CREW
RESOURCE MANAGEMENT

A positive change for the fire service

★ ACKNOWLEDGMENTS ★

Third Edition.

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Featured photographers:

Jocelyn Augustino
Roman Bas
Andrea Booher
Chauncey Bowers
Bryan Day
Tim Syzmanski

Special contributor:

Carl Peterson, NFPA

INTRODUCTION

No one intentionally sets out to commit an error. Captain Edward J. Smith was diligently working to validate the White Star Lines' claims that the ship under his command, Titanic, was the largest, fastest, safest liner in the world. The ship's vaunted invincibility lulled Smith and the ship's crew into a false sense of security as it traversed the North Atlantic on its fateful maiden voyage. Nor did the incident commander at Boston's tragic Vendome fire intentionally leave his personnel in harm's way. However human behavior patterns suggest that the most well intentioned, best-trained, consistently performing individuals and work groups commit errors. Some of these errors are miniscule in scope and have little or no impact on events. Others are calamitous. The purpose of this manual is to introduce a concept to the fire service that will spark a top-to-bottom behavioral change in the way we approach our work.

We know that accidents are not just random occurrences. People cause accidents and make errors. The concept introduced in this manual has a proven history in reducing errors in two industries (aviation and military) with parallel work group structures. Welcome to your first exposure to breaking the unacceptable death and injury rate stalemate that has plagued the fire service for the last 12 years. Be prepared to adopt and implement a paradigm approach to error, injury and fatality prevention. Welcome to Crew Resource Management.

Tragic Watersheds

On July 1, 1988, the Hackensack (N.J.) Fire Department responded to a fire in the service bay area of the Hackensack Ford dealership. Arriving units found a well-developed fire in the bowstring truss space above the service bay area. A recall of off-duty personnel was initiated to provide additional resources. Understaffed crews fought the fire for a period of time before being ordered to retreat. A catastrophic collapse occurred before the crews could exit the building. Three firefighters were killed in the initial collapse. Two other firefighters were trapped in a concrete block room used to secure mechanics' tools. Numerous radio transmissions were made by the trapped firefighters, telling command where the men were trapped. Command answered one of the transmissions but called the wrong unit. Repeated calls from the trapped firefighters went unanswered. Video footage of the incident shows a chaotic scene. The incident commander is seen with his portable radio slung over his shoulder participating in the fire fighting operations. After 27 calls for help, the radio goes silent. The

two entombed firefighters run out of air and suffocate, bringing the death toll to five and completely demoralizing the 100-member department.

On October 27, 1997, the District of Columbia Fire Department responded to a fire in a corner grocery at Fourth and Kennedy Streets, N.W. DCFD crews initiated an aggressive interior attack on the fire. The fire, however, had already gained considerable control of the building. Crews evacuated the building after feeling heat rapidly building up and the floor shift. The crew of Engine 14 exited and realized their officer was not with them. They reported their discovery to another officer who told them he was sure their officer was somewhere—they just became separated by the confusion. The crew was unable to find their officer, so they again reported their missing officer to yet another officer. Several minutes passed before Engine 14's crew could get anyone to believe them. The fire was extinguished after an extended defensive operation and a search was conducted. The missing officer was found dead in the basement. Post incident analysis of the radio transmissions identified a single call from the officer ("14's in the basement") that was not heard on the fireground. Several other microphone clicks can be heard and were suspected (but not confirmed) as coming from the officer.

The DCFD officer died nine years after the Hackensack tragedy. From 1997 to 2001, approximately 500 firefighters died in structure fires and fire fighting operations in places such as Worcester, Mass.; Keokuk, Iowa; Louisville, Ky.; and New York City. Despite the diverse locations and circumstances, several common threads appear in each of the tragedies. Factors that contributed to these and other fire service tragedies are remarkably similar to factors identified by an industry that began adopting Crew Resource Management as a mantra more than 25 years ago.

The nation's aviation industry recognized that human error was the prevailing cause in aviation disasters. They embarked on a long, arduous and sometimes acrimonious trek to change behaviors and traditions to reduce the likelihood of repeat tragedies. The lessons learned by this industry are worth study by the fire service because of common contributing factors to the deaths in both industries. The captain ruled the flight cockpit with an iron hand before the advent of CRM. On the fire scene, the chief is always in charge and expects (and is expected in some cases) to make all decisions. Both industries ultimately rely on people to accomplish tasks and meet objectives that may involve life-or-death decisions. A person's very humanity contributes to errors that are the root cause of tragedy.

A Tale of Two Flights

United Airlines Flight 173 was on final approach to Portland International Airport after an uneventful flight on December 28, 1978. The cockpit crew of three consisted of an experienced DC-8 pilot, first officer and flight engineer. Eight flight attendants and 181 passengers occupied the cabin. The pilot noticed that he had not received the usual "three down and green" indicator telling him that all landing gear was properly deployed. The nose gear light failed to illuminate green. The pilot notified the air traffic control center and requested additional flight time to resolve the situation. He went through his checklists while circling. In spite of the crew's efforts, the nose gear landing light continued to glow "red" indicating the gear was not locked into position.

Throughout the troubleshooting the first officer and flight engineer had informed the pilot that the plane was running low on fuel. The pilot either ignored the warnings or did not comprehend the messages. Approximately six miles southeast of the airport runway the perfectly capable, but fuel starved plane crashed into a wooded residential area. Eight passengers and two crew members were killed, and 23 people were seriously injured. The lack of a post crash fire kept the death toll mercifully low. The lack of communication skills under stress, situational awareness, team building, decision making and task allocation sent the plane into the ground. The post crash analysis determined that the green light indicator for the nose landing gear had a burned-out bulb. The nose gear had been down and locked the entire time.

Flight 173's disaster was the catalyst for the aviation industry's recognition that technology alone was not the cause of air mishaps. A bold, new thinking evolved. The DC-8 used by Flight 173 was a fully functional, mechanically sound airframe that crashed because the humans flying the machine became over-engrossed in a burned-out light bulb. The pilot became so absorbed in the burned-out bulb that he forgot to fly the plane. As a result, a new training program was implemented that sought to capture and minimize human frailty. Cockpit Resource Management had arrived.

The industry's senior pilots initially rejected the program. The airline "chain of command" had a traditionally rigid hierarchy with an autocratic captain and subservient flight crew. The cabin crew was not even considered part of the flying team. This tradition closely mirrored the maritime industry's concept of the captain being "master of the ship." The industry, however, held fast. Cockpit Resource Management evolved into Crew Resource Management, and the training became mandatory for all pilots and flight crews.

Flash forward to United Airlines Flight 232 bound for Los Angeles from Chicago in July 1989. The plane experiences a catastrophic failure of one of its engines in flight. All three hydraulic lines necessary for controlling flaps, rudders and other flight controls are severed. Flight 232 has suffered an in-flight disaster that robbed the crew of primary and redundant safety features that are built into every airframe. The flight crew and a check ride pilot, using engine controls alone, manage to bring the crippled plane into the Sioux City, Iowa airport. The plane made a spectacular crash landing captured on film by media news crews. One hundred eleven people were killed in the crash. However, 184 survived. What actions did the crew of Flight 232 take to save the 184 passengers? The crew, led by the pilot, initiated behaviors learned in a training program that taught them to overcome the five factors that contribute to human error. The pilot and crew attributed their success to Cockpit Resource Management. CRM finally had the landmark event necessary to validate its worth.

CRM in the Fire Service: Breaking the Chain of Complacency

Photo by Chauncey Bowers, Prince George's County Fire/EMS

Additional industries looked into and adopted CRM throughout the 1980s and 1990s. The medical field, military and maritime trades introduced CRM[1] into their fields with dramatic results. The U.S. Coast Guard reports a 74 percent

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[1] LCDR Valerian Welicka, USCG (DC), presentation at IAFC headquarters, June 14, 2001

reduction in its injury rate since adopting CRM. U.S. air disasters (not related to terrorism) have fallen from approximately 20 per year to one to two per year.[2]

The fire service in the United States has been lulled into a weary acceptance of an "average 100 line-of-duty deaths and 100,000 lost time injuries per year" mentality. None of these deaths or injuries is considered an intentional act. Firefighters do not report to the station for duty and state, "Today I will take actions that will intentionally kill and/or injure myself and my colleagues." There are voices that insist all has been done for firefighter safety, and we are living with the best possible circumstances. Any further change in fire fighting tactics will essentially put us outside the building on all fires and essentially out of business. Firefighters are not being killed and injured by flames, smoke and heat. Reading between the lines of the line-of-duty death reports reveals the effects of adrenaline and machismo are significant factors. Communication failures, poor decision making, lack of situational awareness, poor task allocation and leadership failures are listed as the contributing factors in far too many NIOSH Firefighter Line-of-Duty Death Reports. Since the factors are the same as those cited in aviation disaster reports, it logically follows that CRM would benefit the fire service. We need to look to new venues to break the chain of complacency.

A comparison of the interaction and behaviors of emergency service crews and flight crews reveals a number of additional similarities. Both crews are structured with a leader and one or more crew members. The group functions best when it works as a cohesive team. The team can spend hours of time performing mundane activities and then be called upon to act swiftly under stressful conditions. Some crews work together frequently and others are assembled on short notice.

