

First Responder Communications and Interoperability in Vermont

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Table of Contents

Executive Summary	1
1. The Problem of Interoperability	3
2. Vermont’s Homeland Security Interests	3
2.1 Vermont Yankee Nuclear Power Plant	4
2.2 United States – Canada Border	5
2.3 Burlington International Airport	6
3. First Responder Communications in Vermont	7
4. Barriers to Interoperability	8
5. Interoperability at the Municipal Level	9
5.1 Methodology	9
5.2 Technical Aspects and Band/Frequency Usage	10
5.3 Interoperable Capability and Communications with Surrounding Communities	10
5.4 Training, Community Outreach, and Grant Programs	11
5.5 Border Cooperation	12
6. Best Practices and Policy Options	12
6.1 Technology and Interoperability	12
6.2 Obtaining Grants	13
6.3 Improved Training Procedures	14
6.4 SAFECOM’s Interoperability Recommendations	14
7. Conclusions	15
Appendix A: First Responder Communications Case Studies	16
Technical Aspects and Band/Frequency Usage	16
Interoperable Capability and Communications with Surrounding Communities	16
Training, Community Outreach, and Grant Programs	17
Appendix B: Table of Interviews	19
References	20

EXECUTIVE SUMMARY

This report seeks to assess the status of first responder communications and interoperability in Vermont and describes the potential of interoperable equipment to assist in responding to natural and man-made disasters. We interviewed eight communications experts and local officials throughout the state and assessed the interoperability of equipment at three potential security threats:

Vermont Yankee Nuclear Power Plant

Vermont Yankee is located on the New Hampshire/Vermont border in southern Vermont. It has recently undergone a series of drills to test evacuation procedures in the case of an emergency at the plant. There were two major problems with the communications equipment in two separate drills. As a result, buses did not arrive at the appropriate place to evacuate schoolchildren and news reports were confusing and inaccurate. The plant has not participated in any statewide homeland security exercises, and the commissioner of public safety in Vermont has expressed concerns over the plant's safety.¹

United States – Canadian Border

It is important that police and border patrol agents in New York, Vermont, and Canada can communicate with one another regarding potential terrorist threats and illegal activities. Our report found that this would be extremely difficult today because different departments in different states use different types of radios – analog, digital, and sometimes both. Officials have conducted numerous exercises at the border involving the Vermont Department of Public Safety's Homeland Security Unit, local first responders, and Canadian agencies. The most recent exercise was in October 2005 and was almost entirely funded at the federal level.²

Burlington International Airport

Burlington International Airport serves as an entryway into the United States from Canada, making it a security concern. Airport security is a division of Burlington's police department and can therefore communicate with the city's police department effectively. To our knowledge, the airport has no standardized procedures to inform surrounding communities if there is a terrorist attack on the airport or if a suspected criminal evades customs agents. However, the facility is part of a mutual-assistance agreement in case there is an accident or a natural disaster that requires more response than Burlington can provide.

Our study finds that, with the exception of two cities that have upgraded their communications infrastructures through millions of dollars in homeland security grants, Vermont's first responder agencies have not fully mobilized to improve their interoperable communications. There is a perception among agency officials that using multiple radios or frequencies is an effective example of an interoperable infrastructure, when, in fact, interoperability can be improved on many more levels:

- The communications infrastructure, equipment, and technology could be improved. Efforts to replace older analog radio systems with new interoperable equipment and computerized dispatch and communications hubs may be beneficial. Digital-voice modulation and data transfer to mobile data terminals (MDTs) represent the forefront of interoperable communications. In lieu of such infrastructure upgrades, a parallel interoperable system can be established with cell phones and portable radios.
- While there is training at the statewide level, there have been no exercises designed exclusively to test interoperability. A combination of classroom instruction, tabletop drills, and live drills specifically designed to address interoperability could be useful. Even without these drills, routine communication between local, state, and federal authorities could be encouraged to open these channels as much as possible. Some localities turn air shows, state fairs, and other events into opportunities to test communications between multiple first responder organizations.
- Steps could be taken to improve the grant application process for first responders at the municipal level. Often, police and fire chiefs are burdened with applying for grants and only do so through the state Homeland Security Unit. It may be beneficial to encourage local law enforcement and fire services to apply for grants and run workshops about grant seeking and proposal writing.

