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Radio Interoperability: There is More to it Than Hardware

Track 8: C2 Technologies and Systems
Track 6: C2 Metrics and Assessment
Track 1: C2 Concepts, Theory, and Policy

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Communications continues to be a major issue in post-disaster after-action reports. Under the umbrella term *interoperability* grant funding is facilitating deployment of equipment to enable field personnel to patch radio systems together, with the expectation of improving emergency scene communications. However, numerous causal factors, beyond hardware limitations, contribute to inadequate disaster communications. Communications impediments include insufficient radio infrastructure, behavioral reactions by people in stressful situations, intergovernmental relations, inadequate procedures and training, and general lethargy over the need to institute special operating policies, distinct from routine practices. Relying solely on technological solutions, without providing training and practice, greatly reduces the effectiveness of radio patching equipment. Contrary to the intended effect, patching equipment, in the hands of those minimally familiar with the radio system architecture, is likely to produce radio communications system overload and sector vulnerability. This paper examines the domain of emergency scene communications, including recommendations that reach beyond technological solutions.

INTRODUCTION

The public servants in our communities — America's firefighters, law enforcement officers, emergency medical personnel, and a host of allied professionals, provide the first-line of defense and protection to our communities in times of crisis. Hundreds of millions of dollars in homeland security funds have been spent to provide interoperable radio communications, yet the human behavioral aspect of radio communications has not been adequately addressed. Nationwide, numerous reports (Department of Homeland Security, 2004; National Task Force on Interoperability, 2003; Lund, 2002) have identified a problem with radio communications at the scene of disasters, yet the assumption has incorrectly been that the problem is largely a technical one: Once disparate radios are connected, effective operational communications will result (Newsday, 2005.). The assumption is that communications will improve if more users are added together on the same channels.

This is a flawed assumption for two reasons. Superfluous radio transmissions contribute to the auditory overload of first responders at the emergency scene, obscuring development of an accurate operational picture for all involved, and radio spectrum is a limited commodity — once it's full, it's full. Even if 700 MHz channels are opened for full use later this decade, there will always be a practical limit to the number of people who can operate on a common platform before the quality of effective communications deteriorates.[1]

Policies and practices need to be reexamined from a human behavioral perspective, to develop new strategies which will facilitate effective communications. A central question is whether the more significant interoperability issue is behavioral, and if so, which behavioral adaptations will enhance the crisis communications capabilities of the first responder community? This is an issue we cannot simple buy our way out of by merely deploying more equipment.

Interoperability has been misapplied as a catch-all phrase to describe a multitude of issues surrounding emergency scene communications. Does it refer to police officers being able to talk to firefighters at the same incident; local fire officials talking to neighboring fire agencies? Are we talking about federal agencies with radio connection to state and local officials? Is it implemented at the scene, or command post, or Emergency Operations Center? Will radio interoperability be provided for every responder, or command-to-command, only? Or does it address the wider issue of radio system coverage, frequency spectrum capacities, technology piece ergonomics, and alternate (non-voice) communications methods?

There is a larger, unacknowledged and unaddressed human factors issue regarding the need for new procedures involved in the communications process. The first responder and homeland security communities have misjudged the radio interoperability issue as being solely technological. This misaligned approach has resulted in the expenditure of hundreds of millions of dollars on communications patching equipment predicated on the assumption that emergency scene communication will instantly and automatically be improved once the equipment is bought and plugged in (Davidson, 2005). The complexities of the communications process require greater examination and modification before any turnkey solution will produce a meaningful result.

The mandate to the first responder community, post 9/11, has been to fix interoperability. Since that time, an estimated $1.5 billion has been spent on radio hardware to facilitate interoperability. Despite the focus on the word interoperability, there is still no agreed upon definition of interoperability. Does interoperability refer to configuring a radio to enable it to talk to any other radio that may be present at the scene of an emergency response? At the same traffic accident, state police, local police, ambulance and fire personnel may be present. Are we advocating all of them hearing each other, interactively sending voice radio messages to one another? One definition, pre-dating 9/11, came from a cross-section of industry professionals

1 While the Federal Communications Commission has reserved a block of channels for public safety use, many metropolitan areas are precluded from using these channels until a relatively few television stations migrate to digital television service. Congress is expected to act in compelling them to vacate the channels before the end of this decade.

assigned to the Public Safety Wireless Advisory Committee. They define interoperability as "an essential communication link within public safety and public service wireless communication systems which permits units from two or more different agencies to interact with one another and to exchange information according to a prescribed method in order to achieve predictable results" (Irving, 1996, p. 49).