Crew Resource Management can be taught using a variety of methods. The airline industry uses a three-step process to teach the five factors (communication, situational awareness, decision making, teamwork, barriers) that comprise CRM. The first step, awareness (which is the function of this text), introduces the concept. The second step, reinforcement, underpins the awareness level by having attendees participate in simulated activities that require action to overcome problems in the five factors that lead to disaster. The third step, refresh, is a session that reminds participants of the basic concepts and reinforces the five factors through lecture and role play. The second and third steps provide for repetitive (or in-service) training to reinforce the five factors. This training is based on the concept of Recognition Primed Decision Making. (Recognition Primed Decision Making is explained in greater detail in the Decision Making section of this text.) While the fire service certainly could benefit from a program as intensive as the airline industry's, the current airline training has evolved over a 25-year period. Getting the word out is the first step. Becoming familiar with the five factors is an essential first component of the first step.

Communication
Communication is the key to success in any endeavor. We all have experienced misunderstandings that led to errors and mistakes. CRM teaches people to focus on the communication model (sender-message-medium-receiver-feedback), speaking directly and respectfully and communication responsibility.

Situational Awareness
Situational awareness is a concept that discusses the need to maintain attentiveness to an event. It discusses the effects of perception, observation and stress on personnel. There is emphasis on the need to recognize that situations in the emergency services are particularly dynamic and require full attention.

Decision Making
Decision making is based on information. Emergency service decision making relies heavily on risk/benefit analysis. Too little information results in poor risk assessment by the decision maker and results in errors, injury and death. Too much information overloads the decision maker and makes it difficult to make effective decisions. CRM training concentrates on giving and receiving information so appropriate decisions can be made.

Teamwork
Any group that fails to perform as a team is eventually doomed to fail. Failure in the emergency service field results in excessive damage, poor crew performance, injury and death. CRM training emphasizes team performance through exercises in the awareness tier and crew performance during the reinforcement tier. The training also focuses on "leadership-followership" so all members understand their place on the team and the need for mutual respect.

Barriers
The final factor addressed in CRM training is recognizing the effect of barriers on the other four factors. Barriers are any factors that inhibit communication, situational awareness, decision making and teamwork. Barriers can be external (physical) or internal (prejudice, opinions, attitudes, stress). The CRM segment on barriers focuses on recognizing that barriers exist and taking steps to neutralize their negative effect.

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[2] Mr. Chris Hart, FAA (DC), presentation at IAFC headquarters, September 18, 2000.

Crew Resource Management requires a commitment to change leadership and operating cultures that have evolved over generations of time. The similarities between the flight deck and the cab of an emergency vehicle suggest that CRM has application to the emergency services. CRM's goals are to minimize the effect that human error has on operations and maximize human performance. Crews trained in CRM learn skills that enhance communication, maintain situational awareness, strengthen decision making and improve teamwork. The U.S. military, medical industry and shipping industry already have adopted the concept. Developing and adopting Crew Resource Management for the nation's emergency services is the next logical step toward a safer, more effective service.

Over the next decade, approximately 1,100 firefighters will die, and one million will be injured if the fire service continues down its current path. We are well protected from flames, heat and smoke thanks to technology. However, if we do not take some action to arrest the effects of adrenaline and machismo (cholesterol requires another approach), we are doomed to continue a history of grand funerals and mourned losses. The answer may lie in Crew Resource Management. The fire service can adopt the proven concepts of CRM. If history holds true, the fire service will realize the same benefits that other industries have achieved in arresting catastrophic events caused by adrenaline and machismo (aka: human error). CRM has a 25-year record of proven success.

What is Crew Resource Management (CRM)?

Simply put, Crew Resource Management is the effective use of all resources. The Federal Aviation Administration's Advisory Rule expands the definition to include software, hardware and humanware in its definition. The ultimate goal for the FAA is achieving safe and efficient flight operations. Their specific listing of software, hardware and humanware is meant to emphasize the point that problem solving involves using all available tools.

CRM is not an attempt to undermine the legal ranking fire officer's authority. Nor is CRM management by committee. Tom Lubnau and Randy Okray observed that CRM is a "force multiplier."[3] In fact authority should be enhanced through the use of CRM. All team members direct information flow to the officer. While opinions are valid, the final decision on a course of action still rests with the officer. Using CRM provides for:

- ★ better teamwork
- ★ newly acquired communication and problem solving skills
- ★ an operating philosophy that promotes team member input while preserving legal authority
- ★ proactive accident prevention.

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[3] Lubnau, Okray, "Crew Resource Management for the Fire Service," Fire Engineering, p. 99, August 2001.

LEADERSHIP/FOLLOWERSHIP- A NEW LOOK AT TEAMWORK

Teamwork requires group members to cooperate in order to accomplish common goals. Goal accomplishment requires someone (a leader) to identify what the goals are and at least one other person, or group of people (followers), to perform tasks that will achieve the established goals. The very nature of fire service work requires that people work in groups to accomplish tasks. The breakdown of teamwork results in two ends: inefficient goal attainment and injuries.

Leadership

Fire service leadership is established by both formal and informal mechanisms. Laws enacted by local governments define the mission and structure of a fire department. The internal structure of the fire service has traditionally followed a quasi-military structure that defines lines of authority. Department members in leadership positions from chief to company officer are obligated to acquire and develop leadership skills that best serve the community and the department. Human behavior specialists have identified four leadership skills that are critical to the leadership function. These skills are authority, mentoring, conflict resolution and mission analysis.

Authority

CRM recognizes and reinforces the legitimate authority of the fire department structure through four points. Ensuring mission safety, point one, is the first requirement of every assignment. The once proud declaration, "Fire fighting is the most dangerous occupation in America," is no longer acceptable. Every fire service leader and the people led expect to be able to carry out their assigned tasks and return home safely to their loved ones. Mission safety requires the commitment of all members. However, the ultimate responsibility for member safety lies with the leader.

The second point necessary for successful authority involves fostering an environment of respectful communication among the crew. Respectful communication is one of the core elements of CRM. This conclusion was derived from research of aircraft disasters conducted by the aviation industry. The research and report results strongly suggest that failures to communicate or misunderstood communication (verbal and non-verbal) are significant contributing factors in airline disasters. The same conclusions have been reached in several high-profile fire service disasters (e.g., Storm King Mountain; Hackensack, N.J.; Washington, D.C.'s

Photo by Bryan Day, NIFC

Cherry Road). Leaders who are open and promote respectful communication with their personnel are more effective.

Establishing tasks with clearly defined goals is the third point in CRM's reinforcement of legitimate authority. Personnel clearly thrive and excel when they are given work assignments that have attainable, defined goals. By nature people want to do a good job. The sense of accomplishment and boost in morale that are derived from accomplishment fuel a member's sense of self worth, improve performance and heighten the individual's awareness. Highly motivated members satisfied with their performance and entrusted to complete tasks are less likely to sustain injuries or make mistakes.

The fourth point involves including crew input (when appropriate) when activities are altered or situations change. The critical phrase here is "crew input." Leaders do not wake up in the morning and set goals to make decisions that will have the department membership hate them. They often are left to make decisions in a vacuum because of a lack of input from subordinates. Soliciting input is not intended to relieve a leader of his duty to make decisions. Nor is crew input an abdication of authority on the part of the group leader. Actually, the intent of soliciting crew input is to guarantee that all factors possible are weighed so the leader's decision making is enhanced. Two sets of eyes see more than one set, four sets see more than two and so on.

Mentoring

The second leadership skill necessary to develop is mentoring. Mentoring is a fundamental function of any leadership position. Developing and supporting prospective leaders ensures a department's future. A sense of commitment from department leadership to its members is fostered. Leaders must possess a high degree of self confidence and commitment in order to mentor others. Self confidence permits leaders to impart knowledge and allow for a member's personal growth without feeling threatened.

Technical competence is an essential component of mentoring. Through technical competence a leader is able to:

★ Demonstrate skills and techniques
★ Demonstrate professional standards and best practices
★ Verbalize errors and limitations promptly
★ Recommend solutions to enhance crew effectiveness
★ Monitor and assess crew performance
★ Motivate members.

This give-and-take process allows members to develop confidence in their leader, trust the leader's judgment, accept decisions, perform better as a team and grow personally.

Conflict Resolution

Conflict inevitably arises in groups. Conflict can be healthy and unhealthy. Resolving unhealthy conflict quickly and positively promotes harmony and goal accomplishment. One of the double-edged swords of CRM is that it can give rise to conflict if members let their egos get in the way of their reasoning. Recognizing and accepting this point suggests that leaders develop effective conflict resolution skills and followers respectfully address rank with their concerns.

A frequently heard opening complaint in conflict resolution is, "The other side is not listening to me." Arresting this complaint can be rather simple. The first step is to provide a legitimate avenue for dissent. Leaders who are accessible and acknowledge differences of opinion are halfway toward conflict resolution. The second step in conflict resolution can be more complicated. Emotions can run high during periods of conflict, clouding the root cause (or causes) of conflict. However, using effective listening techniques, avoiding emotional involvement and staying focused on cause identification can help a leader weed through the rhetoric and identify core conflict issues.

Crew members should be encouraged to diplomatically question the actions/decisions of others. Fostering this aspect of conflict resolution is not without some heartburn. Zealots empowered to "question authority" believe they have the right to challenge all decisions made by leadership under the guise of CRM. Nothing could be further from the truth. Questioning authority in the CRM world should more appropriately be termed "confirming situational awareness." (Note: Situational awareness will be discussed in depth in a later section.) Expressing a difference of opinion diplomatically and in a non-threatening way can be accomplished using the five-step Assertive Statement[4] method.