Vermont is already on the way to addressing these interoperability issues with the implementation of the Vermont Communications (VCOMM) group, which enables community outreach and cooperation between different parts of the state.

1. THE PROBLEM OF INTEROPERABILITY

Effective response to a range of events – from building fires to hostage situations, traffic accidents, and terrorist attacks – depends on first responder communications. Effective first responder communication is enabled by “interoperability,” or “the ability to provide an uninterrupted flow of critical information among responding multidisciplinary and multi-jurisdictional agencies at all levels of government before, during, and after an event.”³ In other words, interoperability allows different agencies to share information when a significant event happens. Multi-jurisdictional incidents are those that by their severity force one agency to reach out to other agencies horizontally (to surrounding communities) and vertically (to higher state and federal authorities). In some instances, agencies must effectively combine their communications resources due to the location of the incident. New Hampshire and Vermont share a border, and first responder assets are often shared.

The importance of interoperability is demonstrated by a 1997 incident involving law enforcement officers from New Hampshire, Vermont, and the U.S. Border Patrol pursuing gunman-murderer Carl Drega. Outdated and incompatible police radios allowed Drega to elude capture for hours as authorities scrambled to pass information between agencies. During the incident, Vermont and New Hampshire officers had to park two of their cruisers together to serve as a hub between the two organizations because their radios worked on different frequencies.⁴ Portsmouth, New Hampshire Police Chief Brad Russ put the problem concisely when discussing the failure of communication during the incident: “If someone has a piece of information that is vital but can’t get [it] quickly to everyone, it can be a significant public safety issue.”⁵ Although communications structures have improved since then (thanks to state and federal grants and homeland security concerns following the terrorist attacks of September 11, 2001) interoperability is still an issue of concern in Vermont and New Hampshire.

This report seeks to assess the status of first responder communications and interoperability in Vermont and the relationship of interoperable communications to statewide homeland security goals. To do this, the report draws together current research on first responder communications and interoperability, as well as evaluations of Vermont’s communications. Personal interviews were conducted with state and local homeland security officials and first responders, including those from police or fire services in four Vermont municipalities. We examined the quality of first responder communications systems in three dimensions: (1) the technology behind communications devices, (2) multidisciplinary/multi-jurisdictional interoperability, and (3) training, community outreach, and education.

2. VERMONT’S HOMELAND SECURITY INTERESTS

Three homeland security interests in Vermont merit special attention: (1) Vermont Yankee Nuclear Power Plant, (2) the United States – Canada border, and (3) Burlington International Airport. These three targets are places whose destruction (either by natural

or man-made disasters) would pose a threat to the state and surrounding area. During a disaster, communications systems that would allow first responders to respond effectively and to bring in the surrounding communities for assistance would be crucial in limiting the threat to the state and its citizens. Improved communications at each site and throughout the state would require a marked improvement in radios, networking, and public alert systems. Some of these goals could be attained through a dedicated effort at expanding statewide interoperable communications.

2.1 Vermont Yankee Nuclear Power Plant

Each of the 104 commercially licensed nuclear reactors across the United States is an important national and state asset and necessitates close safety monitoring by the U.S. Nuclear Regulatory Commission (NRC).⁶ Perhaps the most feared situation at a nuclear facility is a core meltdown, which can lead to the release of highly radioactive material. To deal with emergency scenarios, there are two “emergency planning zones” (EPZs) around a nuclear plant. The first, with a radius of 10 miles around a plant, is called the “plume exposure pathway.” Those within this area face direct, external exposure to radioactive materials. The second zone, with a radius of 50 miles around the plant, is called the “ingestion exposure pathway,” and those in this area risk ingesting contaminated water or livestock.⁷

Because of the capacity to harm many people in a large geographical area and to cause sustained damage to the surrounding environment, accidental or deliberate failures at a nuclear reactor can have devastating consequences. Thus, nuclear power plants are often considered potential targets for terrorists. Attackers could cause a meltdown by damaging security systems for the plant core. Alternatively, they could drain the cooling water from the spent fuel storage,⁸ which would result in a fire and the release of radioactive materials. Additionally, a nuclear power plant could be susceptible to an attack by air, in which terrorists fly an airplane into the plant. If the plane were able to penetrate the building far enough to reach the containment area of the core, then a meltdown could occur.⁹

