation for further research that refined intuitive decision making that benefitted military decision makers in the U.S. Marine Corps, the U.S. Army, and the U.S. Navy. The military did not solely benefit from this research; Klein stated that "The Los Angeles County Fire Department called us in to help them build intuitive decision making skills, and so did the National Fire Academy" (p. xv).

While many writers contend that John Boyd was the most brilliant military tactician since Sun Tzu (Hammond, 2001; see also Coram, 2002; Richards, 2004), it remains a severe disappointment that Boyd published very little, and transcribed none of his research into a prose format. Hammond (2001) contends that reasons for this is because "Boyd came from a culture that that is, though technically competent, essentially anti-intellectual" (p. 17). Further, Hammond points to the fact that the military institution promotes the conveyance of ideas through briefings rather than papers or books, and that Boyd was averse to publishing because his ideas were constantly revised until the time of his death.

Regardless, many authors identify the reality that Boyd understood his work to apply to all forms of conflict, and not just military engagements. Hammond (2001) found that "Boyd's Way. . .is a way of thinking, connecting, learning, synthesizing, solving and surviving" (p. 17). Hammond (2001) further concluded that subscription to Boyd's method of rapid tactical decision making under stress will help ". . .improve our ability to cope – as all organisms must – with a complex, unknown, constantly changing environment" (p. 17).

Coram (2002) discovered that Boyd and Chet Richards had spoken for years about the application of Boyd's maneuver warfare theory to forms of conflict that exist in the civilian world – particularly business. Coram wrote that Boyd encouraged Richards to develop the ideas of maneuver warfare theory as it applies to all forms of conflict, and further encouraged him to

write about the subject. Coram concluded the following about Boyd: “He saw this as an affirmation of the fact that his intellectual legacy encompassed more than warfighting; his ideas were universal, timeless, and could be applied to any form of conflict” (p. 429).

Richards (2003) confirmed that he found that Boyd’s theories applied not just to war but to all forms of conflict. Personal and business-related conflict requires the same sort of characteristics that Boyd champions, and Richards contends that the lessons of warfare in general – and Boyd specifically – have significant application outside of the military establishment. Richards summarizes the important applications by saying “War strategies, however, rest on a deeper foundation of people working together under stress and uncertainty, and good ones shape the terms of the conflict to their liking before combat begins” (p. 14).

Jason Brezler, a Marine Corps infantry commander and FDNY firefighter, also drew correlations between the battlefield and the emergency operations scene. He stated that the significance of how we train firefighters to be resilient problem solvers is found in Marine Corps training and combat doctrine: specifically, that mistakes will be made on the battlefield and that the same is true of operations on the fireground (personal communication, April 19, 2012). Brezler stated that fireground commanders should adopt the mindset of infantry commanders: that in training, commanders should not promote a mistake-free environment, but rather should allow mistakes to happen so that subordinates can learn both how to see them coming and fix them quickly when they occur. Likewise in the fireground setting, commanders should anticipate that mistakes will be made, and be prepared to deftly overcome them when they do occur (personal communication).

Similarly, Major Brezler drew a parallel between tactical decision cycles and considerations on the fireground and those on the battlefield. He stated that when he travels the

country instructing tactics classes for firefighters, he always builds from a foundation of Col. John Boyd's maneuver warfare theory, his OODA Loop, and the central tenets related to flexibility and intuition located in the first chapter of the Marine Corps Warfighting manual (personal communication, April 19, 2012). He also stated that he teaches tactical decision making under stress to firefighters in a similar fashion as he trains Marine Corps leaders – by employing decision making exercises that focus on the critical tactical determinants of time, space, and resources (personal communication).

Further, Brezler offered critical insight that supports the findings of Hammond (2001), Coram (2002), and Richards (2003) when he drew similarities between using rapid tactical decision cycles - like Boyd's OODA Loop - in combat and using the same decision cycles on the fireground:

> The good thing that I am seeing is that some people are starting to understand the value of learning a faster cycle. Our incidents today are developing much more rapidly and becoming more time-sensitive, and there is a definite need for us to equip ourselves to out-cycle our enemy. But we are much more deliberate, particularly because the ICS system is somewhat rigid and disallows intuitive decision making at all levels – people feel they need to be told to do something by the Incident Commander. The problem with that is that our enemy has a big head start on us and is gaining initiative while we try to understand the situation, and our enemy doesn't need orders from anybody. He simply lets himself and the building instantly determine what is best for him. But we need to see the value in getting our cycle in front of our enemy's cycle. We also need to be better at realizing that when we pull up and conditions are so bad that we know that we can't compete with the enemy's cycle – just like walking into an ambush in war – we need to

> realize that there is no way that we will out-cycle the fire and that we will lose if we try. In those situations we need to accept the fact that we just need to take a defensive posture and live to fight another day (J. Brezler, personal communication, April 19, 2012).

Dr. Gasaway also provided concise insight on the application of combat-based rapid tactical decision making to fireground commanders. The researcher asked Gasaway if the fire service should pay closer attention to the rapid tactical decision making lessons of the U.S. military combatants. Dr. Gasaway had the following to say:

> I think so, because the military has the money to do the research. This is exactly where I got turned on to it in looking at military medicine and aviation, because there was absolutely nothing coming from the fire service on situational awareness and rapid tactical decision making under stress.
>
> The stuff the military is doing? Man! If we had their money, we could throw our money away. I don't mean that disrespectfully of course – my son is a Marine and I think that the military deserves their budget. But when it comes to resources, the military knocks our socks off. We can't even dream of competing with them with the things that they are learning. And the things that they are learning they are applying (R. Gasaway, personal communication, April 26, 2012).

Gasaway lamented the reality that fire service professionals too often discount the valuable application that combat decision making has to the fireground. He stated that he has repeatedly heard fire officers tell him that they would prefer pertinent fire-based decision making lessons, rather than those from the military. Dr. Gasaway response defines the naivety related to such point-of-view:

> Unfortunately, when I use military examples in some of my classes, some firefighters tell me that they are nice analogies, but that 'we want something that is relevant to the fireground.' Really? Does anyone really think that a soldier getting shot at in a high-stress, high-consequence situation that could cost him his life isn't the same as a firefighter inside of a building that is on fire? That is naïve if you don't think that we're talking about the exact same thing.
>
> How about a pilot who is trying not to crash his airplane because the engine flamed out? Do you think that he isn't having to make high-stress, high-consequence decisions that are the exact same as the ones you are having to make at a fire scene? That is naïve. (R. Gasaway, personal communication, April 26, 2012).

The survey instrument distributed to ICFD incident commanders also revealed that some degree of similarity exists between rapid tactical decision making on the fireground and the decision making that takes place in combat (Appendix D). ICFD officers were presented with several training components that the research indicated may better prepare officers to make rapid tactical decisions under stress (see question 19). Respondents were asked to subscribe a level of importance, including very important, important, not very important, and not important at all, to the varying training initiatives. One of the initiatives was related to the experiences of military tactical decision makers. Of 19 respondents, 17 or 89.4% completed the question. 4 officers, or 23.5% of respondents, ranked the lessons of military tacticians as very important. 7 officers, or 41.2% of respondents, ranked the same category as important, while 6 officers, or 35.3% ranked it as not very important. In total, all 17 respondents ascribed some level of importance to the experience of military tacticians, with 11 of 17, or 64.7% believing that it was either important or

very important. None of the respondents indicated that the experiences of military tacticians was not important at all.

The literature review, two personal interviews, and research survey instrument all help to define that many similarities exist between rapid tactical decision making in combat and rapid tactical decision making in the fire service. Klein (2003) draws a direct correlate between the two environments; writers and researchers profiling Boyd do not explicitly mention the decision cycles of a fire ground commander, but they do contend clearly that the rapid tactical decision cycles of maneuver warfare are applicable to all forms of conflict.

Brezler and Gasaway agree, with the former being an experienced tactician both on the battlefield and the fireground, and the latter being an expert at fireground rapid tactical decision making. More than half of ICFD incident commanders concur that the lessons gleaned from military rapid tactical decision making have a place in training curriculum for ICFD officers.

The fifth question that the research endeavored to answer was (e) What models or methods should be used by the Iowa City Fire Department to train officers in making rapid tactical decisions under stress? The literature review, two personal interviews, and the ICFD survey instrument clearly demonstrated that there are several components currently not utilized by the ICFD that will promote rapid tactical decision making.

Col. Nye (1986) identifies four main components of a program designed to enable officers to reach their full potential as leaders and decision makers. First an officer must develop an image of himself. A vision of oneself, according to Nye, is “an acute sense of the possible” (p. 3). The officers of Nye’s day – consisting of the post-World War II era – carried visions that they may someday equal the accomplishments of the greatest commanders of that war. Visions of themselves as competent military leaders “gave our lives more meaning and lifted us beyond our

day-to-day jobs. They put many of us on a quest for new knowledge, helped us grow, and made us more adept at creating new things" (p. 2).

The vision explained by Nye (1986) instilled in young officers the drive to emulate the leaders whom they admired, and that promoted Nye's basic foundation for competence in decision making: reading. Nye contends that with each passing generation, military officers have a greater responsibility to be intellectuals and experts that are well-versed in the experiences and trial of leaders who have gone before them. These men, according to Nye, must envision themselves as the "Brain of the Army" and as "Thinkers and Deciders" (p. 8). Nye wrote that:

> Such men are not trapped into the thinker-versus-doer syndrome that has provided the lazy and arrogant with an excuse for mental mediocrity. Rather, they accept that the cerebral process of making sound judgments is at the heart of military competency, and they study and practice the thinking and decision making process in a conscientious manner (Nye, 1986, p. 8).

Nye (1986) subsequently found that the visions of thinkers and deciders can best be realized by a career dedicated to reading, for "Military men become best known for their competence. . .a competence that is nourished early in a career by professional reading" (p. 9). Further, "The inquiring soldier can best begin the search for his own vision as Thinker and Doer with the memoirs of military men who write of their own trials in making critical choices" (p. 9).

Nye's third step was related to achieving a relative level of technical expertise with each piece of equipment that might fall under his command. From small arms to trucks and tanks, Nye's contention was that each officer had the responsibility to know how it functioned, and to be the expert troubleshooter in preparation for the time when the system failed in combat. For an

officer to appropriately influence the outcome of battle, “Enough information,” Nye said, “is usually more than anyone else around” (p. 65).

Nye’s final step in training to be an adept decision maker was rooted in senior officers mentoring junior ones. He identifies two components to a mentoring relationship: one distinctly personal, and one rooted in the careful study of past military commanders (1986). Of the former, Nye stated that:

It is the commander-as-trainer who attempts to prepare his people for the missions the might embark on tomorrow morning. As mentor, however, the commander looks more to the horizon, to the protégés’ potential in years to come. His chief function is to cause his people to become better learners. He teaches them how to learn from reading writing, and discussion. He motivates them to teach themselves. As such, he might be as concerned with whether they read as he is about what they read (Nye, 1986, p. 152).

While a personal teacher-and-learner relationship is one component Nye (1986) draws attention to, the more important mentoring relationship is the one that the officer must build with those commanders whose biographies define their distinction. Nye contends that he himself consulted 250 biographies and histories of professional soldiers, social scientists, and philosophers in preparation of his book *The Challenge of Command* (p. 149). He observed that officers who avail themselves of 4 or 5 of those books per year, as a professional development endeavor, will integrate the knowledge of their predecessors with their own field experience, enabling them to “follow in the footsteps of their predecessors who distinguished themselves for excellence in military command” (p. 149).

The United States Marine Corps echoes the findings of Nye in *Warfighting* (1994), where the doctrine states that preparation for war is first dependent upon leaders to be thinkers who are

"students of the art and science of war at all levels" (p. 58) with a firm foundation in and knowledge of military history and the lessons that may be learned from past engagements. A chief realization for USMC leaders to understand and embrace is that training must be conducted at the individual and unit level to promote boldness and initiative. A further responsibility of leaders who prepare their subordinates for war is to "realize that errors by junior leaders stemming from overboldness are a necessary part of learning" (p. 58). Marine officers are thereby instructed to deal leniently with errors, and are ordered to abolish a training mentality that promotes the absence of defect.

The goal for training as described in the warfighting doctrine (1994) is to develop force efficiency, but that is not the primary goal. Rather, realistic scenario-based training is used to teach initiative and build mutual trust between all ranks of the command structure.

An unexpected result yielded from study of *Warfighting* (1994) is that the Marine Corps - arguably possessive of the most disciplined rank structure in the U.S. military – places a great premium post-training evolution critiques that necessarily involve the open and honest opinions of all ranks. The USMC contends that critiques should immediately follow all training evolutions because "critical self-analysis, even after success, is essential to improvement. Their purpose is to draw out the lessons of training" (p. 63). The USMC promotes that members of all ranks participate openly and honestly in critique sessions, and that it is important to not focus on the actions that occurred, but rather why the actions were taken and why specific results were subsequently yielded.