1. Opening/attention – Say the person's name.
2. State concern/owned emotion – "I'm very uncomfortable with . . ."
3. State the problem as you see it – real or perceived.
4. Offer a solution – "I think we should . . ." (Major success key)
5. Obtain agreement – "What do you think?"

The Assertive Statement method should be used where risks are low, time is not a factor and lives are not in danger. While offering a solution is considered a major success key in the assertive statement, the lack of a solution should not prevent a crew member from pointing out a potential problem.

A second, more forceful method is available but should be reserved for those situations where members are engaged in high-risk activities and the potential for tragedy is real. This method is known as the "This is Stupid!" (TIS) technique. Asserting opinion in this environment is reserved for life threatening situations. It is the "red flag" of respectful communicating in the leadership/followership arena. The statement focuses on actions, not individuals. Therein lies its successful key. If the statement were turned to say, "You are stupid!" the leader becomes defensive. This defensive posture leads to an inability to see the potentially tragic error because of the distracting nature of a personal attack. "This is stupid" is the last tool in the toolbox prudently used to direct a leader to review actions or activities that are potentially dangerous. A department may wish to create or develop its own "call sign" to indicate a TIS event is occurring. This call sign should be simple and recognizable by every crew member. Call signs offer the benefit of being less inflammatory than "This is stupid," but carry the same "let's review what's going on here, now!" weight. Some examples of TIS call signs include: "red flag," "TIS" and "red light."

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[4] The five step "Assertive Statement" was developed and trademarked by Todd Bishop, Vice President, Error Prevention Institute Incorporated. Used with permission. EPI specializes in Error Prevention Training. See bibliography for contact information.

Photo by Andrea Booher, FEMA

Successful leaders accept conflict as a normal component of leading people. A CRM trained leader will acknowledge the difference of opinion, accept constructive criticism and recognize that differences of opinion will crop up within any work group. The leader's response to criticism will drive successful goal attainment and prevent injuries to the group. Effective leaders will recognize that differences of opinion exist, accept constructive criticism, actively listen to what subordinates are saying, employ subordinate counsel and reinforce that the final decision rests with the leader.

Mission Analysis

The final leadership skill to develop is mission analysis. Mission analysis can be likened to the size-up process. Its components include: evaluating risk versus gain, identifying objectives, developing strategies and tactics to meet the identified objectives, implementing an action plan, expecting the unexpected, evaluating the effectiveness of the action plan (critiquing) and devising alternative strategies. Most fire officers are well versed in the size-up process. Mission analysis, therefore, should be the easiest skill in the CRM Leadership/Followership component to develop.

Followership

Goal attainment and teamwork require people who can think and follow direction. CRM empowers followers to challenge a leader's decisions. This empowerment is not doled out indiscriminately or without thought. Followers have a significant obligation to meet in order to maintain their right to challenge a leader. One of the core tenets of CRM is that the authority of the leader is preserved and protected unless the leader is incapacitated. In order for followers to be at their peak, they have to be at the top of their game and develop skills to be more effective.

Self Assessment

The physical and mental condition of any team member is critical to mission success. Being at the top of one's game is also a crucial factor in error recognition and mitigation. Alert, oriented people do not make mistakes. Since CRM recognizes that to err is human, being alert and oriented (i.e., maintaining situational awareness) is an incumbent requirement of every team member.

Being physically fit is a fire service standard. The physical and mental demands of the job require participants to be in the best health possible. This health requirement carries through to CRM as well. There is a wealth of information and programs available to assist firefighters in staying healthy. In a nutshell, followers need to be:

★ Physically fit
★ Hydrated
★ Nourished
★ Rested

Mental condition is also a critical followership self-assessment category. People, regardless of their task assignment or

organizational position, make fewer mistakes when they are focused on their assigned tasks. Good followers understand that stress is an operational distracter. Stress is a function of any number of outside influences. Some stresses are inter-personal, others environmental. Identifying sources of stress, recognizing stress affects performance and taking steps to minimize stress are all necessary in the effective use of CRM.

Sources of Stress
- ★ Anxiety
- ★ Frustration
- ★ Noise
- ★ Temperature Extremes
- ★ Hydration
- ★ Drugs
- ★ Fear
- ★ Anger
- ★ Vibration
- ★ Hunger
- ★ Time Pressure
- ★ Incentives
- ★ Time of Day
- ★ Training
- ★ Alertness
- ★ Lack of Rest
- ★ Punishments/Reprisals

Understanding the human animal is not a requirement reserved for leaders. Attitude, memory limits and behavioral tendencies play a significant role in followership as well. The term attitude is often overused. However, the components of attitude, frame of mind, prejudices and interests all play a role in the actions and interactions of people. The leader's role is to create an environment where crew members can feel comfortable coming forward with a stress event that may impair their performance.

Recognizing memory limits is a trait that reminds followers that leaders can be extremely capable, but nonetheless human. Typically, people can remember up to 10 items (recall the cadence of the ABCs?). Armed with this fact, fol-lowers can assist leaders by making up the difference and referring to checklists.

Knowledge of behavioral tendencies also can provide fol-lowers with tools to be effective team members. Acquiring a knowledge base of how a particular leader reacts in various situations can be extremely beneficial to a follower. This knowledge base provides the follower with the information necessary to develop strategies for approaching and com-municating with a leader.

Photo by Tim Syzmanski, Las Vegas Fire Department

Followers are the power that permits work groups and organizations to achieve goals. We all have to answer to someone, so in essence we are all followers. Even leaders need to be good followers. Consider the list of skills outlined on the next page as necessary to develop for good follow-ership.

Another mental component to assess is your mental atti-tude. The FAA has identified five hazardous attitudes pilots exhibit. A noted fire service leader versed in the human fac-tors field, Tony Kern, has identified two others. These atti-tudes are uncannily applicable to the fire service. We do not have to look around very far to see examples of these atti-tudes. We may have even exhibited some of these attitudes ourselves. The interesting point to evaluate in the self-assessment arena is how these attitudes affected team per-formance and what steps do we take to prevent them from wreaking havoc with team operations. The attitudes are: anti-authority, impulsivity, invulnerability, machismo, resignation, pressing and "air show syndrome."

Anti-authority is the "Don't tell me what to do!" attitude. This mindset is a team killer from the start. Think of any situation where this attitude has been displayed. The very root of the independent stance taken by the anti-authority person destroys a team before it can gel. At the very least it forces the team to roll with a bent axle, stressing a team and depriving it of the synergy necessary to accomplish goals.

The second hazardous attitude identified is impulsivity: the "we gotta do something NOW!" view—no forethought, just react. Failure to assess the scene properly, failure to formu-late an action plan and failure to perform any logical thought

Followership skills

Respect authority.

Be safe.

Keep your fellow followers and leaders safe.

Accept that authority goes with responsibility.

Know the limits of your own authority.

Desire to make the leader succeed.

Possess good communication skills.

Develop and maintain a positive learning attitude.

Keep ego in check.

Demand clear assignments.

Establish an assertiveness/authority balance.

Accept direction and information as needed.

Publicly acknowledge mistakes.

Report status of work.

Be flexible.

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process before taking action are the hallmarks of impulsivity. In some circles impulsivity is known as "white-eye rollback." We have all seen examples of this behavior. It is the wide-eyed firefighter who leaps from the rig grabbing a hoseline, completely disregarding his safety to do battle with the dreaded demon fire. The firefighter races right up to the very precipice of the flaming trash dumpster, sticks his unprotected face into smoke from unknown contents, shrieking for water through fits of coughing and slays the dragon! All because there is a fire and we have to do something about it right now! Too many firefighters who acted without assessing have died in the line of duty. We must get away from the attitude that it is just a routine call, act first—think second.

The next two attitudes, invulnerability and machismo, are closely tied to impulsivity. There is a chicken-versus-egg quality to all three. The attitude of invulnerability leads one to believe that, "It can't happen to me." Firefighters with this attitude tend to take unnecessary risks. When they survive, they point to their survival as justification that their actions were the right thing to do. Weary guardian angels and dumb luck would probably be the more appropriate factors to recognize. The job of fire fighting is not without risks. However, team members with the invulnerability complex jeopardize the entire team.

Machismo arguably causes more fireground injuries than any other factor. The fire service traditions of "Show me what you got, kid" and "I can do anything you can do, better" have been the hallmarks of fire station life for decades. The trend toward a more diverse fire service has pushed the bar of machismo or proving oneself even higher. Falling into the traps of invulnerability and machismo are self-destructive personally and professionally, period.

Resignation. The mention of the word in fire service circles conjures up the antipathy of what fire fighting is all about. However, firefighters displaying the resignation attitude believe they cannot make a difference. Resignation is the Yin to impulsivity's Yang. The resigned firefighter leaves all decision making to others, even acquiescing when he knows an action is too risky. He just wants to get along and not make waves, regardless of the cost.