To some, interoperability is intended for command-to-command use only. This perspective is much more feasible than trying to commingle all of the responders on a single channel. Experienced first responders readily acknowledge their own segmented channels frequently become contentious during such incidents; with so many units talking they cover one another, hampering effective communications. What will the exponential loading of the channel be like if four busy channels, loaded with agency-specific conversations are mixed on the same radio platform? Will the resultant tower of babble be helpful to everyone at the scene? Will first responders readily adopt the "less is more" posture needed when combining so many critical communications onto one channel, instead of partitioning them into appropriately defused platforms, so agency-specific communications can continue? It would be far more desirable to keep agencies on their routine operating platforms, clearing non-incident chatter on other incidents to separate channels.

A compelling case can be made for establishing an incident-specific common command channel among all agencies responding to the critical incident, but it must not be used as a poor substitute for a sound incident command system. Senior command personnel, as dictated by policy, will congregate at a single incident command post, to collaborate, coordinate, and communicate with their own personnel. The National Incident Management System (NIMS) included this recommendation and is supposed to be universally understood and applied, nationwide, as a condition for continued grant funding.

While a lot of agencies say they "have it", when it comes to NIMS, evidence of its application in the field is weak, especially regarding multi-agency presence from a single incident command post. Reasons for slow, or no, adoption of NIMS policy range from traditional resistance to change, to a state of general denial of the possibility that a large-scale emergency can happen in any given jurisdiction, to what may be the biggest factor of all—a reluctance to answer the "who's in charge?" question within areas of historic turf battles, especially relating to police vs. fire department rivalries, and/or squabbles between various levels of government.

Traditionally, there has been a tendency in organizations to devise hardware solutions for a whole range of challenges, instead of addressing human engineering issues. It is understandable that a turnkey solution is hoped for—the purchase and delivery of new equipment signals tangible evidence that something is being done. The proof of concept comes only months, and sometimes years, later. Considering that the kind of incidents we are preparing for are the statistically unlikely exceptions, occurring only, perhaps, once or twice in a generation, it is difficult for new equipment to get a proper test, even in the most realistic training exercise environment.

The response to Hurricane Katrina in the summer of 2005 is an early indicator, a weak signal perhaps, of the failure to really address the need regarding critical incident communications.

These failures run counter to the expected result, especially after so much money has been expended with the expectations of instant communications improvement. “Police and other emergency agencies responding to Hurricane Katrina were plagued by the same communications problems exposed by the World Trade Center bombing in 1993, yet a solution is still considered years away” (Kerr, 2005).

Radio interoperability is one of many areas where homeland security is evolving so fast that it is outrunning the research. The frenzy to answer allegations of inefficient on-scene radio communications reported in the 9/11 Commission Report has led to the purchase of hundreds of millions of dollars of hardware, yet much of the problem is behavioral and is likely to be exacerbated by patching radio users together, instead of achieving the intended outcome, which is to actually facilitate communication. New patching equipment is being deployed nationwide, with little, or no, guidance nor consensus on proper use. Due to the nature of radio system architecture, patching equipment actually makes previously “guarded” or well-managed systems vulnerable, because for the first time, their airtime can be impacted by users outside of their system.

Standards on Emergency Scene Operations

Of particular interest is the deployment of NIMS and the formation of a center to create and issue standards on emergency scene operations, including communications (NIMS, 2004). Another document receiving attention is the National Fire Protection Association (NFPA) Standard on Disaster/Emergency Management and Business Continuity Programs (Standard 1600), released in 2004. It is currently undergoing debate at the committee level, and will likely undergo significant update and modification within its three-year review cycle. The 9/11 Commission Report focused considerable attention on dysfunctions present in the first responder community (National Commission on Terrorist Attacks, 2004). It should continue to be a catalyst for change for many years to come. It is already attracting a lot of attention to the subject, as evidenced by the designation of interoperability as being the top priority for grant proposal evaluations.

We are also starting to see the inclusion of funding for training accompanying inter-operability grant programs, signaling some recognition of the importance of attention to non-hardware solutions, yet specific examples of actual training applications are difficult to find. What constitutes interoperability training is vague and nonspecific, leaving room for the requesting jurisdiction to include the component in their grant application without actually devoting attention to what the training will entail. As yet, there is no collective recognition of the need for improved human interoperability communications procedures, as agencies presumably expect an out-of-the-box solution, based on patching radio systems together.