Klein (2003) found that there are three key components of teaching an individual to refine the ability to make rapid intuitive decisions. Klein promoted the use of "premortem exercises" as a means to develop an individual's ability to anticipate problems before they occur

(p. 98). Klein defined these exercises as a way to identify vulnerabilities in any plan. He also found that this exercise was preferable to individuals critiquing their own plans because "When people critique their own plans, they are hoping that they won't find any show-stoppers. Any flaws that can't be fixed" (p. 98). Similarly, when plans are critiqued in a team setting, "people are often reluctant to criticize the ideas of others" (p. 99). According to Klein, the premortem provides not only a format to critique a plan productively, it also teaches through mental simulation that "just because a plan has weaknesses doesn't mean it's a bad plan" (p. 99).

In the premortem exercise, a team examines an idea and focuses on running a mental simulation of the plan's life, imagining problems that might arise and documenting reasons that it might fail. This allows the team to share their relevant expertise and to forecast their understanding of potential difficulties. Once the lists of potential problems are consolidated, the problems are considered relevant to ideas for "avoiding or minimizing" the problems (Klein, 2003, p. 101).

Klein (2003) also found that critiques of intuitive decision making scenarios were invaluable. The decision making critique "is designed to help us review our decisions by getting feedback on the quality of the decisions and the process by which we arrived at them" (p. 58). Klein stated that the goal is to allow the decision maker to reflect on how specific judgments were made – not what specific judgments were made – so that one can see what has worked well and what might have been done differently to garner success. This critique must be very specific, allowing a moderator or instructor to "tunnel insode the incident to examine the trickiest judgments, assessment, and decision that were made, the moments where improvisation might have been needed, where interpretation was required, where missing information had to be filled-in" (p. 60). A goal of the exercise is to dig down to reveal what cues and patterns the decision

maker's subconscious was processing, what decisions resulted, and how lesser and more experienced decision makers might have reacted differently in a similar scenario.

A third method for improving intuitive decision making, according to Klein, is to engage in a coaching relationship with a decision maker who has achieved a superior level of experience. Klein (2003) found that this can be difficult because expert decision makers generally rely on a process that is intuitive and operates mostly at a subconscious level, and therefore can be difficult to articulate. Klein contends, however, that such relationship should be involve a coach that avoids generalizations, but instead burrows into a decision making process relative to a specific event with which the coach has experience. This sort of coaching allows for the clarification of goals, the understanding of cues and patterns, and exposure to expertise.

Performing decision cycles that allows fire crews to move more quickly and effectively that the fires they face was of paramount importance to Major Brezler. He also contended that realistic, scenario-based training that is aligned with the training requirements of *Warfighting* was of great importance to enabling officers and firefighters to be resilient problem solvers and sound makers of rapid tactical decisions under stress. The importance of the former is defined by the necessity to realize that fires in modern construction with modern furnishings grows and moves much faster than many of our current mitigating tactics:

> The good thing that I am seeing is that some people are starting to understand the value of learning a faster cycle. Our incidents today are developing much more rapidly and becoming more time-sensitive, and there is a definite need for us to equip ourselves to out-cycle our enemy (J. Brezler, personal communication, April 19, 2012).

The latter is defined by Brezler as the synergistic effect that mistakes can have on the fireground, where one misstep may sow the seeds of panic in an individual and spread

throughout the organizational structure, effectively changing the orientation of a commander to his incident. Brezler stated that the majority of training in the fire service is not performed under realistic conditions, does not prepare decision makers to be resilient problem solvers, and fails to instill within emergency responders a set of experiences that allow for second-nature, intuitive recall under pressure:

> The problem with the fire service is that we train, but very, very rarely does the training replicate real life. You can climb your aerial ladder 100 or 1,000 times in training when it is sunny and 70 degrees, and you think that you have developed experience to the point that execution of that evolution is second nature. But the fire doesn't happen when it's sunny and 70, it happens in the middle of the night when the wind is howling and its freezing cold and ice is forming on the ladder. Factor in the chaos associated with a fire, and all of a sudden you have a scenario that is much different than the reality in which you've trained, and the skill set you've made in the sunshine isn't the same skill set that it takes to make the roof under much different conditions (J. Brezler, personal communication, April 19, 2012).

Major Brezler also believed that professional reading initiatives were critical to developing within officers and firefighters the ability to make rapid tactical decisions under stress. Brezler deviates from positions held by Nye (1986) in offering that some of the most important reading initiatives for fireground decision makers should focus on academic disciplines outside the fire service, namely research conducted in the fields of business, economics, engineering, and psychology (J. Brezler, personal communication, April 19, 2012).

Brezler contends that the potential make better decision makers is tied directly to the need the fire service has in regards to creating better learners and thinkers. Currently, according to

Brezler, that ability of the fire service to achieve a greater degree of effectiveness is its own failure to recognize and implement progressive ideas, research, and curricula of other professions:

> But I tell guys that we are not going to professionalize the fire service to be on par with the Marine Corps. But we are going to achieve incremental improvement – we are going to raise the bar. I don't know if we'll ever have it in the fire service. I certainly want it to get there, but it goes back to how we learn, and how we learn effects the way we make decisions – decisions across all spectrums of strategy and even tactics. We need to look outside of our own circle for insight and answers to problem sets. (J. Brezler, personal communication, April 19, 2012).

Gasaway also concluded that the fire service needs to revolutionize the way it learns in order to create problem solvers who are effective in high-stress, high-consequence environments. Gasaway laments the fact that most fire service decision making programs skip the important foundational elements and progress immediately to learning specific task level objectives, which are generally not performed in realistic environments or time frames. Gasaway made seven specific recommendations regarding profitable components of a rapid tactical decision making under stress program (R. Gasaway, personal communication, April 26, 2012).

Gasaway said that there is a high degree of importance placed on teaching students to understand the neurological effects that occur when a decision maker is subjected to stress. Gasaway found in his research that people generally are not interested in knowing the neuroscience related to decision making, and he concluded in the interview that people who make tactical decisions under stress must necessarily familiarize themselves with the effect stress has on the cognitive centers of the brain:

> This is the bottom line for the fire service: people can live and die as a result of our decisions; therefore, we have to know the neuroscience behind the decision making process. If you do not understand it, then you are going to be in a vulnerable position at an incident, and something is going to go bad, and you are going to be part of the reason that it went bad, and when it's all done you are going to wonder what the hell happened (R. Gasaway, personal communication, April 26, 2012).

Gasaway also placed a high degree of importance on teaching decision makers what situational awareness is and what the barriers to situational awareness are, but to teach them separately and in sequence. Gasaway stated that he used to teach only barriers to situational awareness, but quickly learned that the omission of teaching students to define situational awareness was like showing them a sequel to a movie they hadn't seen yet (R. Gasaway, personal communication, April 26, 2012).

The researcher asked Gasaway if it was important to teach students in a decision making class about how a subconscious, intuitive decision making process works; Gasaway believed that it was very important. He offered an insight that was similar to what Klein (2003) found regarding the mystical reputation often assigned to intuition:

> The whole point of it is that we need to build a deep knowledge of situational awareness, a deep understanding of intuition, a deep understanding of how we form it, how we trust it, how we figure out what it means, and how we use it to make high-consequence decisions. Otherwise, it is too easy to talk ourselves out of it. And not even that – we aren't even able to talk ourselves into it (R. Gasaway, personal communication, April 26, 2012).

Dr. Gasaway ascribed a high importance to performing decision making scenarios that employ “thin-slicing,” a way of revealing to a student through a series of detailed questions what he subconsciously observed at the point of making a decision:

> Thin slicing is critiquing and evaluating an incident or a training scenario by asking an individual to talk us through what they were thinking as they made every little decision in the process. This allows them to understand that they were subconsciously thinking about far more than they were consciously aware of. You have to press them and force them (R. Gasaway, personal communication, April 26, 2012).

Gasaway contends that this evolution has limitless potential in revealing the intuitive decision making process to the individual, teaching them to recognize it and trust it. In a specific example, Dr. Gasaway shared that he might ask a student who had made a tactical decision based on smoke several specific questions to reveal to the decision maker precisely what numerous cues he had observed about the smoke. The decision maker would then be able to see how subconsciously recognized cues and patterns had been cross-referenced with his experience to produce a single decision, all without the decision maker being consciously aware that any decision making cycle had been utilized.

The survey instrument delivered to ICFD incident commanders asked respondents to ascribe a level of importance to training methodologies designed to increase the ability of ICFD officers to rapid tactical decisions under stress. The survey question assigned a point-value to each response, with “very important” receiving four points, “important” three points, “not very important” two points, and “not important at all” receiving one point. 17 of 19 officers surveyed answered the question, for a response rate of 89.4%. Results of the survey question and their assigned value are located below:

1. Scenario-based training decision making training (3.65 points)
2. Senior officers coaching junior officers (3.65 points)
3. Department training that promotes understanding of the decision making process (3.24 points)
4. Revamp post-incident critique to focus on the decision making process (3.18 points)
5. Utilize the post-incident critiques completed by other shifts as a foundation for training (3.06 points)
6. Professional development reading list (2.94 points)
7. Department training that promotes the decision making methods used by military tacticians (2.88 points)

The results of the literature review, personal interviews, and research survey instrument revealed that there are many methods and models recommended to teach decision makers how to better make rapid tactical decisions under stress.

Developing and refining experience and expertise was critical to Klein (2003), and he found that both intuitive decision making skills and an individual's trust in those skills could be augmented through premortem exercises, decision making critiques, and coaching. Nye (1986) found that developing a vision as thinker-and-doer, gaining technical expertise, and mentoring were all important to developing decision making skills. Nye also said that these three initiatives were predicated on reading for professional development.

Brezler believed that the rapid tactical decision making lessons of the United States Marine Corps had direct application to the fireground, and he cited rapidity of decision making cycles, realistic scenario-based training, and reading for professional development as important factors in preparing rapid tactical decision makers (personal communication, April 26, 2012).

Gasaway identified situational awareness and barriers to it as important components of a decision making curriculum, as well imparting an understanding of neurological, psychological and physical reactions to stress. Gasaway also found that it was important to teach students about the subconscious processes that enable rapid and intuitive tactical decision making under stress, and identified "thin-slicing" exercises as a vehicle to help students "unpackage" the subconscious mechanisms that enabled them to arrive at sound decisions in high-stress, high-consequence environments (personal communication, April 26, 2012).

The ICFD survey instrument identified scenario-based training, officer coaching relationships, decision making theory, post-incident critiques, professional development reading lists, and experiences of military tacticians as being components suitable for use in rapid tactical decision making training.

Discussion

The research revealed that decision making in both the military and the fire service is unique to most decision making paradigms in that sound decisions must be arrived at very quickly in order to produce a suitable outcome. All resources and research instruments indicated either explicitly or implicitly that time was the critical factor in the tactical decision making process. The research revealed that two major models exist for decision making; the Classical Decision Making model was defined by the National Fire Academy's *Decision Making* curriculum (2010) as a model to be employed when the decision maker has "little or no previous experience or training with an incident with the variables that are now present" and that the CDM is rarely suitable to be used in emergency situations because "the classical process is used during evaluation and planning when time is not a factor" (p. 3-9). Klein (2003) stated that the CDM was well-suited for use in laboratory, planning, and research settings, where time is

seldom a factor. The TADMUS study revealed that CDM is utilized only in single-decision events, where all parameters are clearly defined, and the environment surrounding the decision maker is static, with no unpredictable variables or unanticipated changes (Canon-Bowers & Salas, 1998).

These same resources revealed that the Naturalistic Decision Making model was well-suited for rapid tactical decision making under stress. NDM is the way that experts make tactical decisions (NFA, 2010), because NDM allows the decision maker to utilize well-developed adaptive expertise to know what will work and what will not, particularly in rapidly changing and confusing situations where the parameters may remain unclear (Canon-Bowers & Salas, 1998).

Time was of critical importance in defining tactical decision making at every step. The rate at which parameters of a decision making environment changed defined the need for a Naturalistic versus Classical Decision making process. Time was important not only in defining the need for the process, but it was important to the process itself, as TADMUS determined that NDM occurs much more quickly than does CDM (Canon-Bowers & Salas, 1998). While a process reliant on adaptive expertise and experience inherently produces results faster than one based on deliberate and rational analysis, both Klein (2003) and Boyd (Hammond, 2001; see also Coram, 2002; Richards, 2004) agreed that deliberate efforts must be employed to make our own processes run increasingly faster.

The research also revealed that to the rapid tactical decision maker, experience was of equal importance to time. The TADMUS research found that properly developed experience was the factor that enabled a tactical decision maker to determine courses of action in rapidly-changing, stressful situations. The TADMUS researchers concluded that contextual experience

produced adaptive expertise, the key to enabling a reliable process that is both fast and intuitive. TADMUS further concluded that adaptive expertise required that training methodologies for tactical decision makers be reconsidered, as cognitive adaptive expertise can only be developed in a performance-based training context (Canon-Bowers & Salas, 1998).