Pressing is the attitude that can best be associated with the dumpster fire that is dispatched just as the roast is coming out of the oven. Crews race to the scene blowing traffic lights, leave the SCBA on the rig and gloves in the coat pocket, extinguish the fire quickly and race back to the station to catch at least one piece of roast beef before it can be more appropriately deemed Grade A leather upper. The crew of our fictional pumper achieved goal attainment in the wake of critical judgment errors in time. The guardian angels and dumb luck will sooner or later submit their retirement papers, leaving firefighters exhibiting the pressing attitude to their own demise. Pressing ultimately results in mistakes, injury and death.

Tony Kern coined the phrase "air show syndrome" to describe a hazardous attitude that insidiously finds its way into every fire department. You may already recognize this attitude as "We've done this before and nothing happened, chief," or "They always do it this way on B shift, cap." Some fire service members become complacent about the dangers of the job after surviving close calls. They feel the need to push the envelope a little further each time or given the chance to perform (e.g., featured on a media news report or documentary) and exhibit behaviors that are akin to aerial daredevils. Such behavior may result in tragedy as it sometimes does for the aerial daredevil.

Several years ago the Discovery Channel aired a documentary on a metropolitan fire department. One of the companies spotlighted responded to a fire in a row house. The company arrived on the scene and ran to the rear of the house with a hoseline from another engine. The fire was in

Antidotes to Hazardous Behaviors[5]

Hazardous Behavior	Antidote
ANTI-AUTHORITY *"Don't tell me."*	*"Follow the rules. They are usually right."*
IMPULSIVITY *"Do something – Quickly!"*	*"Not so fast. Think first."*
INVULNERABILITY *"It won't happen to me."*	*"It can happen to me."*
MACHISMO *"I can do it."*	*"Taking chances is foolish."*
RESIGNATION *"What's the use?"*	*"I'm not hopeless. I can make a difference in my world."*
PRESSING *"Let's hurry up and get this thing done so we can go home."*	*"If a job is worth doing, it is worth doing right the first time."*
AIRSHOW SYNDROME *"I am going to look so good. Look at me."*	*"Let's get the job done right."*

the basement, and the spotlighted company had a good shot at the fire as they positioned at the threshold of a basement door, except for one significant point: companies that had entered from the front of the house were already hitting the fire. A narrated voiceover dramatically described the action as the company officer warned the firefighter on the nozzle to stand back. The firefighter (not wearing SCBA, gloves or protective hood) replied that he was okay, protected by a draft. The firefighter also added that the crew from upstairs was pushing the fire on the crew at the basement door. The narrator noted that the basement door crew was at "serious risk." Seconds later a huge cloud of steam burst from the basement door, enveloping the basement door crew, burning the nozzleman (who by this time had removed his helmet to don his SCBA). The crew retreated from the threshold, momentarily stunned. They then pulled their hoseline around to a side window (also billowing clouds of steam and smoke) and made another attempt to enter the basement. The engine crew upstairs continued to fight the fire. Driven back by intense steam, the basement door crew finally gave up on entering the basement. The injured firefighter sought medical treatment (reluctantly under orders said the narrator) and was off duty for two shifts. Classic fire service Airshow Syndrome was captured forever on videotape.

Fighting the Feeling

The hazardous attitude behaviors spread like a viral infection. Human behavior specialists who have studied the effects of the infection also have identified antidotes to the dangerous acts resulting from the hazardous attitudes. The antidotes require a perpetual vigilance on the part of all personnel. Simply put, the cure for the infection is as simple as consciously reversing the hazardous attitude. The "Student Pilot Judgment Training Manual"[5] advocates memorizing the antidotes to protect one's self (and those around) from catastrophe.

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[5] Diehl, Alan, Ph.D., de Bagheera Buch, Georgette, Ph.D., Livak, Gary Spencer, authors, The Student Pilot Judgment Training Manual.

COMMUNICATION

Overview

There is universal agreement that communication is the key to success in any endeavor. Firefighters are acutely aware of this fact. A number of firefighter fatality incidents list communication breakdowns as contributing factors. Five particularly poignant examples of how communication breakdowns impacted firefighter safety are the Hackensack Ford Fire (Hackensack, N.J., July 1988), Storm King Mountain (Colorado, July 1994), Louisville House Fire (Louisville, Ky., February 1997) the Kennedy Street Fire (Washington, D.C., October 1997) and the World Trade Center Attack (New York City, September 2001). Interruptions in the communications flow process resulted in messages and orders being misinterpreted, not properly conveyed, completely missed or improperly carried out. The results were devastating.

Communication takes place between at least two people (a sender and a receiver) and generally involves six steps.

★ *The sender formulates an idea in Step 1*
★ *That message is encoded in Step 2*
★ *Step 3 involves sending the message through a medium*
★ *The receiver receives the message in Step 4*
★ *The receiver decodes the message in Step 5*
★ *Step 6 has the receiver confirming understanding by providing feedback to the sender.*

Errors that occur throughout the communication process contribute to injury and death. These errors can be divided into three categories: sender errors, receiver errors and filters or roadblocks.

Sender errors

A response of, "What do you mean?" is a good indicator that the receiver has missed the sender's message. There are a variety of reasons why this occurs. The most frequently encountered problems are:

★ **Not establishing a frame of reference.** *If the receiver is not on the same page as the sender, miscommunication occurs.*
★ **Omission of information.** *The sender leaves out pertinent details that affect a receiver's ability to comprehend what is being said. "Pull that line" leaves quite a few unanswered questions. "Pull that line to the front door and standby until I finish my circle check" gives the receiver more direction and mission definition.*
★ **Providing biased or weighted information.** *Inserting the sender's opinion when providing information.*
★ **Assuming messages only depend on words.** *The sender underestimates the power and importance of tone and body language.*
★ **Not willing to repeat information.** *We normally talk at about 125 words/minute and think at 500-1,000 words/minute. Senders who only say something once run a very high risk of failure if they think*

Photo by Jocelyn Augustino, FEMA

their message penetrates all of the thinking, talking and other external stimuli.

★ **Disrespectful communication.** *Want to ensure your message is blocked? Open your communication with an insult, demeaning or degrading remark.*

Receiver Errors

A receiver also can make mistakes that interrupt the communication chain (remember, to err is human). Receiver errors generally fall into six categories.

★ **Listening with a preconceived notion.** *The receiver already has his mind made up before the sender can formulate a thought.*

★ **Poor preparation.** *Receiving messages is more than just allowing the words to pass through your ears. Receiving a message is a conscious process.*

★ **Thinking ahead of the sender.** *Extrapolating the sender's thoughts, putting words into someone's mouth, finishing sentences for a sender, formulating a response before the sender finishes (the trigger phrase here is "Hear me out," from the sender) are all examples of thinking ahead of the sender.*

★ **Missing the non-verbal signals.** *Overlooking body language and facial expressions can be crippling when it comes to interpreting communications.*

★ **Not asking for clarification.** *Failing to employ the old standby, "So what you are saying is . . ." can be the death of good communication.*

★ **Disrespectful communication.** *Want to slam the door shut on a message? Respond with an insult, demeaning or degrading remark.*

Filters and Roadblocks [6]

We bring certain impressions to the table as we communicate. These impressions are based on how we were raised by our parents, life experiences and the influence of others. When we communicate with others, these impressions can serve to interrupt communication. Being aware of these "filters" prior to communicating can prevent the communication from becoming a conflict. Some of these filters, sometimes called "roadblocks," include:

★ *A natural resistance to change initial impression*

★ *Defending ourselves from looking foolish or stupid*

★ *Supporting our opinion even when it is not totally correct*

★ *Blaming others when our message is misunderstood*

★ *Intentionally withholding information that could benefit the group*

★ *The Halo Effect (usually bestowed on a group member thought to be infallible)*

Conveying Thoughts
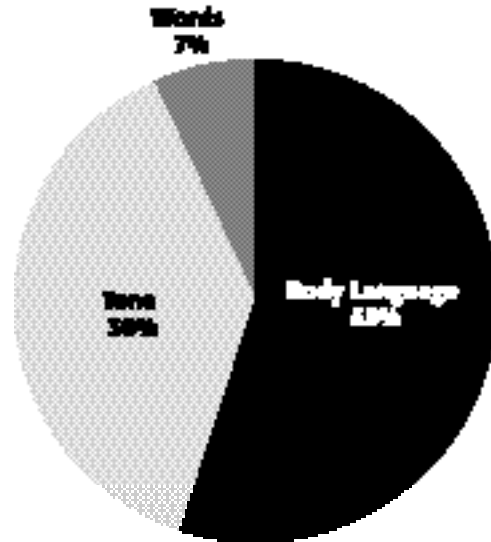
★ *"Odd Man Out" (a crew member who does not have the ear of the group because of tenure, race, creed or gender)*

★ *Complacency*

★ *Fatigue*

★ *Reckless attitude (risk taker who does not use a risk/benefit analysis).*

The cornerstone principle of CRM is effective communication. Communicating is at the root of everything we do. Speaking comes to mind as the principal method of communication, but we humans actually convey messages three ways: verbally (words), tone (inflection) and body language. Of the three ways, body language ranks highest in the ways we convey messages, followed by tone. Words, while important, are the trailing method of conveying thought.

Every time air passes our vocal cords, we are communicating verbally (words/tone). Body language (non-verbal communication) takes place over a wider range of media and, as the chart indicates, has a greater impact on conveying messages. Facial expressions, body posture, gestures and dress are the components of body language.