When conducting this research, common themes were the need for a better definition of the issues associated with radio interoperability and the need for more enlightened approaches for emergency scene communications. Although examples of the need for better communication were easily found, the specific interoperability problem was generally ill-defined and the term was misapplied to include non-technical challenges. While the solution to emergency scene communication generally equates to a technical treatment of how to patch one system to another, the larger question remains: What behavioral components (i.e. procedures, training) are required

as a necessary adjunct to hardware interoperability communications solutions? Since the collective conscience of those within the homeland security discipline is still being developed, emergency scene communications issues represents something of a moving target.

The experiences of Hurricane Katrina are starting to produce additional lessons learned. In both man-made and natural disasters, it can be anticipated that the infrastructure itself will be damaged, by whatever catastrophic event has occurred, plus communications will be limited by the amount of radio traffic squeezed onto whatever radio spectrum remains operational. One hospital in Gulfport, Mississippi thought they had adequately prepared for communications contingencies before Hurricane Katrina, with back-up equipment—including satellite telephones and short-wave radios—yet the dish on the roof and towers they relied upon were damaged by the hurricane-force winds (News-Sentinel, 2005).

METHOD

Transcripts from numerous critical incidents involving various combinations of fire, police, medical, local, and mutual aid units, responding to single and multi-jurisdictional incidents were analyzed. This included coding incident transcripts from Sept 11, 2001, for timely and effective delivery of messages. (Due to space limitations, results from one large training exercise are the focus for this paper. Results from analysis of other transcripts are found in Timmons, 2006.) Scoring criteria included successful message delivery, economy of wording, number of times a message went unacknowledged, and number of times it was necessary for a message to be repeated.

Case Study from a Regional Fire Training Exercise

A study was conducted in the fall of 2005, where communications from a series of training exercises in the suburban cities north of Dallas, TX, were coded. The specific purpose of the exercises was to practice working with other agencies, through a scripted series of actions to be taken at the scene of a simulated multiple-alarm structure fire. The exercises were held at a training academy where facilities allow for burning of straw and special effect lighting to create realistic building fire conditions. While the participants were focused on tactics and accomplishment of operational objectives, this case study enabled analysis of the communications conducted toward those goals. This is especially significant in validating the findings since the participants were not knowingly engaging in a study on communications, but rather using radios as they normally would at a building fire, with several separate agencies working together.

The goal for this study was to measure the quality of first responder communications to determine where improvements in communications can be made. Participants were from a number of surrounding career departments, deployed in two-to-four person teams on engines, ladder trucks and medical units. This exercise was typical of others in the multi-week series, insomuch as there were 13 units, totaling about 50 firefighters and command officers. Each participant was provided with a portable radio on a common channel, with the incident commander and an aide seated in a command car (a sport utility vehicle), operating on a mobile radio.

Table 1 presents a description of the types of units participating in the training exercise, along with metrics relating to the communications conducted during the exercise.

Table 1. Exercise Description for Communications Coding Analysis.

Number of Fire Departments Participating	5
Number of Engine Companies	6
Number of Truck Companies (or Engines w/Elevated Streams)	5
Medical Units (Ambulances)	2
Duration of the Exercise in Minutes	62
Number of Communications Turns	428
Average Length of Each Message in Seconds	7
Number of Words Broadcast	3556
Average Number of Words Per Communications Turn	8
Average Number of Words per Minute	57

One of us [Timmons] obtained a recording of the radio transmissions occurring during the exercise, from which a written transcript was produced. This provided the basis for scoring the communications conducted (included in Timmons, 2006). Notations were made and tabulated for: (1) instances in which the message was not received or was unclear and had to be repeated; (2) a subjective assessment rating of the excitement level of the voice (either normal or excited); (3) use of any codes or phases other than plain English; and (4) a subjective assessment rating on whether the message was critical to operational picture development and/or tactical efficiency, or whether another method could have been employed.

RESULTS

Analysis of communications produced a common pattern of coping mechanisms that require modification. Table 2 presents results of the communications coding analysis.

Table 2. Communications Anomaly Summary.