The results of two personal interviews and the survey instrument revealed that a great deal of continuity exists between how the research subjects valued time and experience compared with the authors and researchers studied in the literature review. Major Brezler reinforced the value of rapid tactical decision making cycles related to time, referring to Klein's Recognition Primed Decision making paradigm, and referencing the importance of Boyd's contributions to decision making and maneuver warfare theory to the infantry company commander (personal communication, April 19, 2012). Gasaway also believed that the spped at which tactical decisions were made was of critical importance, and drew parallels to Klein (2003) when he stated that a well-developed knowledge base can enable a subconscious decision making process that produces an intuitive result before the decision maker could possibly recognize that a process is even at work. Klein's findings were also recalled and reproduced by Gasaway, whereas he stated that it is less important to be cognizant of the steps of the process than it is to trust that the subconscious decision determined by that process (R. Gasaway, personal communication, April 26, 2012).

One of the survey questions asked ICFD incident commanders to identify what sort of process they utilized when making rapid tactical decisions under stress. 6 of 18 respondents, or 33%, identified that they used an intuitive process versus other options that described a Naturalistic Decision Making process. This is significant because it identifies that one in three commanders value a fast and subconscious process without having been exposed to any training

curriculum related to Naturalistic Decision Making or Recognition Primed Decision Making. This sort of question was significant to Klein (2003), because he found that while understanding and trusting the intuitive process was critical, his research determined that the majority of decision makers mistakenly believed that intuition was a mystical concept that could not be trusted, and that they would likely determine that they used a process that employed deliberate and rational analysis of all available information.

One of the most pertinent findings of the research was related to the role that experience plays in determining the speed and effectiveness of a rapid tactical decision making process. Experience formed the foundation of rapid decision making processes, particularly when they were performed under stress. Although experience was the critical factor throughout a rapid tactical decision making process, it was the primary factor which enabled a decision maker to become oriented to a changing environment. TADMUS researchers found that the intuitive Naturalistic Decision Making process was predicated on the recognition of patterns to achieve situational awareness, which was in itself reliant on the decision makers pertinent experiences (Cannon-Bowers & Salas, 1998).

Experience was also critical to Klein (2003), who found that intuitive decision makers were ones who “have experience and are comfortable relying on that experience” (p. 282). Klein also found that the intuitive process was “the way we translate our experiences into action” (2003, p. xiv). Notable military commanders such as Von Clausewitz (1968), Marshall (1978), and Nye (1986), all found that properly developed and pertinent experience was the key factor that would define a commander’s ability to understand his environment and make expert decisions. The failure to recognize cues and patters through experience, Richards found, necessarily led to a corruption of orientation, which would lead to flawed decisions and actions.

These flaws would subsequently lead to break-downs of individuals and groups, the surrender of initiative, and ultimately loss of the conflict (Richards, 2004, p. 66).

Experience was also defined by Brezler and Gasaway as being key factors to rapid tactical decision making. Brezler offered that today's fire service is presented with a glaring problem related to tactical decision making – specifically, that adaptive expertise is being sacrificed in favor of teaching people to not make mistakes. This is identified as a problem in Brezler's view, because the USMC doctrine (Warfighting, 1994), and TADMUS (Cannon-Bowers & Salas, 1998) have both proven that mistakes are guaranteed to happen in high-stress operational environments. The popular paradigm of fire service training for experience, however, is based in teaching people to not make mistakes, rather than develop realistic experience that is rooted in experiencing the consequences of mistakes, subsequently teaching decision makers to be resilient problem solvers (J. Brezler, personal communication, April 19, 2012). Gasaway concurred, citing the fire service proclivity to "train for failure" (R. Gasaway, personal communication, April 26, 2012). Gasaway found that neither instructors nor students realize that the fire service training paradigm is to avoid mistakes. This is especially problematic, according to Gasaway, because "Out of failure, the brain rewires the way it learns in a totally different way, which allows it actually to learn more effectively out of failure" (personal communication, April 26, 2012).

In order to make appropriate use of experiences, the research revealed a continuity of thought in developing critical thinking skills. Nye (1986) was a proponent of creating military officers who spent their career dedicated to recreating themselves into the image of a great and competent military commander, because "To command a military organization is to think and make judgments, employing specialized knowledge and deciding what those commanded will

and will not do" (1986, p. 19). To that end, an officer must be dedicated to the proposition of becoming a "thinker and decider' (p. 130), and Nye's contention was that this is primarily done by reading biographies, military histories, philosophy, and psychology. Marshall (1978) agreed that "it is an anachronism to place the emphasis in training and command primarily on weapons and ground rather than on the nature of man" (p. 39).

The USMC holds similar views for decision makers, contending that combat-based decisions are the product of intuitive recognition skills, analytical savvy, and creative abilities to devise acceptable outcomes. Synthesizing these abilities into a cohesive decision making process "is the product of experience, education, intelligence, boldness, perception, and character" (Warfighting, 1994, p. 89). An officer should develop and augment these abilities by understanding that the profession of combat arms is a thinking profession over all else; therefore the USMC requires that officers be "students of the art and science of war at all levels – tactical, operational, and strategic – with a solid foundation in military theory and a knowledge of military history and the timeless lessons to be gained from it" (p. 58). One of the primary means an officer can achieve these requirements, and thereby become established as a critical thinker, is by personal study in the Marine Corps' professional development reading list (Coram, 2002).

Brezler also held that reading was an important component of developing adaptive experience, as well as the critical and analytical skills of a rapid tactical decision maker. He stated that fire service decision makers would better their decision making ability by reading books about business, engineering, finance, sociology and psychology – books that he contends "have nothing to do with the fire service, but have everything to do with the fire service" (personal communication, April 19, 2012). Brezler found it profitable as an infantry commander in Fallujah to require his Marines to select and read books, subsequently requiring them to give

presentations to their peers in order to share the knowledge gleaned, thereby augmenting personal experience that was utilized for decision making.

Gasaway also believed that reading was an important way to train decision makers, identifying findings of learning research as a way to improve cognitive capabilities and decision making abilities. Gasaway stated that when the brain files away experiences in areas that will subsequently be subconsciously accessed during rapid decision making evolutions, real experiences cannot be delineated from vividly imagined fiction. Gasaway explained that when reading about situations where high-stress, high-consequence decisions were made, a reader could allow someone else's experiences to be catalogued as their own, if a reader would endeavor to imagine that they were subject to the same environment and decision making variables that were presented in the writings. In this manner, according to Gasaway, a decision maker with relatively little experience might significantly augment their own database of adaptive expertise simply by reading reports of firefighter close-calls or line-of-duty-deaths (personal communication, April 26, 2012)

The research continued to define experience and expertise as concepts whose importance to rapid tactical decision making could not be overstated. The literature identified Boyd as the most influential figure since Sun Tzu related to battlefield tactics and making decisions under fire (Coram, 2002). Central to Boyd's research was the idea of experience. As with Klein (2002) and TADMUS (Cannon-Bowers & Salas, 1998), Boyd's OODA Loop for rapid tactical decision making under stress was wholly dependent upon an individual's ability to orient themselves to their changing situation and environment (Boyd, 1992; see also Boyd, 2010; Hammond, 2001; Coram 2002; Richards 2004). Their orientation was predicated upon the ability to observe important cues and patterns which were subconsciously cross-referenced with personal

experience to allow orientation to take place. Experience also played a critical role in the orientation phase in terms of understanding the implications that cultural traditions, genetic heritage, new information, analysis and synthesis had on the decision maker's situational awareness (Boyd, 2010, p. 3).

Experience was not only important to Boyd in terms of application to the specific steps of the decision cycle, however. Boyd placed great emphasis upon the key attributes of the German *Blitzkrieg*, and found that they were foundational to building an organization that decentralized tactical decision making and possessed flexibility based on mutual trust and understanding (Coram, 2002). Experience had its greatest application in terms of *fingerspitzengefühl*, which may be best translated as "mutual trust" (Coram, 2002, p. 334). Although not explicitly identified by the German term, *fingerspitzengefühl* was referred to in the abstract by Sun Tzu, Laurence of Arabia, Von Clausewitz, Napoleon, Nye, and Marshall. Richards (2004) defines *fingerspitzengefühl* as the hallmark of intuitive skill, in that it is "literally a fingertip feeling or sensation. . .usually translated as 'intuitive skill or knowledge.' It provides its owner as uncanny insight into confusing and chaotic situations and is often described as the 'ability to feel the battle'" (p. 54).

Another key attribute of the *Blitzkrieg* that was important to Boyd's research was defined by the German term *schwerpunkt*. This concept is defined as "the main focus of effort" (Coram, 2002, p. 334). The direct translation of the term literally means "hard/difficult point" (Richards, 2004, p. 57), but indicates "any focus or concept that gives focus and direction to our efforts" (p. 57). The true significance of *schwerpunkt* is that it allows for decentralized decision making (Coram, 2002). Once the main focus of the effort is identified, it becomes imperative for all members of the organization to direct and support operations in such a way that the main

objective is achieved. When first introduced by Boyd, the American military found this to be a difficult concept, because it promoted subordinates throughout the organization to use intuition and initiative to seize opportunities that supported the main focus. This was a break from the military culture that stifled creativity and did not promote subordinate initiative on the battlefield (Coram, 2002). Richards, however, defines the importance of *schwerpunkt* to Boyd's theories because it is a powerful tool for motivating subordinates, and allows them to override standing orders to achieve the focus of the mission when conditions change. *Schwerpunkt* allows subordinates to understand the intent of their commander, which gives them reassurance that creativity is supported even if it defies previous orders, so long as it helps achieve the main focus of effort. Even when conditions change and a novel reality exists in conflict, it allows the organization to harmonize its effort and converge on the goal, where otherwise a shift in orientation might have led to chaos and subsequent defeat (Richards, 2004).

The synthesis of *fingerspitzengefühl* and *schwerpunkt* helped to promote a third *Blitzkrieg* characteristic called *Einheit. Einheit* may be defined as trust, unity, cohesion, harmony, oneness, or "mutual trust between the members of the organization" (Richards, 2004, p. 101). Mutual trust is also foundational to a rapid tactical decision cycle, according to Richards, "Because it is the internal harmony that converts a mob into a team. For this reason, it underlies all the other components of a competitive organizational culture" (p. 101). Boyd found that mutual trust was a key factor in harmonizing all parts of an operation to achieve victory in conflict, primarily because it increased the speed and effectiveness of decision making cycles. This is due to the fact that an organization comprised of individuals who have mutual trust practice implicit communication, which occurs much faster than explicit communication. Also, an *einheit* environment allows and encourages the use of intuitive decision making and personal initiative.

The effectiveness of this environment is augmented because subordinates can practice initiative without fear of reprisal, and supervisors trust that initiative so long as it is geared toward achieving or supporting the mission's focus (Richards, 2004).

Boyd found experience to be the foundational characteristic for decision makers because enabled a fast and effective judgment process for rapid tactical decisions under stress, and also built a foundation upon which *schwerpunkt* and *einheit* could be fostered. The *Blitzkrieg* principles enables a faster decision making tempo at even the lowest levels of the organization, and execute the speed of action by promoting low-level initiative, adaptability, and implicit communication. The effectiveness that these characteristics have in promoting rapid decision making skills is fostered by an atmosphere of mutual trust.

The literature review revealed that realistic scenario-based training was the best way to build experience and adaptive expertise (Klein, 2003; see also Cannon-Bowers & Salas, 1998; Weick, 1993). Brezler was a proponent of professional reading initiatives, realistic scenario-based training, and training scenarios that focus on allowing realistic mistakes to occur in order to create resilient problem solvers in stressful conditions (personal communication, April 19, 2012). Gasaway found that training scenarios as described by Brezler were important in creating rapid tactical decision makers. Gasaway also found that it was important to teach decision makers the fundamentals of and barriers to situational awareness, as well as the psychophysical effects experienced by decision makers when subjected to high-stress, high-consequence decision making environments. The review of firefighter near-miss reports and NIOSH line-of-duty-death reports was also a fundamental element in training because it had the capability to create expertise and subsequently facilitate rapid tactical decision making in stressful environments (personal communication, April 26, 2012).

One of the survey questions asked of ICFD incident commanders was: How do you generally make rapid tactical decisions under stress? 18 of 19 survey subjects answered the question. 6 respondents representing 33 percent answered that they make decisions intuitively, which implies a Naturalistic Decision Making model. 8 respondents representing 44 percent answered that they make decisions based on selecting the best option from all available options, which implies a Classical Decision Making model. 6 respondents representing 33 percent answered that they make decisions by following ICFD Operational Guidelines, which also represents a Classical Decision Making model.