Communicating in CRM boils down to this: respectfully communicate what you mean in clear text and confirm what is being conveyed to you. Errors are reduced through clear, concise communication, injuries are avoided and performance is enhanced. CRM accomplishes the clear communication process by using five skills: inquiry, advocacy, listening, con-

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[6]   *National Wildfire Coordinating Group, Human Factors on the Fireline, October 2000.*

flict resolution and critique (or feedback). Learning and employing these skills places firefighters in a position to proactively stay ahead of the injury and death curve.

Inquiry

Curiosity is a natural human trait. Wondering how things work, challenging the status quo, raging against the machine, a simple "Why?" all contribute to how we learn and how we apply what we learn. Inquiry in the CRM world maximizes the positive aspects of this human trait. Firefighters are provided with a tool to "raise their hand" in the name of self-preservation and protection. Inquiry is not a revolutionary concept in the fire service. It is already an ingrained process in a firefighter's decision making. The first question of size up (a firefighter's fundamental obligation at any emergency) is, "What do I have?"

CRM inquiry is revolutionary is in its empowerment to everyone on the emergency scene. Inquiry encourages firefighters to speak up (respectfully for maximum effect) when they recognize that a discrepancy exists between what is happening and what should be happening. A three-person engine company is stretching a handline to begin an attack at a single-family dwelling. The officer, preoccupied with assisting with the hoseline stretch, misses the fact that the flames are licking at the house electrical service. The pump operator notices, calls to the officer and asks the officer if he sees that the current path the hoseline crew is taking will travel in the fall line of the power lines. The officer looks up, recognizes the hazard and redirects his hose hauler out of harm's way. The pump operator's initial action (calling to the officer) is inquiry. This action leads to error identification and mitigation. In inquiry the subordinate needs to be proactive, use clear concise questions and express concerns accurately.

Advocacy

What next? Questioning the wisdom of a superior's decision can be gut wrenching. As a subordinate, how do you approach a superior and tell him that a foul up is brewing? The answer lies in being an advocate of your position. The most effective method for advocating your position is through the use of the assertive statement outlined in Section I, Leadership/Followership. The five parts of the assertive statement are:

★ An opening statement using the addressed person's name ("Dave," "Captain," "Chief")
★ Stating your concern as an owned emotion ("I think we are heading for a problem . . .")
★ Stating the problem as you see it ("It looks like that building is getting ready to flash")
★ Offering a solution ("I think we should evacuate the interior crews right now")
★ Obtaining agreement ("Do you agree?").

[7] Lubnau, Okray, Crew Resource Management for the Fire Service. 2002.

Using advocacy helps promote situational awareness, improve understanding and avoid catastrophe. When firefighters use advocacy, they rightfully believe that they are in charge of their destiny and become more willing to meet goals and objectives.

Listening

"Did you understand what I said?" and "What did he say?" are two of the most frequently uttered sentences. These questions are key to affirming communication. Unfortunately, not asking these questions is a significant contributing factor to errors.

Listening is a fluid, dynamic process that involves more than just hearing. Active listeners watch and process verbal and non-verbal forms of communication to gain total understanding. Becoming an effective listener is a learned trait. Part of that learning process is being aware of obstacles that affect active listening. An active listener learns to avoid the traps that prevent listening and comprehension. Consider the following to become a better listener:

★ Use all of your senses to stay focused on the sender
★ Make eye contact with the sender
★ Suppress filters that affect listening (personal prejudices, preconceived opinions, gossip)
★ Repeat the sender's message to confirm understanding
★ Create an environment conducive to communication (move away from the command net radios so you can hear a face-to-face conversation).

The active listener overcomes the majority of problems encountered in our environment through mastery of the art of listening. The learned skill of listening also is dependent upon several other factors such as maintaining situational awareness and being in good overall health. When filters, cultural roadblocks or other problems impede listening, errors emerge in a way that is truly reflected in the line from the movie Cool Hand Luke: "What we have here is a failure to communicate."

Conflict Resolution

Conflict is a normal occurrence in group dynamics. Conflict is the natural result of people thinking. Everyone should expect that at some point in time there will be conflict in groups. Once group members are prepared for the inevitable, resolving conflict becomes an easier experience. Conflict resolution techniques are an integral part of CRM. The principal key to conflict resolution revolves around "what is right, not who is right."[7]

Staying focused on the issue at hand is a cardinal rule in conflict resolution. It is also one of the most difficult to employ. Therefore all participants must continually remind themselves to devote all attention to the current source of conflict. Conflict resolution is not the place to open old wounds. Biases need to be put aside. Concentrating all efforts on resolution is the primary goal of everyone involved.

Feedback

The final step in the communication process is to provide feedback. Feedback confirms comprehension. Providing feedback is also known as "critiquing." Conscious feedback must be provided during every communication interaction. After-action reports, critiques and post-incident analyses are already well known terms in the fire service. These are all forms of feedback.

The fundamental objective of feedback is to confirm understanding. Once feedback has been provided to the sender in the communication process, communication is considered complete. Feedback in the form of a critique also serves to reinforce communication.

The goal of any communication is to send information. In order for the communication to be complete, feedback must be supplied to ensure understanding. Communicating involves using verbal and non-verbal messages that are understood by the sender and receiver. Communication is not complete until the loop is complete. The crux of CRM is effective communication. Time and again disaster analysis points to breaks in the communication loop as contributory and often the principal cause. Using effective communication is imperative for all levels of an organization. The fire service is no different. Our history is overflowing with examples of communication breakdowns that resulted in death. Improving communication skills is accomplished in the same way firefighters become proficient at advancing hoselines and throwing ladders. Practice makes perfect.

DECISION MAKING

A three-member engine company arrives at the scene of a working fire in a four-story multi-family dwelling on a raw, rain-swept afternoon. Fire is evident on the second floor, extending rapidly to the third. Department SOPs call for the engine to lay a supply line from the nearest water supply and initiate fire attack. As the engine pulls up to the hydrant, agitated occupants run up to the pumper and yell that there are people trapped on the top floor and people jumping from the third floor. The rest of the assignment is enroute, but the hands on the arrival clock seem to be moving counterclockwise. What should the crew do, attack the fire or perform rescues? Should the officer skip the layout and blitz the fire with the deck gun or pull the pumper out of the way and use its ground ladders to pluck as many people from the building as possible while the fire extends into the attic space and threatens more occupants? Should the officer establish command while the other two firefighters work, or would it be better to work as a three-person team to accomplish fire attack or rescues? Is there a "right" decision?

Decision making can be divided into two general categories—life threatening and non-life threatening. Non-life threatening decisions are typically made when a decision maker has time to evaluate options in an unhurried manner and chooses the best option. Life-threatening decisions do not offer such leisurely reflection.

Making decisions, regardless of threat, depends on four factors: information, experience, knowledge and urgency. Making rapid, correct decisions on the fireground requires that the information avalanche and information chasm situations faced by fireground officers be rapidly processed and formulated into an action plan. Klein found that fireground officers made decisions during fire combat by using a unique adapted behavior. Robbed of the ability to fully analyze all options during working fire conditions because of time compression, fireground officers defaulted to previous experiences (known as "pattern matching") of similar situations to plot courses of action (Gary Klein, 1995). Klein also discovered that fireground officers often select the first decision that comes to mind, virtually eliminating any analysis. This method of making decisions is the widely recognized recognition primed decision-making model.

The fireground officers of the '60s and '70s, officers whose decision-making capabilities were formed under actual fireground situations, are rapidly fading from the ranks. Fires are also on the decline. Today's fire officers are now arriving at

Photo by Tim Syzmanski, Las Vegas Fire Department

incidents that they literally have never seen before with perhaps no knowledge of methods or techniques to mitigate the emergency. However, the urgency factor is still present. This urgency factor in some cases may be self-imposed but still affects the decision-making process.

As humans we are all prone to make mistakes. Marcus Tullius Cicero (106-43 BC) astutely noted this flaw in our character with his statement, "to err is human." Mistakes typically fall into two categories, omissions and commissions. Omissions are unintentional. They occur when the decision maker misses a step in a procedure (e.g., skips over turning on the SCBA cylinder during a donning drill), mixes up the steps in a procedure or order (e.g., transposing two digits in a telephone number) or cannot remember the steps in a procedure (e.g., "Was it pull up the protective hood first then don the SCBA facepiece or don the SCBA facepiece and then pull up the protective hood?"). Commissions are deliberate actions that result from misapplication of an accepted rule/policy/procedure (the captain of the Grandcamp battening down the hatches to control a fire in a hold full of ammonium nitrate while the ship laid at anchor in Texas City, 1947), lack of knowledge about the gravity of a situation (Kingman, Ariz. firefighters attempting to extinguish a burning propane tank with limited water supply, 12 firefighters killed), purposely violating policy to save time or defending freelancing activity on the fireground.

The CRM Contribution
Crew Resource Management provides work groups with a framework to process all information and formulate action plans. The leader retains ultimate authority but processes

FEMA News Photo

inputs from the crew to render more efficient and correct decisions. CRM teaches leaders to be less the "fighter pilot" and more the "bomber pilot." Leaders versed in CRM recognize the limits of their ability (to err is human) and encourage their subordinates to participate in the decision-making process. Subordinates versed in CRM recognize the importance of providing their leader with as much pertinent information as possible to assist their leader in making the best decision possible, regardless of the consequences.