Anomaly Type	Number of Turns	Percent of Turns
Unacknowledged Message	51	11.9%
Needed to be Repeated	21	4.9%
Confused/Unclear/Questionable Value	11	2.6%
Exclamatory/Excited Message	5	1.2%

The percentage of radio messages needing to be repeated was 4.9%; plus 11.9% of the radio messages were unacknowledged (33 out of the 51 unacknowledged messages were to the incident commander), and were presumed to be unheard. In addition, 2.6% of the communications turns were judged to be a questionable use of radio airtime, e.g. face-to-face message exchange may have been more appropriate, the speaker was communicating redundant information, or information of questionable value was transmitted. The collective total of repeated, unacknowledged, and questionable communications turns equaled 19.4% of all messages, indicating a significant opportunity to reclaim nearly one-fifth of all radio airtime lost to such inefficiencies.

It should be noted that a few of the repeated messages occurred because personnel were trying to talk while wearing an airpack facepiece. Interference caused by the airpack facepiece has been an area of concern for many years, with only marginal success in technological improvement.[2] This was not a major contributing factor, since the messages were discernable on the recordings reviewed.

Documented Communications Problems

Common communication impediments were noted in several transcripts of actual emergency recordings which were reviewed for this research.

- Responding units tended to stop at the first injured person encountered at the periphery of the incident and call for an ambulance to that specific location, even when it was obvious that a mass casualty incident was underway, involving dozens, or even hundreds of victims.
- Communications turns became clipped into ineffective bits, to the point where it was difficult to tell who was talking to whom.
- If a field unit expressed excitement in their voice, the dispatcher's voice tended to also rise in pitch and pace, but not to the full extent of the field users'. The dispatcher plays a key roll in keeping everyone calm by the use of a controlled voice inflection and in exuding a stoic confidence.
- Units prefacing their transmissions with key words, such as "urgent" "priority message" or "emergency traffic," got greater attention than those continuing to speak unacknowledged and without preface, even if they conveyed urgency in the pitch and pace of their speech.
- Many incidents eventually got to the point where dispatchers and incident commanders tried to control and reduce the volume of radio traffic by limiting who was talking. Requests such as "all units stand-by" and "command officers only on this channel" were commonly heard.
- A relatively small number of units dominated a majority of the airtime, often with non-critical matters, while many units said nothing. The channel loading was unevenly skewed to a small portion of those present.

Positive Practices

Our analysis also revealed a pattern of best practices.

- The most assiduous dispatchers and commanders tried to anticipate those things the field users might ask, and act to broadcast a summary of information, before it is asked for, in an effort to preempt use of the radio channel for repetitious information requests. This includes best access routes, staging areas, triage points, command post locations, and brief situational updates. This relatively small menu of variables made up a disproportionate number of repetitious and superfluous radio transmissions.

2 Greater attention is needed to the issue of responder communications while wearing respirator facepieces. Many agencies with limited experience in communicating while using respirator facepieces, especially in law enforcement, have issued respirators to their personnel, using homeland security grants. Extensive training and exercises should be provided for people new to operating with such equipment, prior to entry into hazardous environments.

- The use of timed milestone updates gave the most even flow of information, acknowledging that time often gets out of phase—either faster or slower, to the perception of those involved at the scene. Many dispatch computer systems have automated features to trigger prompts to the dispatcher at timed intervals, i.e. every ten or 20 minutes. Dispatcher-initiated requests for updates from incident commanders, at timed-intervals, aids in development of an operational picture for those at the scene, as well as for support players off-site (still responding, or at alternate locations, such as Emergency Operations Centers).

Listening to recordings after an incident allows one to readily identify inappropriate assumptions, ineffective communications, and unacknowledged speech turns not evident to those involved at the moment. This can be attributed to the calm environment the reviewers are in and the lack of multi-sensorial stimuli imposed upon those performing as the incident was actually occurring. While it is not possible to eliminate all distractions and simultaneous demands placed upon those operating at emergency scenes, the inference here is great value would be derived if sensory input was managed and limited.

DISCUSSION

In this section the reader is provided with suggestions to improve communications, which should be carefully weighed and tailored by first responder policy makers, while devising a policy best suited for their local jurisdiction. Operating practices and regional variations make it difficult and undesirable for the thousands of police and fire departments across the U.S. to operate in exactly the same way. Despite minor regional differences, the overriding need to cooperatively work together, in the spirit and intent of homeland security initiatives dictates the development of common practices and policies that will help first responders bridge these regional differences. One aspect of needed common practice and policies involves new procedures for use by first responders when using radio equipment designed to improve interoperability.