A similar question asked ICFD incident commanders which model for rapid tactical decision making under stress was most important for officers to cultivate. The results were very similar to the previous question. 6 of 18 respondents representing 33% identified intuitive decision making as the decision model that should be cultivated. 9 of 19 respondents representing 50% identified deliberate and rational analysis of all information as the model of choice, while 3 respondents, or 17% identified decision making in obedience to ICFD operational guidelines as the model of choice.

This research project revealed that the majority of officers may practice and promote the use of a Classical Decision Making model, which was identified by the literature review as not suited for fireground operations (Klein, 2003; see also Cannon-Bowers & Salas, 1998; National Fire Academy, 2010). Further, Gasaway indicated that the fire service has instituted an over-abundance of policies and guidelines which is problematic in that fire and emergency operations rarely, if ever, comply to static parameters defined by these documents (R. Gasaway, personal communication, April 26, 2012).

Klein (2003) found that decision makers who have not been taught about Naturalistic Decision Making and Recognition Primed Decision Making are not likely to recognize its value, relegating the urgings of intuition to mysticism and magic. Klein found that these decision makers would likely assume that they used a Classical Decision Making model, when in truth a great majority of their decisions were made intuitively. While the survey identifies the possibility that as many as 77% of ICFD incident commanders use a decision model not suited for emergency situations, the possibility also exists, as identified by Klein, that some ICFD commanders identify deliberate and rational analysis as the decision making model of choice because, to them, "the whole things sounds very comforting. Who would not want to be thorough, systematic, rational, and scientific" (2003, p. 20)? To this end, many of these commanders may simply believe that they use a deliberate and rational model, when in fact they rely on their experience and intuition to make the vast majority of judgments under stress. More research is required to determine to what degree the intuitive decision making process is used by ICFD incident commanders.

A final survey question posed to ICFD incident commanders asked what training initiatives should be used to prepare officers to make rapid tactical decisions under stress. 17 of 19 commanders surveyed answered the question. The most popular initiatives were (a) senior officers coaching junior officers, and (b) scenario based decision making drills. For both initiatives, 11 of 17 respondents representing 64.7% identified the initiatives as very important, while 6 of 17 representing 35% identified the initiatives as important. The second most important training initiative was identified as training that promotes understanding of the decision making process, with 4 of 17 or 23.5% identifying it as very important, while 13 of 17 of 76.5% identified it as important. Other initiatives identified at lower levels of importance were

professional development reading list, training that promotes the experiences of military tacticians, and post-incident critiques focusing on decision making.

Of interest to the researcher was the low number of incident commanders that identified intuitive decision making as something that was profitable to both themselves and the department. The results of the survey should not generate alarm, however, as the ICFD has had no training curriculum specifically designed to teach rapid tactical decision making under stress during the researcher's tenure, which spans 11 years. Whereas Klein (2003) cites the examples of his original focus group of firefighters as being unable to identify that they used any decision making model at all, it remains a distinct possibility that all command officers use some form of intuitive decision making while remaining unaware. Gasaway also believed that the survey questions revealed a problem so long as the survey respondents had no background in the fundamentals of recognition primed decision making and its associated term definitions.

The research results related to the survey instrument were also both surprising and encouraging to the research. It was an unexpected result to find that ICFD commanders valued coaching relationships highly, which may define an environment where Boyd's characteristic of mutual trust might flourish. Further, the identification of training initiatives that promote understanding of the decision making process was an unexpected result. The fire service as a whole, and particularly the ICFD, tends toward hands-on learning, often to the detriment of didactic and academic training initiatives. The research revealed, particularly in the contentions of Klein (2003), Boyd (Hammond, 2001; see also Coram, 2002; Richards, 2004) and Gasaway (personal communication, April 26, 2012) that an understanding of the subconscious processes is critical to augmenting and speeding-up rapid tactical decision making skills. ICFD officers have,

through this survey instrument, conveyed their support for learning these theories in order to become more effective decision makers.

The problem identified by the researcher was that the officers of the Iowa City Fire Department are not trained to make rapid tactical decisions during stressful emergency operations. The purpose of the research was to determine what methodologies should be used to train Iowa City Fire Department officers in rapid tactical decision making under stress. This research project determined a clearly defined need for the Iowa City Fire Department to develop and institute a training program that teaches decision makers how to augment, trust, and rapidly execute intuitive decision making cycles in stressful environments. As identified by Gasaway (personal communication, April 26, 2012), break-downs in situational awareness and rapid tactical decision making are the chief contributing factor in firefighter close-calls and line-of-duty-deaths. The research determined that it is imperative for the ICFD to implement a training model based on the findings of this research project in order to produce timely, refined and informed decisions on the fireground that are based in experience and expertise. The survey instrument revealed a disparity in decision making models that ICFD commanders valued and employed, which could translate to inconsistent applications on the scenes of emergencies. Further, allowing inappropriate decision making models to be used compromises the safety of both civilians and firefighters, and is not in keeping with the mission statement of the Iowa City Fire Department, which is *the mission of the Iowa City Fire Department is to protect our community by providing progressive, high-quality emergency and preventive services* (Iowa City Fire Department, 2010).

Recommendations

The results of this Applied Research Project substantiated the researcher's contention that the officers of the Iowa City Fire Department are not appropriately trained to make rapid tactical decisions under stress. The findings satisfied the purpose of the research, which was to determine what methodologies should be used to train officers of the Iowa City Fire Department to make rapid tactical decisions under stress. In accordance with the purpose of this research project, the following recommendations are submitted:

1. Clearly define the similarities between making rapid tactical decisions on the fireground and making rapid tactical decisions in warfare, in order to validate research findings of the military.
2. Instruct ICFD personnel in the definitions and machinations of Classical Decision Making, Naturalistic Decision Making, and Recognition Primed Decision Making.
3. Instruct ICFD personnel the components and concepts of maneuver warfare as it relates to rapid tactical decision making, with special emphasis on the German *Blitzkrieg's fingerspitzengefühl, schwerpunkt, and einheit.*
4. Develop a training program to thoroughly instruct ICFD personnel about Colonel John Boyd's O-O-D-A Loop.
5. Because many topical authorities identify the O-O-D-A Loop as the favored model for making rapid decisions in any form of conflict, instruct ICFD personnel how to develop and use the O-O-D-A Loop for rapid tactical decision making applications while under stress.

6. Develop a training program to teach ICFD personnel the change in nuerological function – and subsequent effect to decision making capabilities – when placed under stress.
7. In accordance with Klein's research, develop and utilize decision making exercises (DMX), to include the use of pre-mortem exercises.
8. Refine the ICFD post-incident critique to implement a focus on how and why company officers arrived at rapid decisions made under stress.
9. Institute realistic, scenario-based training with post-training critiques as a way to build adaptive experience that will enhance intuitive decision making.
10. Develop a comprehensive professional development reading list for each rank. Consider tying professional development reading requirements into annual performance evaluations and/or the ICFD's General Policy on promotions.
11. So long as firefighter safety is not compromised, adjust the ICFD training philosophy from one of "mistake-free" training, to one where mistakes are allowed to happen, so that resilient problem solvers are developed and better prepared for inevitable mistakes on the fireground.
12. While outside of the researcher's scope of influence, a final recommendation is for the a national fire service organization such as the IAFF, IAFC, NFA, or USFA to develop and maintain a database of fire departments that have developed and utilize a training program for rapid tactical decision making under stress.

The Iowa City Fire Department is a professional organization that is dedicated to providing progressive and high-quality emergency and preventive services. The thoughtful design and careful implementation of a training program that is based on the findings of this

research project is appropriate, responsible, and directly related to the mission of the ICFD and the greater fire service, as well as the operational objectives of the United States Fire Administration. It is this researcher's contention that adoption of these recommendations will significantly augment the ability of fire officers to make rapid tactical decisions under stress, thereby enhancing the safety of firefighters operating in austere conditions, while providing the citizens of and visitors to Iowa City a higher level of emergency response services.

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Appendix A

Personal Interview

April 19, 2012

Major Jason Brezler, USMC & Firefighter, FDNY Squad 252

Indianapolis, IN

Note: this appendix represents the content of a personal interview between the researcher and the interview subject. Results may not be reproduced without the expressed consent of the interview subject.

1. In the fire service, how do we train our people to create a cohesion where we possess the characteristics of maneuver warfare and the Blitzkrieg: understanding of intent, mutual trust, and implicit direction that will create good rapid tactical decision makers?

We expect our people to train to a standard that demands that when at a fire, they operate to perfection. We say perfect practice makes perfect execution. And then we say that what we are trying to do is train people to reduce the number of mistakes that they make at fires. Yes – and no. The survivalist in me, when I look at all the research, particularly my favorite thing is the inverted U-curve. Once you fall off the peak, all bets are off. You can be an experienced climber with 25 years' experience, and on Mt. Everest you just walk off the mountain – all bets are off. "You are not here now" as they say in the Corps. You are somewhere else, right? Totally off the reservation.

So, we are most likely to make mistakes at fires that are not routine, where there is a situation that you have never experienced, and we haven't had the training that allows us to replicate that situation. Once I fall off the back of the curve, or slip to the back side, the entire

incident starts to back-up on you. It creates uncertainty, and if I am panicking it creates more stress for the Chief in the street, and it can go either way. The Chief in the street can perceive something to be there that might not be there. It can be real or imagined, and now he starts to come off the back side of the curve, and move the entire incident into a different reality. He can start to deploy resources and make decisions that move that entire incident to the bad side of the curve. Similar to the notion we have that everyone on the scene is a safety officer – that anyone can call a time out – anyone can also really start to move the operation out of the ideal range on that curve.

So we have this notion that if we train folks that we are going to be able to erase mistakes. For instance, we could say that we made a mistake at this fire – like we didn't stretch enough lengths, or we had a burst length, and we didn't deal with it, so we need to do it different next time. We are looking at it the wrong way. What research says is that mistakes are inevitable. Part of the problem is that we want to train folks to minimize mistakes, but under stress – and I don't care if they have one year, or they have 35 years – they are likely to make mistakes. They are most likely to miss transmissions. They are very likely to have tunnel vision. They are likely to do all of these things. So, in our training, we try to train folks to make no mistakes, and then because of that the same folks are embarrassed to make mistakes. Folks absolutely do not want to make mistakes.

So we're looking at it the wrong way. We want to train Chiefs to accept the fact that mistakes will be made. They don't have to be happy about it. But we have to make them realize that mistakes will be made, and to realize that it isn't the fact that mistakes are being made on the fire ground that is hurting us. What is hurting us is that mistakes are being made and we are unable to correct the mistakes and minimize their effect in a timely fashion. But we are

convinced that the “culture of safety” tells us that if we train correctly, that we won’t make the mistakes. But we don’t even train correctly, and everyone I talk to seems to know that.

If we have a fire at 0300, and it’s cold and it’s windy, and we send a guy to the roof – what he do when the smoke banks down on the roof? What will he do? The answer is that we don’t know what he will do because he has never been in that situation before, because we don’t train in those situations. We only train in maneuvers on the roof when it is sunny and 70 degrees. So he has never been in that situation before. The answer is that he is probably going to walk, he might fall, he might crawl, but I don’t know because there is no empirical evidence to substantiate that. So I see that there is a huge hazard in this, and the guy that is blind on the roof is at risk, his safety is at risk.

I say that we have firefighters that crawl around rooms with their mask blacked out. Why can’t we do that on the roof in the middle of the day? These are things that I don’t believe we think about enough – how to train ourselves to be able to handle novel situations. This is just one particular example but when it comes to mistakes, I believe we are all at fault for thinking that if we train perfectly we will erase mistakes. I also believe that this gives a false sense of security that will make us even less likely to be able to mitigate the effect of mistakes when they do happen.

Chapter 1 of USMC Warfighting, coupled with everything else that’s out there, tells us that mistakes are inevitable, because of the Murphy’s Law factor alone. We train for the routine fire, and the routine fire is not the best example to base our training on. At a routine fire, everyone is in the sweet spot on the curve – everyone knows what to do and things really don’t go wrong very much. But if the incident changes a little bit and gets out of that sweet spot, we become both more likely to make mistakes and less likely to be able to fix them quickly when

they happen. We just need to break the cycle and move our focus away from avoiding mistakes to being able to correct them when they happen, so everyone's decision making cycle doesn't start to immediately break down.

The good thing that I am seeing is that some people are starting to understand the value of learning a faster cycle. Our incidents today are developing much more rapidly and becoming more time-sensitive, and there is a definite need for us to equip ourselves to out-cycle our enemy. But we are much more deliberate, particularly because the ICS system is somewhat rigid and disallows intuitive decision making at all levels – people feel they need to be told to do something by the Incident Commander. The problem with that is that our enemy has a big head start on us and is gaining initiative while we try to understand the situation, and our enemy doesn't need orders from anybody. He simply lets himself and the building instantly determine what is best for him. But we need to see the value in getting our cycle in front of our enemy's cycle. We also need to be better at realizing that when we pull up and conditions are so bad that we know that we can't compete with the enemy's cycle – just like walking into an ambush in war – we need to realize that there is no way that we will out-cycle the fire and that we will lose if we try. In those situations we need to accept the fact that we just need to take a defensive posture and live to fight another day.