No discussion of decision making would be complete without some strategies to promote improved decision making. Decisions are not made in vacuums. CRM's primary tenet requires use of all resources to their fullest potential to prevent mistakes and promote success. Adopting this tenet as a daily mantra will enhance decision making on all levels. Fire service leaders will recognize and appreciate the value of the additional eyes, ears, opinions, experience and knowledge of their subordinates. Subordinate personnel will improve their decision-making skills as they are solicited for input.

In the world of dwindling structure fires, fire officers from company officer to chief of department need to substitute real life experience with realistic, situational training that taps the same decision-making processes as real world challenges. Command and control training opportunities exist throughout the United States. These training situations teach risk/benefit analysis, promote naturalistic decision making and give officers confidence in themselves.

Learning and practicing successful decision-making models will also improve a leader's skill. Ludwig Benner developed one of the most successful models. Dr. Benner's model, known as "DECIDE," provides a six-step process for reaching a decision. Using Benner's model provides leaders with a proven method for analyzing a situation, weighing options and taking appropriate action.

The "DECIDE" Model
D etermine the problem.
E valuate the scope of the problem.
C onsider available options for mitigating the problem.
I dentify the most appropriate option.
D o the most appropriate option.
E valuate the effectiveness of actions.

SITUATIONAL AWARENESS

The station chef is in the firehouse kitchen preparing dinner. Several pots are going on the stove, and he is talking to the battalion officer trying to get off next shift. Temperatures continue to rise in the pots, and the latent heat of vaporization point is reached while the cook has his back to the stove confirming his leave plans. Pots begin boiling over faster than the cook can drop the phone and reach the stove. The night's dinner is flowing across the stove and onto the kitchen floor. The cook's epithets and clouds of steam stream into the day room alerting the rest of the shift. The cook's failure to maintain situational awareness sends the shift dejectedly to the watch desk in search of the carryout menus.

Situational awareness has three components: awareness, reality and perception. Disaster (small or large) is the result when situational awareness is lost. Situational awareness is an internal process that goes on constantly, much like size-up. Like size-up, situational awareness must be updated constantly through the principles of observation and communication. The dynamic, fluid emergencies firefighters respond to require that firefighters maintain the absolute highest state of alertness and attention at all times.

Since firefighters are human and subject to the same human frailties as the rest of the general population, the loss of situational awareness does occur. The nature of the firefighter's work requires that losing situational awareness be kept in check. When situational awareness is maintained, incidents are mitigated smoothly and injuries are eliminated. The loss of situational awareness can be attributed to eight factors. Remembering these factors arms firefighters with another weapon to stave off mistakes. Remaining vigilant for the appearance of these factors and taking action to arrest their influence gives firefighters an advantage over the catastrophic, life-altering incident.

Photo by Roman Bas/FEMA News Photo

Loss of Situational Awareness Indicators

Ambiguity	Open to more than one interpretation or unclear.
Distraction	Attention is drawn away from the original focus of attention.
Fixation	Focusing attention on one item excluding all others.
Overload	Too busy to stay on top of everything.
Complacency	A false sense of comfort that masks deficiencies and danger.
Improper procedure	Deviating from SOPs without justification.
Unresolved discrepancy	Failure to resolve conflicts or conflicting conditions.
"Nobody flying the plane"	Self-explanatory.

Reality and perception refer to what is going on and what we perceive is going on. Communication and observation are essential in order to make reality and perception equivalent enough to be considered identical. The best way to avoid losing situational awareness is to be alert for the loss of situational awareness indicators. There is no greater defense against the loss of situational awareness than perpetual vigilance.

Photo by Bryan Day, NIFC

WORKLOAD MANAGEMENT

The advent of the 10-digit telephone number pushes the average human brain to the limit of its recall ability. We marvel at those individuals who are great multitaskers. As we undertake more work without shedding other work, our ability to perform each assigned task with equal efficiency begins to decline to the point of inefficiency. Your ability to comprehend the previous sentence is a case in point. You may have had to read the sentence twice to understand its meaning. Sentences in excess of 20 words tend to overload our ability to understand the meaning with one read. We compensate by reading the sentence a second time and breaking the sentence into more manageable parts: workload management.

A number of studies conducted by Dr. Robert Helmreich (University of Texas) concluded that commercial airline pilots believed that they were immune to overload. Part of a pilot's training and indoctrination creates the development of a self confidence that leads pilots to believe they "can do anything." Helmreich discovered, however, that a pilot's performance under stress was not always as good as the pilot perceived. Some pilots failed to recognize that they were overloaded and made mistakes that were not corrected.

Workload management is a system used by effective leaders to divide a given task into equal parts to ensure no one worker is overloaded, including the leader. Overloaded workers make mistakes. The mistakes range from a simple clerical error to loss of life. Workload management:

★ *Promotes teamwork by emphasizing the interdependence a crew has on each other*
★ *Provides an increased margin of safety as a result of a crew's balanced workload*
★ *Encourages teams to develop strategies for handling work overload.*

One fire department's approach to fighting structure fires provides an example of workload management for the structure fire safety component. This department dispatches two com-

Photo by Tim Syzmanski, Las Vegas Fire Department

mand officers to each full assignment (four engines, two trucks, one heavy rescue and an EMS unit). The ranking command officer typically serves as incident commander. The junior command officer takes interior. The incident commander may call for an additional assignment known as a safety dispatch when a working fire is confirmed. The safety dispatch is comprised of two additional companies. One company is assigned as the rapid intervention company. The second company is assigned as the safety support company. The officer of the safety support company is typically assigned as the incident safety officer. One of the safety support company members is assigned as the incident command aide. The third member of the safety support company is assigned as the accountability officer. By dividing the safety functions into manageable parts, the incident commander can then devote his/her attention to command decision making. This is a critical area for all chief officers. Being an effective fireground leader/manager is far superior to the chief-in-charge making all decisions. Delegating responsibility along with authority is essential.

ERROR MANAGEMENT AND STANDARDIZATION

The fire service is in the business of error mitigation—that is, managing the mistakes of others. We are known as the "last line of defense." The drawback to the service's approach to date is the "last line of defense" mentality has caused us to pay less than the necessary attention to managing our own errors. Since errors are a fact of life (and the reason our service exists), it stands to reason that minimizing our own errors would improve safety. Improving safety translates to reduced deaths and injuries. Reductions in deaths and injuries translate to a more effective workforce. Sounds simple enough. But enter the human factor and the fire service's history of "jumping to a concussion" (an old life net drill adage). Approximately half of all firefighter line-of-duty deaths can be attributed to error. Few firefighters deliberately enter a burning structure, swift water event, confined space, hairpin turn or any other hazardous situation with the intent of doing themselves harm. The other 50 percent (death from stress) also can be arguably attributed to error: that is failing to take care of himself or herself (poor physical conditioning, poor diet, smoking).

The safety pyramid, originated by Heinrich in the 1930s and modified in recent years, illustrates a sobering presentation on the impact of errors in the workplace. While we focus on the singular, catastrophic fatality event at the top of the pyramid, we fail to see the bigger picture of how prevalent errors are in the world. Dr. Robert Helmreich, Ph.D., a noted human error specialist considered to be one of the founders of Crew Resource Management, developed an Error Management Model that provides a framework we can use on a daily basis to attack the staggering numbers found in the safety pyramid.

The first step, avoid, is the step that offers the greatest number of opportunities to prevent error with the least risk. Error avoidance can be actively practiced by following six tenets outlined by the airline industry.

★ Maintain a high level of proficiency
★ Follow SOPs
★ Minimize distractions
★ Plan ahead
★ Maintain situational awareness
★ Effectively use all resources.

Three of the six steps—maintaining proficiency, following SOPs and planning ahead—have been part of the fire department drumbeat for generations. Minimizing distractions has slowly made inroads in the last decade.

Photo by Tim Syzmanski, Las Vegas Fire Department

Photo by Tim Syzmanski, Las Vegas Fire Department

Maintaining situational awareness is new terminology for the fire service but can be likened to a crusty mentor's admonishment to "pay attention" at all times. Effectively using all resources involves using CRM. Avoidance is the least labor-intensive error management action that results in the most effective error management effort. Doing your job and doing it well leads to a subconscious error avoidance strategy.

To err is human, ergo mistakes will occur. Avoidance will not always be successful because the fire service mission is to take action to minimize disaster, and humans fulfill the role of firefighter. The fire service typically arrives at incidents and initiates the final step in someone else's error management model, mitigation. But within the service's own error management model, trapping errors follows avoidance. Once an error occurs, all efforts must be exerted to keep the error to its least damaging level. The second step in error management is accomplished through creating layers of redundancy. Redundancy provides a series of "safety nets" or "barriers" designed to keep an error from escalating into a catastrophe. These layers of redundancy mirror the six actions outlined in error management.

The first barrier is maintaining a high level of proficiency. Few fire departments spend more than five percent of their total work time actually handling emergencies. Therefore, a significant portion of a department's productive time needs to

be devoted to training and preparation. The late Vince Lombardi's statement "You will play like you practice" is as true for the fire service as it is for the NFL. Well-trained and proficient firefighters make fewer mistakes.

A solid set of well-developed, tried-and-true standard operating procedures cannot be given short shrift. SOPs provide the usual course of action for crews to follow. The advantages of good SOPs are well known. The SOPs contribution to error management lies in their consistency and standardization. The predictability of knowing where each company will be on a structure assignment reduces the potential for duplication of effort and problems such as opposing hoselines. Procedures cannot be created for every situation, however. Even the best-designed systems can be circumvented because human fallibility is a given. The ill-timed venting of a structure before hoselines are in position is a good example.