Training

One way to improve communications efficiency would be to provide training on better prioritization of radio messages and introduction of the concept of communication alternatives, other than public safety radio. Face-to-face communication and sector-level task coordination are examples of ways to achieve objectives without use of radio resources.

The presence of unacknowledged messages to the incident commander is an area of concern, and was noted in other un-scored exercises in this series, as well in the recordings studied from actual emergencies. Further research is needed to fully assess predominant reasons for such inattention, since radio problems and clarity of the message were not noted on the recording. The incident commander was presumably attending to something else at that instant.

It would be beneficial to have personnel at the emergency scene assigned exclusively to facilitate communications support for the incident commander. Some large first responder departments have such scene-based communications capabilities (aides, chiefs' drivers, etc). Other agencies should seek creative ways to develop such expertise, such as detailing first-arriving support personnel who often self-dispatch to large-scale incidents. Greater operational efficiency, enhanced crew safety, and reclamation of scarce radio airtime can be expected if communications support personnel operate inside a quiet environment, at the command post, with the incident commander. Communications specialists should be supplied with adjunct

devices, such as headphones and visual displays, allowing them to pay close attention to radio traffic and assist the incident commander in communications continuity.

Changes to Radio Procedures

Changes to radio procedures are needed to (*i*) manage and reduce the amount of radio transmissions; (*ii*) establish procedures and policies for treatment of large numbers of casualties without the need to call for help individually for each one; and (*iii*) command and control from a detached perspective to improve the quality of the information provided and control the vocal tone of those transmitting.

The intent of this section is to suggest companion behavioral components that would enhance radio interoperability, acknowledging that more than a technological solution is required. The goal is to divert the dominant focus from technology and devise a template for agencies interested in optimizing their mission-critical communications. In doing so, the result will be better, more realistic expectations, and more effective communications within the limits of public safety radio infrastructure. These recommendations will likely gain widespread acceptance only after a series of practical failures continue, despite the expenditure of so much homeland security grant money to achieve interoperability.

A set of new procedures were drafted for first responder agencies at the author's [Timmons] city. The city of Plano, TX, is adjacent to the city of Dallas and is the home to 250,000 people. A separate department, Public Safety Communications, is responsible for the receipt of 911 calls and dispatching of the police, fire and medical units. The department also operates the radio infrastructure for seven growing cities, covering over 250 square miles.

As is the case with many public agencies, equipment purchased with homeland security grants has begun to arrive from a number of sources. Little has been said about how to use it: The assumption has been that interoperability starts as soon as the boxes are opened. To overcome the inherent limitations of radio system patching of multiple units onto a common operational platform, a new procedure is proposed which prioritizes the use of limited radio resources by controlling the flow at the source. These procedural recommendations are based on a review of numerous critical incidents involving various combinations of fire, police, medical, local, and mutual aid units, responding to single and multi-jurisdictional incidents, which revealed a common pattern of influences.

New Procedure Proposed

As a result of reviewing numerous recordings of critical incidents, it is apparent that the best practice would involve modification of radio system utilization, at the source, to optimize the quality of communications occurring to produce better – not more – communications turns. To answer this need, a new procedure was devised by one of us [Timmons] whereby field units will modify their utilization of the system, once declaration of a critical incident is made. This is not necessary for a routine building fire or bank robbery, but once a critical mass of units start arriving at an intense incident, such as would be the case at a terrorist attack, it would be invoked to prioritize radio traffic.

The policy draft presented to the Plano Fire Department, by Timmons, reads in part:

It must be recognized that significant single or multiple events can create a communications system overload situation that negatively impacts scene operations. The expected, and understandable, emotional state of radio system users, combined with the shear number of units transmitting on a system, will frequently contribute to a disaster scene communications breakdown. There has been a tendency by some agencies to fragment operational groups at the same incident, onto different radio system talk-paths (talkgroups, channels, frequencies). While assigning additional talkgroups to sectorized functions provides some buffering, it must be remembered that it will become difficult for dispatchers and incident commanders to effectively monitor and control multiple talkgroups. Moreover, there is a practical limit to the number of simultaneous conversations possible on systems that typically are shared by several agencies, and routine radio traffic, will continue, in addition to the specific incident.