One thing I think that is fascinating – and definitely pertinent to most chiefs – is an appreciation for time. I think cell phones have had a lot to do with this because nobody wears watches anymore, they just look at their cell phones, and we are losing an appreciation for time – especially on the fire ground. Though we know on the inverted U-curve that when you start to move to either side from center that time gets really distorted. People have no idea what 20 minutes feels like because stressors really distort their orientation related to time.

One pertinent example as it applies to me was in Fallujah when the province was without a doubt the most dangerous place on Earth. We knew that we had no chance of winning unless we could gain the support of the locals. Research and experience had shown us that people didn't join the insurgency for philosophical reasons or because they were militant. They joined the insurgency because they were destitute, desperate, and because their world was in shambles.

The Marines were charged with receiving, guarding, and delivering large quantities of the Iraqi currency. The logic behind all of that was that we needed the currency to be in the hands of people that could use it to better themselves and the country, and we knew that if we didn't guard it that the insurgency would seize it, and they would grow stronger at the same time that the people that we wanted to help – and needed them to help us – would grow weaker. So we would set-up locations to deliver the money, and we knew that we had a brief window to conduct an operation that involved many large crates of currency. We had to do each operation in less than 20 minutes, do you know why? Because in 20 minutes the insurgency could figure out where we were and deploy snipers to kill our Marines.

I knew I couldn't keep track of time at the same time I commanded the operation, so I had my radio man give me "hacks" every few minutes. "Sir, 5 minute hack; sir, 15 minute hack, sir 18 minutes on the objective - it's time to go." This is just like we do at the FDNY. My radio man was a Corporal, but he knew my intent and had an appreciation for why the time on objective was important to me, and to our Marines. One time, right as we packed up and got out right at the 20 minute mark my vehicle took sniper fire. There is definitely a lack of appreciation for time as it relates to space and resources, which are our other two important elements of success in tactical decision making.

With that said, I do a tactical decision making class. I give the students a scenario with a tactical decision game. I have them work through a scenario. The results are different when you go to different places where they don't go to as many fires. I mean, in the FDNY we go to fires regularly, but that's not the case when you go to some other places, so people respond to tactical exercises differently. It isn't that they're not good firemen – they are – but it is just a matter of tempo. Some people don't always function at tactical decision making that well, and that's why we train.

In most instances, there perspectives are to narrow. It seems like even relative to their environments and their departments, they are sort of short-sighted. It is almost like they are just pulling stuff; they're just shooting from the hip, as we say in the Corps, on these tactical exercises. So what I do is I talk to them about Col. Boyd, I talk to them about USMC Warfighting, and I give them this model called "time, space, resources." I teach this model because every decision you make tactically is governed by three things: time in the protracted sense, the spatial component, and resources.

After I explain the appreciation for time, as it relates to the enemy and our competing decision cycles, and I explain the importance of space and resources using the "bank scenario" with my 20 minute mark, I give them a problem and a diagram with those three components listed in columns. I ask them to write down whatever comes to mind as being related to one or more of those three categories. They scribble a bunch of answers and I ask them to determine what their course of action is. It is a very simple model, but there is a requirement for a great deal of deeper thought related to all of these things, and thinking repeatedly about time, space, and resources makes them better at doing it intuitively.

2. How do you define the importance of reading in developing expertise?

Yes. Education is wasted on the youth, man. I was really, really lucky. I went to one of the best schools in the country when I was fortunate enough to attend the United States Naval Academy. The instructors – I mean, wow. Admiral Rowe, when he had just finished being the Chairman of the Joint Chiefs of Staff was one of my professors. One of my professors clerked for William Rehnquist. Unfortunately, when you're 19 or 20 you're just trying to survive at the Naval Academy, and all the resources in the world are available to you; all you have to do is ask and anyone there will bend over backwards to help you learn whatever you want to learn.

Most of it though – I couldn't connect it to real life. I would sit in Physics and I would ask myself what I was doing in the classroom. I only knew that I wanted to be a Marine officer or I wanted to be a firefighter, and I couldn't see how Physics had anything to do with that. 16 years later, I work in FDNY Special Operations, and all I want to do is go back and sit in that same class. I feel like after having some experience in life, I am much more motivated and inspired to go back and become a student of too many things. I love to read history, I love to read about the military, I love to read about decision making and psychology, I like to read about terrorism, and now I have this thing where I love to read about engineering as it applies to the fire service. Building construction, too, is something I love to read about.

There is nothing better than coming back around with a little experience and looking to refine it and looking to shape it with a book. I will find that I read a book that maybe doesn't particularly motivate me, but then I have or build some experience that makes me want to go back to some of those ideas in that book and look at them in a new way. It can really give you a different perspective.

The fire service – it's sad about our professional reading program, because we don't have one. We don't have one. It's unfortunate, and here's my line: I think about a guy like Gonzalez

who wrote *Deep Survival*, right? About Gonzalez and this book, I tell folks that this book has absolutely nothing to do with the fire service, but it has everything to do with the fire service. And I get confused looks. If people will read it, they will understand.

I had a Lieutenant in Squad 252 that got promoted to Captain. He is a former Marine, and he just got promoted to Captain and took a four-week Captain's course at FDNY. He is a great guy, a great asset; he's been in the department 22 years. So I asked him how much decision making, how much psychology of decision making under stress, how much human factors he got in his four-week course. I mean, this is stuff that is in the Corporal's Course in the Marines, you know? I asked him how much he got in the Captain's curriculum. You know what he said? He said that they didn't do anything like that.

I asked him if they learned how the brain responds to stress, or how to make decisions under stress, or if they saw any case studies of decision making under stress? He told me that they didn't have anything like that. He said their course was technical, it was bureaucratic, it was legal, it was liability. In four weeks of training New York City fire captains they covered all of this, and they covered safety and strategy, but you know what they didn't teach guys? They didn't teach them how to think. And this surprises me because this is the best fire department in the world; it is the most professional fire department in the world, but the question is what are we doing? And what does this say for the rest of the fire service? We are paying guys to make decisions, but then we aren't even opening any doors.

I think about this, and I think about a lot of the books that are being sold by Pennwell at FDIC that are great, but sometimes the things that they teach are very task-oriented, they're generally New York-centric or Los Angeles-centric and they may not even apply to how we do things in our own departments, let alone the rest of the fire service. And I think, where the

importance is concerned, that if I wanted to make a difference I would get a table at FDIC and I would sell Gonzalez' book, I would sell Gladwell's book, I would sell a book by Connerman called *Thinking Fast and Slow* that just came out. I would sell ten books, that seem to have nothing to do with the fire service but in reality have everything to do with the fire service, and when a chief walks by I would say "Hey, do me a favor. Read this book, and if you don't get anything out of it, I'll pay for it myself."

I tell guys that, too. Guys that are really into the job and want to do good, they ask me what they should read. I tell them to thumb through the *New York Times* every week and find the list of the best fiction and non-fiction. I tell them to look down the list and find two that might seem like they are even remotely related to what we do. Even like *A Bridge Too Far*. I tell them to just grab it and read it. I tell them to go the *Harvard Business Review* or the Harvard Business School and see what these people are reading. Those books seem like they have nothing to do with the fire service, but in reality they have everything to do with the fire service. Because do you know what they do at the Harvard Business School? Of course there's the quantitative piece, and the economy stuff, but they teach people how. They teach people how to do what? They teach people how to think. They teach people how to think outside of boundaries.

I tell people that I want to run an officer's academy for the fire service where we could take the guys away from a training academy, and I wouldn't even have to put their hands on any tools. I would put their hands on books.

The people I tell this to tell me that I wouldn't be teaching these officers anything about the fire floor. I have a very contrary opinion to that, because I know that I could teach them more about themselves and more about decision making and more about leadership and about all the factors that are laid out in Chapter One of USMC Warfighting. With books I could teach them

about their environment and how to be comfortable in that environment, and they would go back to their respective departments better than they would if I gave them a week-long class on ventilation or any other topic. Because now I've given them something. I hate this cliché, but the disappointing thing about the fire service is that we are giving people fish. We need to teach them how to fish.

If I was running a Lieutenant's course for the FDNY, or better yet a Chief's course, I would tell them that each of them needed to pick a book related to engineering, one related to building construction, and one related to economics – all relevant to today's fire service – and you're going to read it, write a series of notes, and do a 20 minute hip-pocket class. So what happens is that everybody essentially gets to read those books. Everybody gets to read more than 20 books, while only really reading three.

This is exactly what I used to do with Marines. There is so much stuff out there related to counter-insurgency in Iraq, and I assigned each Marine to read one book and give a 20 minute presentation. In the end then, every Marine in the platoon was exposed to more than 30 books. What I found is that some Marines read more than one, because they were learning something. My point is that we have to look outside of fire service publications. We need to look at business and psychology, because they are looking far beyond their respective fields.

I ran into this problem two years ago when I started my research. You know, by Marine Corps standards I am very old. By fire service, people want to know what this 33 year-old kid has to teach, because I've been in the fire service seven years while everyone around me has been in for 30 years. That's great though – I'll respect their seniority and I'll respect their experience and I'll respect their authority. But I can't help but think what would happen if the business world were like the fire service – parochial to a fault – held that the only person that

could impact the organization were the people that had been there 30 years? Fortune 500 companies wouldn't be Fortune 500 companies. Relying exclusively on the voices of the most senior in terms of years and experience to influence the organization could be a huge mistake. Some fire departments still only promote leaders based exclusively on seniority. All of the leadership and all of the policy-makers are the people that have been there the longest. That can have tragic consequences. We have to value people who are smart, and allow them to contribute. Smart people read. Smart people get smarter by reading.

Reading? It's all linked to decision making, time, space, resources, and all of that. But the reading piece is so important. But sometimes I get frustrated. This is maybe a little more philosophical, but I'm getting my Master's Degree at Oklahoma State – I'm almost done. They created this fine Fire and Emergency Management Program, right? So it's basically an MPA, but it's called Fire and Emergency Management.

I used to be a big advocate of it – I thought it was a great idea. At the end of the day, the scope of the fire service and emergency management is too narrow to really justify an academic discipline of its own. Everything we have is borrowed from Political Science, Sociologists, Psychologists and Economists, more or less, and a little bit from Engineering. But we are not really a stand-alone discipline that can be justified. It's almost like the academic programs or curriculum managers are trying to justify their own existence.

If I had it to do all over again, I would have just gone to a decent school and gotten an MPA. Because in the programs that we have, you might have a professor with a PhD in Political Science, and he's teaching Emergency Management. He's not an emergency manager. So what are they doing? They are teaching us to think critically, and how to apply some of that rigorous research, both qualitative and quantitative research, to improving and advancing our field.

The debate we have all the time, guys from all over the country, surrounds the question about if the fire service is a profession or is it an occupation? And the challenge that we have is that as much as you and I would like to professionalize it, I am of the belief that, at the end of the day, the fire service is an occupation. It really is an occupation. We don't have any academic journals per se, where you could write an article and I could write a rebuttal. There is no peer review. We can only agree to disagree, and try to have a mutual level of respect, but there is no level of accountability for anything of a proprietary nature. People steal ideas and presentations from each other all the time, and there is no accountability for that. We either disagree and go our separate ways or we agree and steal each other's stuff, and there is no development through rebuttal or peer review, no rigor. So we are just perpetuating the idea that we not a stand-alone profession.

I don't know what's going on with the other trades. The cops certainly tend to be a little more professional. I'm thinking of little things, like the way they use data. The way they collect, analyze, and apply data to make decisions is light years ahead of the fire service. They respond to data. Almost to a fault, but they do it like the military. They send more cops into areas where data reflects there is more crime. Yet we have neighborhoods where they have one fire a year and neighborhoods where they have a fire every day, but if we talk about reducing staffing in the one to increase staffing in the other, our people tell us that we absolutely cannot do that. I don't have the same number of Marines in every province in Afghanistan; I have them in three provinces that where the majority of the bad guys are.

But I tell guys that we are not going to professionalize the fire service to be on par with the Marine Corps. But we are going to achieve incremental improvement – we are going to raise the bar. I don't know if we'll ever have it in the fire service. I certainly want it to get there, but it

goes back to how we learn, and how we learn effects the way we make decisions – decisions across all spectrums of strategy and even tactics. We need to look outside of our own circle for insight and answers to problem sets. And that is sort of a limiting factor, because at the end of the day a guy who is a truckie in a really busy truck company is no different than the guy who is an iron worker, welding and fabricating buildings all day. At the end of the day he does his job, and does the best he is able to do, but he maybe isn't too interested in what psychologists say about what his brain is thinking when he is forcing a door at 0300 when it's 20 below. But back to the question about reading, it's a cliché but it is true: reading is absolutely fundamental. There are a million books that need to be in firefighter's hands, but they aren't because they seem to have nothing to do with the fire service. But in reality, they have everything to do with the fire service.