In addition to these scenarios, electrical power outages are of particular concern for nuclear power plants. All U.S. nuclear power plants receive electrical power for their reactor safety systems primarily from an offsite electrical grid system. A typical nuclear power station is connected to the electric grid through three or more transmission lines. If these power lines or the electrical grid go down, onsite emergency generators begin functioning. These generators prioritize their power during the blackout to a few safety-class circuits. According to the Nuclear Regulatory Commission, over 50% of all hypothesized accidents leading to a core meltdown begin with a station blackout. In addition to a terrorist attack, a natural disaster such as a hurricane or tornado could cause the power lines to go down. If such an event were to be coupled with a failure of the emergency generators, the emergency battery supply would be depleted within four hours. The plant would then lose its ability to cool the reactor core, causing a meltdown.¹⁰

In the past, Vermont citizens and government agencies have had concerns about numerous aspects of Vermont Yankee. One of the principal concerns is that a planned 20 percent increase in the plant's power production would increase the amount of radiation generated by the plant to more than the 20-millirem state standard and could put the plant at risk of major plant failure.¹¹ A letter in late 2005 from Massachusetts Congressman John W. Oliver to NRC Chairman Nils Diaz expresses the concerns of many in the fallout zone¹² of Vermont Yankee. He claims that the power upgrade, combined with "existing cracks in steam dryers,"¹³ has been the root of major plant failures elsewhere in the country and that conducting stress tests¹⁴ while increasing the power production would be irresponsible.¹⁵

In the case of a plant failure or terrorist attack, the ability of first responders to communicate with each other would be crucial to the effectiveness of the response. Evaluations of communications at Vermont Yankee and in the surrounding area have brought some problems to light. *Vermont Guardian* ran an article in February 2005 describing the concerns of Vermont Department of Public Safety Commissioner Kerry Sleeper regarding the state of communications at Vermont Yankee. In particular, he mentioned failing tone-alert radios that signal evacuation in the surrounding communities that compose the emergency planning zone. He also cited the need for improved coverage through emergency sirens as well as automatic telephone calls to warn those in the evacuation zone. According to him, communication failures prevented effective, coordinated responses during drills. He reported that due to a communications failure in an exercise on December 16, 2004, 30 buses failed to arrive from New Hampshire to pick up schoolchildren from the emergency evacuation zone.¹⁶ The same bus drill was repeated on February 12, 2005, and an unannounced drill was performed on October 27, 2005. In both exercises, the failures of the December 2004 drill were corrected and all schools in the 10 mile EPZ were successfully evacuated.¹⁷ A Plume Phase Exercise¹⁸ (conducted by FEMA and the NRC on May 24-27, 2005) exposed more problem areas, including "inaccurate and confusing news advisories, expired potassium iodide,¹⁹ delayed sirens and a failure to complete backup route alerting within the required 45 minutes."²⁰ Several exercises were then conducted in the summer of 2005 to correct these problems, including a remedial Plume Phase Exercise.²¹

While we were unable to find any direct evaluation of Vermont Yankee's interoperability, the communication problems demonstrated by the evacuation failures suggest that the emergency response structure may be inadequate. Vermont Yankee has not participated in any state homeland security exercises to date, but the company works very closely with the Nuclear Regulatory Commission to meet certain standards²² and is implementing their "own set of standards and regulations regarding exercising."²³

2.2 United States – Canada Border

Homeland security regulations allow the United States Border Patrol to ask individuals within 100 miles of the border whether they are U.S. citizens, and the border patrol agents in Vermont do so at 12 fixed locations statewide.²⁴ There has been an increase in

border patrol assets in Vermont following improvements by the state of New York in its own border security.²⁵ In the past year, agents made 218 arrests at Vermont checkpoints, none of which resulted in links to terrorism. Agents stationed at each checkpoint can thoroughly question only 4 of every 100 drivers, which may let some suspects past the checkpoint.²⁶