Such a less is more posture, involving radio system use, runs counter to the policies practiced in daily response to routine incidents. All members must make a conscious effort at disaster scenes to resist the habits practiced in normal operations and limit their use of the radio system to the highest priority of life safety needs.

Effective communication between dispatch and the incident commander must be the highest priority, based on the need to properly report size-up (initial appraisal of the scene), operational picture, and requests for additional resources. To that end, dispatch will initiate a *Priority Dispatch Policy* whenever an intensive incident is underway and channel capacity issues are hampering effective communications.

The policy draft presented to the Plano Fire Department, by Timmons, recommends:

- Dispatch will announce, “The Priority Dispatch Policy is now in effect.”
- A periodic, soft beeping tone will automatically be played on the channel as a reminder of the special condition.
- Dispatch will answer with, “(Unit #) go ahead with priority traffic.”
- Units operating on the channel will suspend routine traffic (calling en route, requesting assignments, repeating size-ups, etc). To support this step, dispatch will endeavor to broadcast (and periodically repeat) staging area locations, known hazards, triage area, and best access information.
- Calling dispatch on the phone should be avoided since the incident itself is likely to stretch 911 Center capacity. The computer system should be used to achieve silent unit status change notification.

Unit-to-unit traffic must be reduced, condensed and prioritized, in the interest of system capacity conservation.

- Transmission of “Maydays” and “Emergency Traffic” receives highest priority.
- Whenever possible, transmission on the radio should be limited to command officers only.

- Formation of self-contained task forces, based on alarm levels, moved-up from staging, offer the greatest opportunity for task assignment and accomplishment, with minimal radio transmissions.
- Face-to-face communication with sector officers, after assignment from staging, provides the greatest prospect for member safety and operational objective achievement, without the use of radio narration typical at routine incidents. *In this mode, the radio becomes a receiver of critical information, only broadcast upon for immediate, life safety issues.*
- During such times of peak system loading, it will be necessary to suspend or significantly abbreviate the fire department SOP Section 303.XII.A.7 (It states: When Incident Commanders issue assignments face-to-face, those assignments shall also be announced over the radio to insure that everyone at the incident is aware.)
- Wherever practical, staging and sector officers will issue verbal, standing orders to be followed, until objective accomplishment, or until further notice. This will reduce the tendency of units to use airtime for task-related information, distracting to the overall operational picture.
- At some point in all mass casualty incidents, it becomes impractical to make individual requests for ambulance responses, to specific victim locations. Whenever possible, low priority patients should be directed or assisted to a triage area, instead of requesting ambulances over the air to specific locations.
- Within the limits of existing policy, patient reports to the hospital, broadcast on the radio system, should be appropriately abbreviated and standing orders implemented wherever practical.

A similar policy is being proposed for local police department adoption, as well.

The main implementation challenge will be to get people to reverse habits that have been developed and reinforced over years of day-to-day use of the system, and to apply new procedures for rare occurrences. This will be accomplished through training and practice at exercises.

Full implementation across all disciplines and jurisdictions will need to go hand in hand with NIMS implementation. A centerpiece of the new procedure involves sectorizing the incident into manageable pieces, with command officers assigned to task and/or geographical locations. These commanders can assume a lot of line-of-sight and face-to-face communication with people in the task groups, thus eliminating much of the radio traffic at a critical incident. While the fire service has allowed sufficient time for incident command system principles to take hold, law enforcement and other agencies have considerable work ahead in transitioning from NIMS training to NIMS *implementation*. The Unified Command concept within NIMS is optimal when commanders from each agency are co-located at the same incident command post. While the separate command post concept is the practice in many locales, it probably has more to do with avoiding the who's in charge issue than it does with any practical advantage. Unified Command is much more difficult when communications paths must be relied upon instead of the optimal communications method, i.e., face-to-face.

Homeland Security Grant Focus

In the immediate aftermath of 9/11, many officials reported communications issues between responders within the same department and with other agencies. These all struck a familiar chord since many of the same things were said after the Oklahoma City Bombing and Columbine school shooting, in addition to numerous incidents of regional significance around the country. Since that time, interoperability has arisen as a top grant funding priority. The rush to address the issue has made it all too easy for agencies to select equipment without much thought or due diligence.