3. For officers that have little relative experience, or have developed poor experience over time, should their rapid tactical decision making skills be predicated on first learning tactical and task-level proficiency, or can the two skill sets be developed simultaneously?

A few of the most prolific and influential leaders in the FDNY in the 70's and 80's and one Captain in particular – used to say that you could learn this job at any rank. A couple of weeks ago I was in Chicago with my godfather John Viggiano – the Marine from Rescue 2 – he said that through the course of his career he has seen a lot of guys who weren't necessarily very good Lieutenants or Captains turned out to be very good – very good – Chiefs. So where am I going with all of this?

What it communicates from folks who would know is that there is evidence to support the notion that you can learn a job at any rank, and that you can learn a job while you are in that rank. Now take the Marine Corps model, and you might ask how you could lead infantrymen if

you were never an infantryman yourself? Well, because what happens is that over a short period of time I am exposed to the technical and tactical pieces, but I am being trained simultaneously to make decisions in that same window of time.

Conversely, one of the problems we have as leaders is that sometimes they have trouble transitioning from being an operator to being a decision maker. So they revert back to what they knew in their old position, and they get fixated solely on the tactical pieces and forego monitoring the environment and observing cues that would be more beneficial to understanding their relationship to the incident, and miss out on the things that would be beneficial to management of the incident.

Now, I understand that the staffing in the FDNY is a luxury. I understand that as an officer where you're from, you don't have the luxury of not being on the line and not having a tool in your hand. I get that – that's a luxury that we enjoy on the FDNY. So our organizational culture regresses to the point that we dismiss the fact that an officer is forgetting about his officer duties, and running off to be a fireman – because he is conditioned to a fault. But I do think that you can take a company officer who maybe wasn't a firefighter for very long – well, I see it all the time. People who are new truck company officers and spent 20 years working on an engine company, yet they're excellent truck company officers. And their ability to adapt in that comes back to their ability to make rapid tactical decisions. This includes being able to assimilate information, to assimilate to their environment in such a way that they observe everything that they need to in order to make good decisions.

At the core of it is the guy who is a truck company officer who was an engine company firefighter – he might come across a type of door that he has never forced. He may have never come across a door like that, so it's a totally new experience for him. But you know what? He's

got guys with him that might have a much better idea how to force that door than he does. But what's more important is he understands the operation and the environment, and he understands the commander's intent. To be specific, he understands control, and knows that if they lose control of the door that it is going to be extremely hard for the engine to put water on the fire. So although he is now in a different position in the decision making matrix, I'm not so worried about the technical aptitude, as long as he is surrounded by people that possess it to a degree, and he is able and willing to create training opportunities for his team to home their craft and skills, I think that is good enough. Some of the decision making is there, some of the technical and tactical proficiency is there, but they will develop simultaneously. And if he is willing to recognize that he has thinkers and doers around him that he can trust, then there's no reason to worry.

We talk about this all the time in the Marine Corps. My platoon sergeant was an operator. He was a combat engineer, he'd been in the Gulf War, he knew about demolition and building construction. I was a 22 year-old Lieutenant with no experience who was green behind the ears. I didn't know anything about building construction, and I had no tactical experience whatsoever. So I relied heavily on those around me while I learned the things I needed to know to be a capable officer. In any situation where lack of experience or technical expertise is identified as a liability, we need to aggressively create training opportunities that are based on realism. That's the only way to compensate for it.

The problem with the fire service is that we train, but very, very rarely does the training replicate real life. You can climb your aerial ladder 100 or 1,000 times in training when it is sunny and 70 degrees, and you think that you have developed experience to the point that execution of that evolution is second nature. But the fire doesn't happen when it's sunny and 70,

it happens in the middle of the night when the wind is howling and its freezing cold and ice is forming on the ladder. Factor in the chaos associated with a fire, and all of a sudden you have a scenario that is much different than the reality in which you've trained, and the skill set you've made in the sunshine isn't the same skill set that it takes to make the roof under much different conditions.

We have to train in realistic conditions, and that is really part of the key that will allow a decision maker to lead an effective team and have a positive influence on a hostile environment. Even simple little things that we might take for granted in training when we are climbing our ladder. There's no hazardous atmosphere in training, right? So we don't need to wear our SCBA in training. Wrong. Climb the ladder with no SCBA and trip, and it might be easy to regain positive control. But try it at a fire when you have your SCBA on, and your center of mass is different, and you're not going to fall forward like you did in training – you might fall backward.

Or take another scenario: I ask guys all the time when I teach a class, what do we wear on our hands when we go to a fire? Well, we wear structural firefighting gloves. What do wear on our hands when we train? Well, we wear extrication gloves or work gloves. Why? Comfort, or because we can get away with it. These are little things we are talking about as examples, but what it defines is a lack of discipline in our culture. But what is exciting is when you create a culture that self-polices. If you create that culture it breeds a level of accountability, and accountability breeds trust, and these are things that have to be present to facilitate rapid tactical decision making. I know we're kind of all over the place, but those are some things to think about when creating a training program for someone who is short on experience.

4. What are 5 important resources to use when creating a training program to enhance rapid tactical decision making under stress?

So this is exciting because it is about qualitative and quantitative stuff; its all methods. The ten mandatory books are John Boyd, which you've read, Warfighting, which you've read, Outliers – I recommend you read that. Moneyball is one, because Billy Beane challenged the framework of the establishment and swam upstream to create a new paradigm in baseball that changed every aspect of the game. On Combat, by Grossman. Warrior Mindset, by a guy named Micheal Askin. Brute, by Coram, about Krulak, who was Marine Commandant when you were in, and who really changed doctrine to align with Boyd. When you talk about decision making – when you read the closest book that replicates modern day theory of war, conduct of war, rapid tactical decision making, is Black Hawk Down. Those guys fell prey to complacency, and it has some great lessons for the fire service and is very pertinent to your research. One that just came out is Thinking Fast and Slow. Great book. You definitely need to read it augment your research. This book is an incredible amount of work and research about thinking, and it is just awesome. And it has unlimited application to the fire service.

5. In terms of furthering exploring this topic in future research projects, what would you recommend as the next step?

I would counsel you to find one or two decision makers in the fire service whom you trust, guys that have proven themselves, and kind of develop your own process for dissecting their decision making process. Really get in there and spend some time with them and dissect and reveal what enables them to make decisions when everything is coming down around them. Most people will tell you that they don't know, because they just make decisions. But that is because of intuition and recognition-primed decision making. But you need to get in there and walk through a certain fire or a certain event and really try to reveal step-by-step what cues they

observed, what their intuition told them, how their training helped them, and identify their process.

Appendix B

Personal Interview

April 26, 2012

Dr. Richard Gassaway, EFO, CFO

Note: this appendix represents the content of a personal interview between the researcher and the interview subject. Results may not be reproduced without the expressed consent of the interview subject.

1. When we are talking about creating a training program to increase situational awareness and better enable people to make rapid tactical decisions under stress, we can talk about assimilating cues that lead to better situational awareness and decision making, and we can talk about identifying barriers to the process. Are they different, and how do you define the importance of teaching people to recognize barriers?

I think the programs are distinctly different, and when I teach them I present them as distinctly different programs. It takes me a whole day to teach someone what situational awareness is, related to making a high-stress, high-consequence decision – that takes an entire day. When I began, it took me another entire day to teach the barriers to situational awareness and decision making under stress, and I have found it necessary to transition that to a two-day program.

When I first developed this program, I used to teach only the barriers to situational awareness, but people weren't getting it. Which is to say that it was like I was showing them a sequel to a movie when they didn't see the first one in the series. I couldn't figure out why the barriers to situational awareness made perfect sense to me, but didn't seem to be making a lot of

sense to these students. I knew I was doing a good job of explaining the material, but it didn't seem that they students were able to upload it. I realized then that the problem was that I had not laid the groundwork of helping them to understand the things that are happening in a high-stress, high-consequence environment, and the process for making a rapid tactical decision, and the process for maintaining situational awareness. Only after we have an understanding of the foundation do the barriers start to make sense.

For instance, if I said to you that staffing is a barrier to situational awareness, you might reply that you could see how staffing might be a barrier to implementations of good strategy and good tactics, but that you couldn't understand how staffing could be a barrier to situational awareness. So if I would try my best to explain it to you without understanding the foundational material of situational awareness and decision making, you would get frustrated and have an incomplete understanding. So I had to stop trying to teach barriers without first teaching the foundations of decision making. I now have to teach the program in three days, rather than the one day in which I used to try to teach it.

The first and foremost thing is getting people to understand on a deep level what happens under stress, how to make a high-stress, high-consequence decision while they are under that stress, and how to use situational awareness to make good decisions under stress. Then and only then can we start to talk about the barriers to that process and start to unpackage the program to a point where people are really going to get it.

2. My literature review has revealed processes for making rapid tactical decisions under stress, and my understanding is that the most effective and efficient models rely heavily on intuition. If our subconscious is managing these processes without us being aware that it is taking

place, do you believe that it is important to teach students about the subconscious process in an effort to improve rapid tactical decision making under stress?

Yes I do. If you don't, it all seems too mystical and magical – almost unbelievable. In fact, in my programs I have come to learn that if I tell people what is going to happen to them in a high-stress situation, they would deny it. So I have to submit them to a scenario where something happens to them and their process, and then I show it to them. Subsequently, they want to know how it happened to them.

I think that it is important to build a deep knowledge when we are trying to understand something as visceral as situational awareness. And when I say visceral what I really mean is mystical. I ask people all the time to tell me the definition of situational awareness. The best answer I can ever get, even in the class I taught this morning, is that situational awareness means to pay attention.

In the recruit class that I taught this morning for a large fire department, I asked the recruits to define situational awareness. They couldn't, and I told them all to look in the glossary of the firefighting manual that they had before them, and see if situational awareness was in the book. They turned to the glossary, and they found situational awareness, and that the definition of situational awareness was "the ability to have an awareness of your surroundings." Heck of a lot of good that is. How do you define a term by using the term to define itself?

So these students came to the conclusion that they could maintain situational awareness so long as they were aware of their surroundings. They thought that wouldn't be too difficult, so I expose them to some simple scenarios that quickly have them in a situation where they don't know which direction is up. They were totally dumbfounded at the cues that were right in front of their faces that they weren't able to observe.

The whole point of it is that we need to build a deep knowledge of situational awareness, a deep understanding of intuition, a deep understanding of how we form it, how we trust it, how we figure out what it means, and how we use it to make high-consequence decisions. Otherwise, it is too easy to talk ourselves out of it. And not even that – we aren't even able to talk ourselves into it. I think it is amazing that the reason that this topic is finding so much popularity in the fire service is that I am teaching what this stuff really means, and they have never known it. I have people that have been in the fire service 30 years that come to me after a class and really explain their frustration that they have had every type of command training available, and nobody has ever taught them this stuff. And I tell them not to feel bad because nobody ever taught it to me either – I stumbled on it completely by accident. And I didn't find it within the fire service; I found it somewhere else entirely. The way I feel is that I was in the candy store looking for a Snickers bar, and instead found a Wonka bar with a million dollar gold wrapper around it.

Understanding the process of building and trusting and using our intuition is so important, because the belief has been for a long time that intuition is some mystical thing. When we are on the scene of an emergency, we certainly don't want to believe that our decisions are based on something that is mystical or magical or unexplainable.

It is too important to have the deep knowledge. The analogy that I use is that you can teach someone to run a pump by telling them to pull this lever and this lever and turn this handle. But if you really want them to be a good pump operator, you have to give them a deep understanding of what is happening behind the pump panel, how to calculate friction loss, about appliances and streams and volume and all of that stuff. Then they have deep knowledge, and then you have a talented pump operator, because they not only understand how to pull the knob, they understand all of the factors at play in the pump delivering water to the nozzle. Then they

are able to see and understand problems, and recognize how to prevent the problem, or how to fix it quickly once it occurs. They become a resilient problem solver who takes care of bad things on the fly, because they have a deep knowledge, and for them everything is connected and they understand what it all means. That is what I am trying to do with situational awareness and the process for making a rapid tactical decision under stress is giving people the connection of the thoughts before they ever have to go out on the scene, so when they get there they really understand why it all makes sense to do it that way. I don't want then to think it is mystical. I'm frustrated that so many people think it is, but they think it is because they don't understand it. They don't know what situational awareness is, but they'll certainly know when they lose it.

3. Is it important to teach people about their psychological and physical reactions to stress in order to better enable them to make rapid tactical decisions under pressure?