Minimizing distractions and maintaining situational awareness are barriers that also contribute to minimizing error. A fire service crew, like its aviation and military counterparts, cannot afford to be less than fully engaged and focused on its mission. Distractions diminish operational readiness and contribute to a loss of situational awareness. The airline industry's crash history is replete with cockpit recordings that indicate crews were not focused on flying the plane. In one case a pilot and co-pilot were engaged in a casual discussion of the attributes of a par-

ticular flight attendant during their pre-flight check. When the plane attempted to take-off, the flaps were in the wrong position and the plane crashed, killing all aboard. The flight crew's distraction and loss of situational awareness were deadly.

When errors escape avoidance and holes in barriers allow errors to penetrate the layers, mitigation is the last-ditch effort available to head off a catastrophic event. As noted above, the fire service is the mitigating force in other people's error management systems. But who is the mitigation component in the fire service error management model? The answer is the same component trained to avoid and trap the errors of others—members trained in CRM. Fire department personnel trained in CRM are prepared for all eventualities. They strive on a daily basis to minimize errors through avoidance and trapping but also are prepared to implement mitigation efforts when necessary. The department freely overlaps all three steps in the error management model to ensure the consequences of errors are minimized. Mitigation requires that firefighters be vigilant and stay focused. Being vigilant and staying focused require communication, workload management, decision making and teamwork. How do we know these efforts work? Ask the U.S. Coast Guard. Since implementing CRM in the 1980s, the Coast Guard has experienced a 74 percent reduction in injuries.
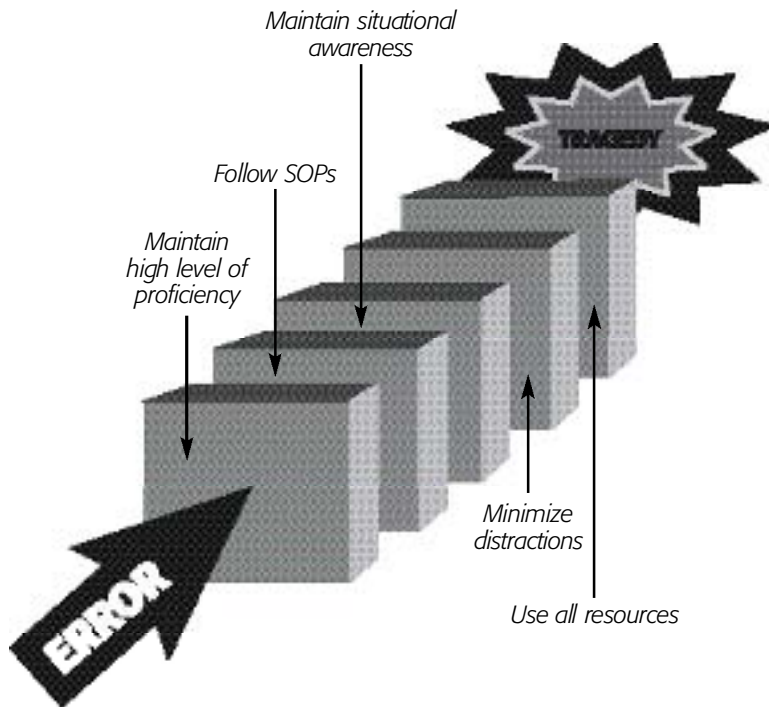

Photo by Tim Syzmanski, Las Vegas Fire Department

So what are the keys to error management?

1. **ACKNOWLEDGE** *that we are error prone. This does not mean errors are an acceptable way of life, just that we should be prepared for them to occur.*

2. **Maximize BARRIERS.** *Keep as much redundancy in your operations as possible. Minimize task loading by using SOPs and CRM. Recognize that reduced staffing may impair your ability to recognize errors by up to 50 percent.*

3. **COMMUNICATE** *risks and intentions. Speak up about anything that reduces your ability to detect errors or increases your chances of making errors.*

4. **Follow the SOPs.** *A NASA/University of Texas study found that pilots who intentionally ignored an SOP were 1.6 times more likely to commit a second error.*

5. **Is this action SENSIBLE?** *Take a moment to think with your analytical head, not your emotional heart. Some sample self-questions might include: What is to be gained from this interior attack? Do I have adequate resources at this time to commit to holding this fire line?*

Layers of Defense ("Redundancy") Reduce Errors 2nd Step in Error Management

Maintain situational awareness

Follow SOPs

Maintain high level of proficiency

TRAGEDY

Minimize distractions

Use all resources

ERROR

APPLYING CRM AT YOUR FIRE DEPARTMENT

You now have been introduced to Crew Resource Management. Where do you go from here? If you return to your department and issue a decree that from this point forward everyone will practice CRM, you will likely find CRM hanging in the closet next to the three-quarter boots, playpipe and aluminum helmets. CRM is a lifestyle change for everyone in the chain of command. The entire department must be brought on board for CRM to be effective. One of the greatest advantages CRM presents to the masses is empowerment. CRM insists that everyone has a voice and an input that must be valued and assessed. CRM also reinforces the fact that leaders have the ultimate authority in decision making but encourages them to obtain input prior to making decisions. CRM does not advocate the leaderless group or call for the overthrow of the chain of command. Rather CRM is a "force multiplier" (Lubnau, Okray) that enhances a department's operation because it sets the stage for thousands of pairs of eyes and ears to look out for errors and improve safety.

CRM must be taught to everyone in the department, from first-day rookie to last-day veteran. As training is undertaken, keep your ear to the wall and see if anyone speaks up about how CRM contributed to avoiding, trapping or mitigating an error.

Successful CRM programs have been enhanced with the "real life experience" of someone who actually used it. Captain Lloyd Haines and the crew of United Flight 232 may be a little abstract for us, but when Captain Johnson of Engine 14 stands before the department and says, "We avoided a catastrophe on this foggy morning's car crash on the interstate. If my crew and I hadn't received CRM training we would have never . . ." a strong link is created.

This manual has been created to open the door to CRM training. But remember, CRM is more than just a one-time presentation. Success will depend on full acceptance, constant reinforcement and frequent review until CRM becomes the department culture. There are a growing number of excellent CRM instructors and programs available for presentation to your department. Select the best program for your department and train everyone in the department to use CRM. The success of CRM cannot be disputed. The aviation industry has produced its fifth version of CRM, taking 25 years to get to the fifth revision, and now considers CRM a mindset. The Coast Guard and Air Force also have validated CRM with a successful 10-year history. Applying the current death and injury rate, 2,425 additional firefighters will die and 2,375,000 will suffer injuries if the fire service takes 25 years to fully implement CRM. Is that timeline, death rate and injury rate acceptable? Make a bold stroke at reducing firefighter death and injury. Champion adopting CRM in your department.

Photo by Tim Syzmanski, Las Vegas Fire Department

APPENDIX I
CREW RESOURCE MANAGEMENT (CRM) SAMPLE INSTRUCTOR OUTLINE

NOTE: *This sample instructor outline is designed to be expandable. Presentations may range from 30 minutes to four to six hours depending on use of exercises and case studies. Instructors will need to develop a learning objectives slide that reflects the depth of subject. Learning objective slides should reflect an emphasis on exposure to:*

- *History of CRM*
- *Components of CRM*
- *Benefits of CRM*

1. History of Crew Resource Management

a. *In 1976 the aviation industry recognized human error was the primary cause in approximately 60-80 percent of aviation accidents.*

b. *Technological "fixes" only reduced accidents until the next human error.*

c. *A new approach to preventing disasters was born when the industry looked at ways to "fix" the primary cause—human error.*

d. *Originally called "Cockpit Resource Management."*

e. *Title changed to "Crew Resource Management" to incorporate all members of the flight team.*

f. *Program adopted by the U.S. military in the 1990s.*

g. *U.S. Coast Guard has realized a 74 percent reduction in injuries and fatalities since implementing CRM.*

h. *Air disasters have dropped from approximately 20 per year to one to two per year.*

2. Fire Service Experience

a. *Firefighter line-of-duty deaths and injuries have remained relatively static for the last 10 years (97/95,000).*

b. *Three key elements responsible for firefighter deaths:*

  i. *Adrenaline*
  ii. *Over aggressiveness*
  iii. *Cholesterol*
     - Chief Bill Peterson, Plano, TX

c. *Numerous recent NIOSH LODD reports cited poor decision making as a causal factor.*

d. *Watershed Fire Service Tragedies Involving Human Factor Errors*

  i. *Thirty Mile Fire, Washington*
  ii. *Worcester, Massachusetts*
  iii. *Keokuk, Iowa*
  iv. *Washington, D.C.*
  v. *Lake Worth, Texas*
  vi. *Houston, Texas*
  vii. *Memphis, Tennessee*
  viii. *Kansas City, Missouri*
  ix. *Storm King Mountain, Colorado*
  x. *Oklahoma City, Oklahoma*
  xi. *Hackensack, New Jersey*
  xii. *Seattle, Washington*
  xiii. *Boulder, Colorado*
  xiv. *Milford, Michigan*
  xv. *Mann Gulch, Montana*
  xvi. *Lairdsville, New York*

Instructor Note:
Select two or three and provide brief overview of event and human factors involved.