Immediately following 9/11, homeland security funds were first distributed in the manner we were most familiar with, i.e. pork barrel spending methodology. The distribution methods vacillated between one extreme where the most politically powerful were able to bring money to their home districts, and the other extreme where an equal distribution method resulted in an attempt to evenly distribute grant money to every state, which produced uneven per-capita expenditures in places where risk seemed remote. To answer the charges that a risk-based formula should be used, the Urban Area Security Initiative (UASI) funding system was devised in 2003 to skew the resource distribution toward the highest density of U.S. urban areas.

In the short history of homeland security grant funding, we have experienced a unique pressure to make quantum improvements in our homeland security posture, literally "before the next attack." The immediacy of the moment encouraged a process in which jurisdictions were under extreme time constraints to submit grant applications or risk the appearance and actuality of not getting money for the local effort, in competition with other cities nationwide. The tendency was to cursorily scan the menu of equipment available in standardized grant request forms, quickly make a choice (which generically would be identified as something like "interoperability equipment"), and get the verbiage and justification prepared in a short time span, before the arrival of immediate, inflexible deadlines. Then a few months would typically pass, and if approved the radio patching equipment would arrive, without much forethought on how it would be used, who would operate it, any potential security vulnerability it may create, and any deleterious effect it may have on communications networks.

In essence, the cost of such equipment previously drove agencies to a deliberate process of alternative evaluations and careful selection based on operational needs. In the years since 9/11, it not only is easier to access the funds, but the process itself has encouraged haphazard requests for radio interconnection equipment and resulted in the development of unrealistic expectations.

The expedited process has fostered a very real concern regarding the effect such equipment will have on the disaster operations of the future. While the equipment does hold the potential to improve emergency scene communications, improved communications will only result if the new equipment is deployed properly and if the users modify their radio habits. The likely outcome of having only a superficial appreciation of what the equipment operator is doing, and continuance of overly-chatty radio turns, will hasten the collapse of communications networks (due to overload), instead of producing the intended outcome of improving the quality and capacity of emergency communications.

Proactive agencies have an opportunity to be early adopters of new procedures and will avoid the inevitable failures of those relying exclusively upon a hardware solution. To overcome the inherent limitations associated with patching multiple radio system units onto a common

operational platform, a new procedure has been proposed to prioritize the use of limited radio resources, by controlling the flow of communications at the source.

After reviewing numerous recordings of critical incidents, it is apparent that best practices would involve modifying radio system use, at the source, to optimize the quality of communications occurring to produce better not more communications turns. To answer this need, a new procedure was devised whereby field units will modify their utilization of the system, once declaration of a critical incident is made. Such a less is more posture, involving radio system use, runs counter to the policies practiced in daily response to routine incidents. All members must make a conscious effort at disaster scenes to resist the habits practiced in normal operations and limit their use of the radio system to the highest priority of life safety needs.

Effective communication between dispatch and the incident commander must be the highest priority, based on the need to properly report size-up (initial appraisal of the scene), operational picture, and requests for additional resources. To that end, dispatch will initiate a *Priority Dispatch Policy* whenever an intensive incident is underway and channel capacity issues are hampering effective communications.

CONCLUSIONS

The 9/11 Commission Report goes into great detail about the failings of the radio systems of the various agencies responding to the terrorist attacks. Transcripts and recordings reveal that there was almost constant chatter, albeit choppy and often unintelligible. Setting aside the technical issues, of which there were many, a lot of people still talked on the radio; so a lot was being *said*, but *communication* was weak. It is relatively easy to make any radio talk to another through patching equipment. Equipment being deployed now through homeland security grants will make patching equipment much more available than ever before. But if each user of the system intends to use their radio in the same manner as they normally would on partitioned systems, it will be far more difficult to manage the large increase in the amount of radio traffic that will be squeezed onto a common platform. The result is likely to be even heavier radio congestion, and less, rather than more, *effective* communication.

Due to the criticality of communications during crisis events, it is imperative to devote resources to developing and implementing new procedures for responders during emergencies. This serves to increase awareness of the need for people to communicate differently in overload situations, instead of the typical practices of loading more and more radio traffic into common radio space, until communications turns are not accomplished, and responder safety and effectiveness is impaired.

By their very definition, high risk/low frequency events do not occur very often. It takes a tremendous amount of interest, discipline, and insightful appreciation for the need, to prepare for something that will only happen perhaps a handful of times in one's career. This is a classic conundrum: How much time should we spend on something that may never happen? Post-9/11 management of first responders has pushed us into unknown territory, in this regard. Deciding on a prudent approach, appropriate for each locality, is one of the most pressing strategic issues of the next few years.

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