Absolutely. If you don't know what is going to happen to you under stress, there is no way you will be able to manage it. It's hard enough to manage yourself under stress when you know what is going to happen to you.

In some of the exercises I use to teach, if I told you what was going to happen to you as the exercise progressed, you would absolutely deny it. Invariably I do the exercise, what I predicted and you denied actually happened, and then you are very willing to listen because I have your attention. If people don't understand the psychology behind it, then their understanding just reverts back to the belief that it is all just some inherent magical stuff.

Now you call it psychology, and I call it neuroscience. The bottom line is that we don't understand how the brain works. That's not part of any of our education, and currently the only way that someone understands neuroscience is if they studied neuroscience in college. Nobody is teaching us this stuff, and for the most part people go through life totally content that they don't

know it – it isn't on most people's 'got-to-know' list. People think that they need to know how to drive their car, and they need to know how to brush their teeth, but they are convinced that they really don't need to know about neuroscience. And the truth is that you probably don't need to know about neuroscience, unless you happen to be in a position to make high-consequence decisions under stress. This is the bottom line for the fire service: people can live and die as a result of our decisions; therefore, we have to know the neuroscience behind the decision making process. If you do not understand it, then you are going to be in a vulnerable position at an incident, and something is going to go bad, and you are going to be part of the reason that it went bad, and when it's all done you are going to wonder what the hell happened.

People like this, who have suffered something tragic that they don't understand, hire me to come in and tell them what went wrong and why they didn't see it coming. After I tell them, they want to know where the hell I was with my lessons before the tragedy happened.

You know, the barriers to situational awareness are nothing more than a tide of neuroscience of the things that make us human and impact our ability to pay attention. There is some really good neuroscience out there that explains for us why firefighters under stress do what appear to be some really dumb things. But when you start to unpack it from the perspective of neuroscience, it actually isn't dumb at all. It is predictable.

Nothing frustrates me more than a firefighter who watches a video of a fireground and says "well, that was stupid!' Really? What he thinks is stupid isn't stupid at all – it's predictable. From the neuroscience standpoint we can tell you exactly what is going to happen to your body and your senses and your awareness under stress. Now, every outcome on a fireground isn't predictable, and many times an incident isn't very predictable. But I can tell you what is predictable, and that is human behavior.

For instance, if we don't have an understanding of the neuroscience, then we can't understand the degree to which our understanding and our performance starts to fail when an incident gets a little bit outside of what we're used to. In fact, the more we find victory – the more we perform well while operating in our 'sweet spot' – the harder we're going to fall when something happens to move that incident outside of our 'sweet spot.' If we've gotten into a very comfortable and confident mindset at incidents, because we have always found success when we do things like this, sometimes the mistakes that occur when we got outside of that comfort zone can be the best learning experiences.

I do webinars and classes on training for failure – in fact this morning I was talking with the firefighters in Asheville about training for failure. I have a dozen examples of where firefighters were trained to fail, and they don't know it, and their instructors don't know it either. The only time we realize that this is taking place is when a firefighter does something dumb, and we fail to realize that he has been trained to fail, but we define it as the firefighter simply doing something dumb. In fact, the firefighter was trained to do something dumb, and the problem is that when we train firefighters, we train them to find success. We don't let them fail. Fundamentally, by protecting them from failure we are hurting them.

Out of failure, the brain rewires the way it learns in a totally different way, which allows it actually to learn more effectively out of failure. You've probably heard people say that they have learned more in life from making mistakes than from doing things correctly, and those lessons have stuck with them. That's because the brain learns from mistakes and from doing things wrong. Training for perfection circumvents that process, and when a firefighter gets proficient at something, you have to build some challenge and failure into the exercise. You have to create some situation that moves the incident out of their 'sweet spot' and makes them think

and act in a different way. Tell your trainees that you are going to do it – you don't have to be secretive or mean-spirited about it – just tell them that whatever they are going to do in this scenario will not work. Tell them that no matter what they do this incident is going to progress rapidly to failure, and you are just going to simulate a bad day – because out of that you learn a different way than you learn when you are having success.

Now, in learning we don't start with having failure. We need to start by building clusters of success, but then we need to progress to where we encounter failures, and that is exactly how you build resilient problem solvers. We talk about how we don't know what to do when the incident migrates out of our 'sweet spot,' but the truth is that our understanding isn't compromised because the incident changed – we're compromised because we're not resilient problem solvers. We know how to solve SOP's, because the fire service is SOP'd right to death. We have great SOP's and we train on them right to perfection – now if we could just get the fire to follow the SOP we would never have a problem.

4. Intuition and the speed with which we assimilate and process information is critical to success in rapid tactical decision making. If we are consciously thinking about a process when we are making decisions, are we creating a barrier for ourselves?

I think it could be, but I wouldn't encourage someone to consciously think about the process. In other words, as I teach someone about the process, I don't want them out there reciting in their mind the steps of the process. I want them to understand that what their mind is doing is running the process so quickly that it has been done before the person could possibly bring it into consciousness. It is happening tacitly, intuitively at a subconscious level. So I don't want people thinking about the steps of the RPD process, or the OODA Loop, I just want them to know how their mind is making decisions so they know that it isn't a mystery.

The one thing I do want them to do is I want them to know all three levels of situational awareness. In my program, I want them to be able to recite how they develop and maintain situational awareness. In other words, I should be able to walk up to anyone at an incident scene and ask them what are the three levels of situational awareness, and are they doing them right now. And they should be able to cite the three levels and be consciously aware – and neuroscience calls this meta-awareness – and they should be aware if their situational awareness is strong or flawed. I don't want them to be thinking about the decision making steps, but I do want them thinking about the situational awareness steps, because situational awareness can slip away – especially when you're busy at an incident. Expert-level decision makers probably don't even need to think about maintaining situational awareness, because it is second-nature to them. But a developing commander, or someone who doesn't see a lot of incidents – they don't know how to do that intuitively, and they are going to get bit really hard in the ass if they don't pay close attention to consciously maintaining situational awareness.

5. In the USMC, fatalities are classified as either 'hostile' or 'non-hostile.' This helps to define the context in which the death occurred, and it is something we do not do in the fire service. After researching the topic extensively, could you make a generalization about what percentage of 'hostile' line-of-duty-deaths – those that exclude medical emergencies and apparatus collisions – can claim a compromised rapid tactical decision making process as a contributing factor?

I would say almost 100 percent. The only time that I think that situational awareness cannot be implicated is when something occurs that is so novel, so unpredictable, that no one – even the best-of-the-best experts, could have anticipated it. For instance, you are inside a structure fire attacking the fire and an airplane falls out of the sky onto the house and kills two

firefighters. Situational awareness had nothing to do with that, because no one is going to watch the sky to see if an airplane is going to crash into the house.

Maybe that isn't a good example, but there's an example where a guy was jogging on a beach in South Carolina, and he had his iPod ear buds in and couldn't hear the airplane behind him that was in distress and making an emergency landing on the beach. The plane landed on him and killed him, but you could never say that there was flawed situational awareness on behalf of the runner.

When I look at an incident, the only time that I think that flawed situational cannot be implicated is when a situation is so unique, or so novel, that a reasonable expert could not have made the prediction of the event occurring. But this is very rare.

6. If good intuition is predicated on good experience and profitable experience, and opportunities to gain realistic experience are waning in my fire department, what is the value of professional development reading as a component of developing expertise?

Well, it depends on what they're reading. If what they are reading is helping to develop expertise, then it is extremely important. Two things here – say I'm reading book on fireground strategy and tactics. When I get to the incident scene, that might help me be a better strategic decision maker, or a better tactical decision maker, but you can't really say that it is necessarily going to improve my intuition. What is going to improve my intuition – if I'm looking for something to read – is to look for a way to cheat the system since we're not having many fires anymore. Is there a way to game the system so that I can gain expertise without going to the fire? The answer is yes. The answer is yes.

You might ask me if I'm speculating that the answer is yes. No, this is based on neuroscience research, and I'll tell you how, and then you can go and find all of the science

behind it yourself. The thing that we've learned about the human brain is that it stores experiences for future use, and that is what primes intuitive rapid tactical decision making. The brain cannot distinguish from vividly imagined fiction, okay? That is why when you are watching a scary movie and you get immersed in it, you might jump or scream when something frightening happens. Why? The movie is fictitious, and you know that there isn't anything coming off of that movie screen that is going to hurt you. But your brain can't distinguish, in the moment that it is occurring, whether what you are seeing is real or fictional. The more real it thinks it is, the more likely it is to store that experience in your memory as something that can be intuitively recalled later, when you need it.

We use case studies, near-misses, line-of-duty-deaths and videos to train firefighters, but there is a trick to this. Let's use LODD's as an example. A firefighter who reads a LODD report won't learn as much if they read it while maintaining a distance, or pure objectivity. When they read it, they need to make it personal. When they read about a LODD, if they look at the death and the circumstances by imagining that it happened to one of their co-workers, if they visualize it by trying to place themselves there and trying to make it real, the brain stores it exactly like it was a real experience. So we can actually accelerate our knowledge base with vivid imagination.

We can do this with simulation – that's why the more robust and realistic the simulation is great at training us. Because it takes a situation that is not real, but tries to make it appear real to us. The more real it appears to us, the more likely the brain is going to store it away as if it were a real experience. We can do it also without having physical stimulation too. When you are reading something, you have to visualize it as real, and put yourself in the mindset that it is real to you. We've all done it – we read a book that really has us engrossed, and we feel that

whatever the main character is experiencing is what we are experiencing. If you make whatever you are reading personal to you, then it will turn into a realistic experience for you.

The fault with reading about the bad experiences of others in the fire service is a matter of perspective. We read about someone else making a mistake that proved costly, and we all too often want to sit in judgment and criticize that person for being stupid. When we change our perspective and try to understand the environment in which the mistake happened, the challenges that were present, and try to understand what could have led a certain individual to select a certain course of action, we can change our perspective and realize that the same thing might have happened to us in a similar situation.

Now I don't think you can do the same with a strategy and tactics book, unless within the book there are actually experiences of real people in real situations being shared. If you can make it emotional and you can make it personal by buying-in to whatever you are reading, you will create for yourself an experience that goes into your slide tray. Your slide tray then is what primes intuition and enables your decision making process that Gary Klein and all of the neuroscientists talk about. You can definitely put more slides into your tray by reading, and if it is done correctly, it definitely works. But if you can't try to create an emotionally charged experience, then slides never make it into your tray.

7. What training models or methods do you believe are most effective in teaching rapid tactical decision making?

First is having the foundation of understanding high-stress decision making and the fundamentals of situational awareness. I think that is the stuff that is always skipped, you know? Most want to skip right to the point of teaching you how to stretch a hoseline and what door to take it through. Many training curriculums like Blue Card are all based on sets and repetitions,

and that's great, but it skips all of the foundational stuff about rapid tactical decision making, and so it really leaves the student missing the point. I'm not dissing on other programs because they present stuff that it essential for training, but where they skip the foundational stuff about decision making it's like building a house on sinking sand instead of on a solid foundation. So starting with understanding stress and stress effects and situational awareness is the first step of it.

Next we need to start with small incidents where we apply strategic and tactical foundational material to. Not SA and decision making stuff, but basic stuff about hoseline selection and placement, how and when to ventilate and here is why. Essentially, we're just crawling. We're talking about fundamentally why and how we do each of the coordinated steps at an emergency, and fundamentally why we would not do this and why we would not do that. Then we can work our way into very basic scenarios one at a time and try to define what we might do and how we might do it to achieve success.

As we work through these scenarios it is important to do something called 'thin slicing.' Thin slicing is critiquing and evaluating an incident or a training scenario by asking an individual to talk us through what they were thinking as they made every little decision in the process. This allows them to understand that they were subconsciously thinking about far more than they were consciously aware of. You have to press them and force them. If they made a decision based on the response that they were looking at the smoke, you have to ask them what about the smoke. And you have to ask them and ask them until you have thin sliced it to the point that they tell you that they were looking at the color, density, volume, turbulence and color of the smoke. And then you can continue to ask them what those all mean to them. Now their subconscious processed all of that information and synthesized a decision almost instantaneously, and it might take 15

minutes of asking questions to make them understand how much information their brain processed in an instant when they weren't even aware that their brain was doing anything.

This thin slicing allows them to see what they were really thinking about, when on a superficial level all they would have told you that they made a particular decision based on the smoke. What was every little piece of information that made you believe that your action was the right thing to do, and what was every piece of information that led them to believe that another action was the wrong thing to do. If you help them unpackage the mysterious process, then you can teach them what they know, and that might surprise them.