3. Human Factor Error Causes

    a.   Gordon Dupont's "Dirty Dozen"

        i.   Lack of Communication

        ii.   Complacency

        iii. Lack of Knowledge

        iv. Distraction

        v.   Lack of Teamwork

        vi. Fatigue

        vii. Lack of Resources

        viii. Pressure

        ix. Lack of Assertiveness

        x.   Stress

        xi. Lack of Awareness

        xii. Norms

    b.   Regardless of occupation, people perform work.

    c.   Error causes are consistent for all occupations.

4. Crew Resource Management

    a.   Crew Resource Management (CRM) is a tool created to optimize human performance by reducing the effect of human error through the use of all resources.

    b.   Resources include:

        i.   People

        ii.   Hardware

        iii. Information

5. Principles of CRM

    a.   Error management through improved training/skills development in six areas:

        i.   Communication Skills

        ii.   Teamwork

        iii. Task Allocation

        iv. Critical Decision Making

        v.   Situational Awareness

        vi. Debrief

    b.   Six steps in detail

        i.   Communication Skills

            1.   Six Step Process

            2.   Abbott & Costello ("Who's on First" video)

            3.   Dominos (exercise)

            4.   Paper Tearing (exercise)

            5.   Communication Barriers (exercise)

            6.   Appropriate Assertive Behavior

            7.   Standard Language

            8.   SOPs

            9.   "Sterile" Cab

            10. Inquiry Skills

            11. Advocacy Skills

Instructor Note:
Use one, two, or all three exercises as time permits.

ii. Teamwork
1. Leadership
   a. Authority
   b. Mentoring
   c. Conflict Resolution
   d. Mission Analysis
   e. Teamwork
2. Followership
   a. Self Assessment
   b. Physical Condition
   c. Mental Condition
   d. Attitude
   e. Understanding human behaviors
   f. Followership Skills
      1) Respect authority
      2) Personal safety
      3) Crew Safety
      4) Accept authority
      5) Know authority limits
      6) Leader success
      7) Good communication skills
      8) Learning attitude
      9) Ego in check
      10) Balance assertiveness/authority
      11) Accept orders
      12) Demand clear tasks
      13) Admit errors
      14) Provide feedback
      15) Adapt

iii. Task Allocation
1. Know your limits
2. Know your crew's limits
3. Capitalize on strengths
4. Eat the elephant one bite at a time

iv. Critical Decision Making
1. Recognize problems
2. Continue to "fly the plane"
3. Maintain Situational Awareness
4. Assess Hazards
5. Assess Resources
6. Solicit Solutions
7. Make a Decision!
8. Rapid Primed Decision Making
9. Ways to increase decision making skills
   a. Experience
   b. Training
   c. Communication
   d. Preplanning

    v. Situational Awareness
      1. "Fight the fire!"
      2. Assess problems in the time available
      3. Gather information from all sources
      4. Choose the best option
      5. Monitor results—alter as necessary
      6. Beware of situational awareness loss factors

    vi. Debrief
      1. Check your feelings at the door
      2. Facilitate
      3. Prebrief
      4. Topics
      5. Decorum
      6. Analyze
      7. Operations
      8. Human behaviors

 c. A high degree of technical proficiency is essential for safe and efficient operations.
 d. CRM alone cannot overcome a lack of proficiency.
 e. Technical proficiency alone cannot guarantee safe operations in the absence of effective crew coordination.
 f. CRM must be taught to all members of the organization.
 g. Team leader retains authority, recognizes benefits of using all available resources.

6. Why CRM for us?
 a. We have improved technology and still experience preventable deaths and injuries.
 b. Parallels between aviation, military, medical industry and fire service errors suggest CRM will work for the fire service.
 c. If we continue on the current LODD/injury path, we will experience 970 fatalities and 950,000 injuries over the next 10 years.
 d. "If not now, when? If not us, who?"

7. IAFC Meetings
 a. September 2000—Kick-off meeting
 b. June 2001—Recommendations to IAFC Executive Director
 c. Goal—Reduce the LODD and injuries caused by human factors by 50 percent within five years of implementation

8. Crew Resource Management—Summary
 a. A proven, positive change to arrest the effects of adrenaline, over aggressiveness, and human error on our culture
 b. A positive change for our culture
 c. For further information, refer to:
   i. Firehouse (seven-part article) May-August 2001, November 2001, July 2002, August 2002
   ii. Fire Engineering, August 2001
   iii. Go to the Web and type in keyword "Human Factors," "Crew Resource Management," or "Human Error."

APPENDIX II CRM EXERCISES
COMMUNICATION EXERCISES

When: *Introduce during the "Communications Skills – Six-step process" segment.*

Purpose: *Emphasize the various forms of communication (one-way, limited two-way and open) and the effect of barriers.*

Duration: *Five minutes*

Materials: *One sheet of paper for each participant.*

Instructions: Paper Tearing

1. *Ask for three or four volunteers from class to step forward.*
2. *Hand each a blank sheet of paper.*
3. *Instruct the group that they must listen to all instructions carefully, not say anything and keep their eyes closed until instructed to open them.*

4. *State the following instructions:*
   a. **Fold** *the paper in half.*
   b. **Tear** *a one-inch square from the lower left corner.*
   c. **Fold** *the paper in half.*
   d. **Tear** *a one-inch square from the upper right corner.*
   e. **Fold** *the paper in half.*
   f. **Tear** *a one-inch corner from the upper left corner.*
   g. **Open** *your eyes, unfold the paper and hold it up for the class to see.*
5. *Discuss the reasons for diverse shapes (i.e., barriers to communication—no vision, vague instructions, etc.).*

Verbal Communications

When: *Introduce during the "Communications Skills—Standard Language" segment.*

Purpose: *Emphasize the various forms of communication (one way, limited two-way and open) and the effect of barriers.*

Duration: *15 minutes, three rotations.*

Materials: *One set of 10 matching dominos for each crew (Note: name the crews to relate to the target audience e.g., engine crew, command staff, Hotshot, etc.).*

Instructions:

1. *Divide class into normal company size.*
2. *Have group select an "officer," "driver," and "firefighter(s)."*
3. *Give one set of dominos to each "officer."*
4. *Have the officer verify that each set contains two sets of five matching dominos (Identical dot patterns, not color, are important.*
5. *Have everyone listen carefully and inform them that the rules change for each rotation.*
6. *Have each officer and driver pair sit back to back so they cannot see each other's dominos.*
7. *Instruct the officer to build a domino shape. Each domino must touch the adjoining domino. The final shape cannot be a circle or a straight line. The goal is for the driver to build the identical shape that the officer built.*
8. *Instruct the officer that he/she may say anything he/she believes is necessary to get the driver to build an identical shape.*
9. *The driver may not make any sounds.*
10. *Firefighters may only watch.*
11. *The other firefighter(s) are observers and may only watch.*
12. *Advise the teams that they have 90 seconds to complete the exercise.*

13. *Confirm all teams are ready, announce "go," and start the clock.*
14. *Call time at 90 seconds and have the officer and driver compare their shapes.*
15. *Have each crew rotate positions.*
16. *Repeat Steps 5-8.*
17. *Instruct the groups: Officers may say anything. Drivers may only say "Yes" or "No." Firefighters may only watch.*
18. *Advise the group that they have 60 seconds, announce "go," and start the clock.*
19. *Stop the clock at 60 seconds and have everyone evaluate his/her work.*
20. *Have groups rotate again. Ensure that everyone is in a position they had not occupied before.*
21. *Repeat Steps 5-8.*
22. *Instruct the groups: Officers may say anything. Drivers may say anything. If the firefighter(s) ask about their role, say, "We don't have time to discuss your role. Groups have 30 seconds to complete the exercise—Go!"*
23. *Call time at 30 seconds and have groups compare work.*
24. *Ask the class if it is possible to complete the task in 30 seconds. (Answer should be no).*
25. *Select an officer and firefighter. Take a seat at the driver position. Instruct the officer to build his shape. Tell the firefighter to start the clock for 30 seconds. When the firefighter says "go," tell the firefighter, "Make mine like the officer's." Lesson—Communication is a two-way street. We must talk and listen to all team members. The answers that we seek may be sitting right next to us.*
26. *Discuss with the class that this exercise was an example of one-way communication (first exercise), limited two-way communication (second exercise) and full two-way communication (third exercise).*

Effective Leader Exercise

When: *Introduce before delivering the "Teamwork—Leadership" segment.*

Duration: *Five minutes*

Instruction:

1. *Have group list the characteristics, qualities or attributes of an effective leader.*
2. *When the list is compiled **emphasize** that most of the items on the list are "people skills" rather than technical skills.*
3. *Display "Leadership" slide and continue with lecture.*

Effective Follower Exercise

When: *Introduce before delivering the "Teamwork—Followership" segment.*

Duration: *Five minutes*

Instruction:

1. *Have group list the characteristics, qualities or attributes of an effective follower.*
2. *When the list is compiled **emphasize** that most of the items on the list are "people skills" employed by crew members who desire to perform good work.*
3. *Display "Followership" slide and continue with lecture.*
4. *Compare how many items from the list match those listed in the "Followership" slide.*

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INTERNATIONAL ASSOCIATION OF FIRE CHIEFS

4025 Fair Ridge Drive, Suite 300
Fairfax, VA 22033
703.273.0911
www.iafc.org