Even when Klein did his research of firefighters, he asked them to identify how they arrived at a decision, and they told him that they didn't know how – they just knew what to do. They couldn't even unpackage it. They didn't even know how to tell Klein how they knew what they knew. It dumbfounded them because they couldn't explain it and they couldn't identify a process – they just knew. They weren't consciously aware of the subconscious processes that were happening in their brain. If you are trying to get these young officers and commanders and develop their expertise and decision making skills under stress, give them rapid decisions but then thin slice their decisions almost frame-by-frame for the duration of the incident. Ask them what they were thinking here, what they were thinking when this happened, what they were thinking when you heard this on the radio? What did it mean to you?

This can be a frustrating process for them, because they might not even know how to answer the question. But you have to keep digging and asking them to think about it and talk about it.

8. How would you quantify the impact that this research is currently having on the fire service, relative to its potential?

Great question. I don't know how to quantify it. There are a couple of reasons why, mainly because I don't know what the standard of measure would be. I could say that when there is a reduction in the LODD reports that I'll know quantitatively that the reason is that we have better situational awareness. I really wish I could say that, but I can't.

Even in the firefighter Near Miss Reporting System, where you can list situational awareness as a contributing factor, and it is currently the leading contributing factor, even if I saw a reduction in that statistic, I'm not sure that I could make a connection between that result and increased situational awareness in the fire service. I honestly believe that some people in the Near Miss Reporting System check the situational awareness box without even understanding what situational awareness is. In fact, if I could watch somebody check the box I would ask them why they checked situational awareness – to break it down and define it for me. I don't know that they would know what to say. They don't know what they don't know. When it comes to situational awareness, they are unconsciously incompetent – they don't even know what they don't know about it. They just check the box for situational awareness because if there had been situational awareness the incident never would have happened. So it must be. Well, not necessarily.

But how can we fix the problem when we don't even know which ones of the 116 barriers to situational awareness are causing us the greatest problems? My study sheds a little light on it, but it is only one study. One study doesn't make it – none of us can ever bank all of our knowledge on the findings of one study. In fact, if someone else were to replicate my study, they might come up with completely different results.

So, it's hard to quantify. Anecdotally, which is not necessarily science or quantification, I have a lot of people – a lot of people – calling me, sending me e-mails, texting me, telling me

that what I taught them made a difference on a fire they had today. People tell me that they had better situational awareness because of what I taught them. Have I ever even quantified how many people have ever told me that? No, I haven't. In fact, I think if I do a class with a hundred people, and I helped 20, I would be lucky if 1 of them reached out to me to tell them that it made a difference.

With that said, there have been enough that have given me that feedback that it motivates me and energizes me to continue carrying that message; pushing a heavy rock up a steep hill so to speak. But that's all anecdotal; I don't have any evidence to quantify the impact. If someone wanted to get scientific with me and ask for statistical data to prove that what I am doing is making a difference – well, I don't have that statistical data. I have the lived experience of people telling me that what I am teaching is making a difference, and the people that keep hiring me and re-hiring me to come in and teach. Because they wouldn't spend the kind of money it takes to have me come in if they didn't think that it was making a difference. Not quantitative, again, it's all anecdotal.

9. In my survey of ICFD officers, I selected about 30 of your barriers that I believe exist commonly on the firegrounds of my fire department. The barriers were assigned categories of increasing frequency and severity, and officers were asked to identify which barriers they encountered, how frequently, and whether the barrier was significant or insignificant. The majority of responses indicated that officers believe the barriers they encounter are manageable and do not occur frequently. Might you assume that this represents an under-appreciation for barriers that could compromise future incidents?

I think it is possible that, if you didn't take the time to explain to them and teach them what a barrier really is, they might not have an understanding of what a barrier is, and might not

be able to really appreciate how much a barrier can impact them, okay? So, how a barrier effects a decision making scenario is really an odd concept that your subjects probably can't get their arms around very well.

Before I did my research, I taught my participants in my research about what a barrier meant. So when we talked about barriers throughout the research, they understood what a barrier meant and what it meant to be impacted by them. So, there is a chance that they simply don't understand the concept of barriers. There is a chance that they simply aren't that good. Now you work with them, you can draw your own conclusion about that.

There are also commanders who are good enough that they can pretty easily overcome most barriers, because they understand their potential shortcomings and they are able to be resilient problem solvers, and they are very talented commanders. So also, maybe you don't have a problem; maybe you have an organization that is very good. So we can't always go to the negative – maybe there are positives. Maybe your department has invested the right time and effort and resources to teach situational awareness and rapid tactical decision making under stress so that when your officers are at incident scenes, they perform very well.

You have to be the judge of that. If you think they actually have been flawed by these barriers, then maybe they didn't understand the question. Maybe they thought that admitting it would be risky, that there would be consequences to admitting it. You know, many people are in denial as well – they have barriers dancing all around them at an incident that they just can't see?

Did I show you the basketball passing video in the class at FDIC? *Dr. Gassaway describes a video that depicts a phenomena called 'inattention blindness.' The research experiment shows several students milling about in a loose circle, passing a basketball. Midway through the video, a person dressed in a gorilla suit walks slowly to the center of the group,*

pounds his fists on his chest, stands there for several seconds, and then walks off the stage. The majority of people who watch the video with the intent of counting passes never see the gorilla – even when the ball is passed to someone who is standing directly behind the gorilla.

Good, so you know what I'm talking about. Well, somebody who doesn't see the gorilla in the video, okay? When you tell someone that they just watched a video on a ten-foot screen, and a gorilla walked right out into the middle of the picture and stood there, and the person didn't see it even though they were looking right at it – well, people can't believe it happened. So you have to go back and show them that the gorilla actually was there, and they were looking right at it with a great amount of concentration, but they never saw it. We know they were concentrating because they were counting passes. We know if they were counting passes that they were looking right at the gorilla, because the ball is passed to someone that is directly behind the gorilla. But they never even knew he was there. So some people have gorillas dancing all around in front of their faces at incident scenes, and can be completely unaware of it.

Some officers and commanders don't see the gorillas in front of their face because they aren't having near-misses, they aren't having injuries, they aren't having fatalities – so they get comfortable that they know what they're doing. But it isn't that they are that good; it's that they are lucky. This is where I was my entire career. I commanded thousands of incidents with gorillas dancing all around me, but I thought I must be pretty good because I never got anybody hurt or killed. But then I went and read the neuroscience and it scared the hell out of me. It made me realize that I wasn't good, I was just lucky. This might be the case with your commanders – I don't know. Maybe they aren't good, maybe they are lucky. This can happen – a person can have so much success doing things the wrong way, but they've never had a bad outcome so they start

to think that their success, based on luck, is actually a skill set. It isn't a skill set, it is just luck that hasn't run out on you yet.

10. Should the fire service be paying more attention to the decision making lessons that are coming out of the military?

I think so, because the military has the money to do the research. This is exactly where I got turned on to it in looking at military medicine and aviation, because there was absolutely nothing coming from the fire service on situational awareness and rapid tactical decision making under stress.

The stuff the military is doing? Man! If we had their money, we could throw our money away. I don't mean that disrespectfully of course – my son is a Marine and I think that the military deserves their budget. But when it comes to resources, the military knocks our socks off. We can't even dream of competing with them with the things that they are learning. And the things that they are learning they are applying.

Unfortunately, when I use military examples in some of my classes, some firefighters tell me that they are nice analogies, but that 'we want something that is relevant to the fireground.' Really? Does anyone really think that a soldier getting shot at in a high-stress, high-consequence situation that could cost him his life isn't the same as a firefighter inside of a building that is on fire? That is naïve if you don't think that we're talking about the exact same thing.

How about a pilot who is trying not to crash his airplane because the engine flamed out? Do you think that he isn't having to make high-stress, high-consequence decisions that are the exact same as the ones you are having to make at a fire scene? That is naïve.

Appendix C

Survey Questionnaire

1. In your command style, do you use explicit order (ie: what, why, when, how) or implicit orders (ie: what)?

    A. Explicit

    B. Implicit

    C. Mostly explicit, but sometimes implicit

    D. Mostly implicit, but sometimes explicit

2. When giving orders in a stressful situation, do you believe it is important for your subordinates to know why something must be achieved?

    A. Yes

    B. No

3. Which do you believe is generally most true about the ICFD?

    A. Officers are able to satisfy tactical priorities because we have built an effective routine at emergency scenes.

    B. Officers are able to satisfy tactical priorities because they have been well-trained to follow the orders of the Incident Commander.

    C. Officers are able to satisfy tactical priorities because they understand the intent behind my orders.

4. On emergency scenes, do you manage experienced officers differently than inexperienced ones?

    A. Yes

    B. No

5. If you answered yes to the last question, what do you do? You may choose more than one answer.

   A. Issue orders more explicitly

   B. Watch them more closely

   C. Expect updates more frequently

6. In your experience, which decision making model do officers most often use when making rapid tactical decisions under stress?

   A. Intuitively

   B. By selecting the best option from all available options

   C. By following ICFD Operational Guidelines

7. How do YOU generally make rapid tactical decisions under stress?

   A. Analyze all information available to me and arrive at a decision

   B. Consider all feasible options and choose the best one

   C. Compare 2 feasible options and choose the best one

   D. Intuitively choose a single course

8. Which decision making model do you think is most important for officers to cultivate for use when making rapid tactical decisions under stress?

   A. Making sound tactical decisions intuitively

   B. Making sound tactical decisions by deliberate, rational analysis

   C. Making sound tactical decisions by remaining obedient to ICFD Operational Guidelines

9. Which do you believe is more true about an officer's ability to make rapid tactical decisions under stress?

A. It is an inherent trait

B. It can be taught and learned

10. In your experience at rapidly-escalating incidents, which decision cycle usually provides for the best outcome?

A. A rapid decision cycle that results in an acceptable course of action, even when better options may exist

B. A slower decision cycle that results in the best possible course of action

11. Subject to your own experience, please rate the following factors in terms of how great a barrier they are to your decision making process at escalating incidents. For the purposes of this question, please consider an escalating incident to be any emergency where, in your estimation, the initial tactical assignment of the first three arriving companies will be insufficient to bring the incident under control.

Data - trouble managing accountability

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Data - too much information

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Data - too little information

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Data - trouble maintaining situational awareness

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Data - inability to gauge the passage of time

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Stress - feeling pressure

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Stress - feeling worried

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Stress - feeling confused

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Experience - my own inexperience

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Experience - the inexperience of company officers or acting officers

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Experience - trying to anticipate what will happen in the future

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Experience - unfamiliarity with the capabilities of mutual-aid companies

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Staffing - not enough people

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Staffing - too many people

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Staffing - worried about city coverage and other calls while managing an incident

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Staffing - inability to expand ICS without removing people from the fire ground

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - monitoring more than one radio channel

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - balancing verbal and radio communication

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - insufficient updates from officers

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - too many updates from officers

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - missed radio traffic

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - can't understand radio traffic from interior

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

Communication - malfunctioning radio equipment

A. Rarely experienced; manageable barrier

B. Sometimes experienced; manageable barrier

C. Routinely experienced; manageable barrier

D. Rarely experienced; significant barrier

E. Sometimes experienced; significant barrier

F. Routinely experienced; significant barrier

12. Do you believe that the current ICFD training curriculum allows you to augment your expertise in rapid tactical decision making?

A. Yes

B. No

C. Somewhat (please comment)

13. Do you believe that all officers on the ICFD are committed to enhancing their ability to make rapid tactical decisions under stress?

A. Yes

B. No

C. Generally Yes (please comment)

D. Generally No (please comment)

14. Do you believe the ICFD offers adequate resources to prepare officers to make rapid tactical decisions under stress?

    A. Yes

    B. No

    C. I don't know (please comment)

15. Do you think that ICFD post-incident critiques focus appropriately on how and why officers made specific decisions?

    A. Yes

    B. No

    C. Yes, with exception (please comment)

    D. No, with exception (please comment)

16. In ICFD post-incident critiques, which is given more attention?

    A. An examination of why and how decisions were made

    B. A review of the actions and reactions that occurred as a result of the decision making process

17. The ICFD post-incident critique COULD BE a very effective tool in teaching members to be better makers of rapid tactical decisions under stress.

    A. Strongly agree

    B. Agree somewhat

    C. Strongly disagree

    D. Disagree somewhat

18. The ICFD post-incident critique IS a very effective tool in teaching members to make rapid tactical decisions under stress.

A. Strongly agree

B. Agree somewhat

C. Strongly disagree

D. Disagree somewhat

19. In your opinion, which of the following components should be used to prepare officers to make rapid tactical decision under stress? You may assign the same level of importance to more than one option.

Professional development reading list

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Senior officers coaching junior officers

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Revamp post-incident critique to focus on the decision making process

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Scenario-based decision making training

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Department training that promotes understanding of the decision making process

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Department training that promotes the decision making methods used by military tacticians

A. Extremely important

B. Important

C. Not very important

D. Not important at all

Utilizing the post-incident critiques completed by other shifts as a foundation for training

A. Extremely important

B. Important

C. Not very important

D. Not important at all