Vermont's Homeland Security Unit and the state's Department of Public Safety recognize the importance of border security. Current intelligence shows al-Qaeda's potential to attack key infrastructure along the border and transport terrorist weapons along the state's major highway routes.²⁷ In such an event, the ability to communicate with bordering neighbors Canada, New York, and New Hampshire regarding potential terrorist threats and illegal entries would be crucial. As of now, various departments in different states use either analog radios or digital radios – and sometimes both. In the event of a border crisis, state and municipal police from Vermont and New Hampshire, as well as the border patrol, would need to pool their assets through interoperable communications devices. Officials have conducted numerous exercises at the border with the Vermont Homeland Security Unit, local first responders, and Canadian agencies. The most recent exercise was in October 2005 and was almost entirely funded at the federal level.²⁸

2.3 Burlington International Airport

As a point of entry from Canada,²⁹ Burlington International Airport (BIA) is a security interest and, like the border, could serve as an entryway for terrorists. In addition to the threat of a hijacking, airports must also deal with the threat of an attack with chemical and biological agents, both of which could cause large numbers of casualties. A contagious biological agent could be especially dangerous, given the potential for a widespread pandemic and large economic damages to the area. In addition, the contaminated airport could be closed for several months.³⁰

The airport's police force is a branch of Burlington Police Department and maintains communications capabilities through that office and its radio frequencies. According to Sergeant Shawn Toof, portable radios used by airport security are approximately 18 years old, and while they permit communication with outside police, BIA's police branch claimed that computer communication with state assets would be faster. There are no standard operating procedures to notify surrounding communities in the event of a terrorist attack; however, the airport does have mutual-assistance agreements in effect in the event of accidents and disasters. Since some general aviation services from Canada land there, the BIA airport has a U.S. Customs presence that checks flight manifests and crew. In the event of a bomb scare or terrorist threat, the Vermont Department of Public Safety would be the main conduit to the U.S. Department of Homeland Security and statewide interests.³¹

3. FIRST RESPONDER COMMUNICATIONS IN VERMONT

While Vermont first responders generally have very good radio communications with members of their own agency through mobile radios and dispatch base stations, the same is not true with regard to communications outside of each department, community, and region. Interoperability, while a stated priority of the first responder community in Vermont, has so far failed to gain significant funding or widespread implementation across the state. In a table detailing the “total shortfall regarding equipment resources needed to reach the desired response level for all categories,” Vermont’s State Homeland Security Strategy report claims that 194 pieces of interoperable communications equipment are required but only 32 are on hand. This represents a shortfall of 162 pieces of equipment and \$46 million.³² This significant lack of interoperable equipment results in a number of problems for the state’s efforts to meet its homeland security goals.

Across the state, law enforcement agencies generally operate their radios on the ultrahigh frequency (UHF) 450 megahertz (MHz) band while fire and EMS units operate on the very high frequency (VHF) high band 150 MHz. Units operating on different bands cannot communicate with each other unless one unit switches its band, a capability that many first responder radios in Vermont do not have. This report found the only exceptions to the above VHF/UHF band distribution are Burlington, South Burlington, and Rutland, where the fire agencies operate on both frequency bands.³³

Operating on one band does not necessarily mean having capabilities exclusively on that band. Many first responder organizations across the state are able to communicate on both bands either through their own radios or via relays at base stations. Many Vermont state police cruisers have recently been upgraded with Motorola MCS 2000 UHF radios that allow multi-jurisdictional frequency programming. State police command cruisers and those stationed along the state’s borders have also been outfitted with Motorola CDM 1250 VHF radios that have similar programming abilities.³⁴ The Vermont Homeland Security Unit (HSU) confirms that the dual-band approach gives the state police communications capability with statewide first responders operating on either frequency. Vermont HSU further recommends, “local response agencies purchase multi-channel or dual band radios for their command and control vehicles.”³⁵

Another problem is posed by the incompatibility of analog and digital voice modulation technologies. Agencies with one technology cannot communicate with agencies that have the other. Voice modulation refers to the way vocal signals are attached to the radio waves. For example, New Hampshire law enforcement utilizes the VHF digital band, while fire and EMS services use VHF analog (though they are in the process of switching to VHF digital). Both branches in New York use analog VHF bands, while first responders in Massachusetts operate on all bands in analog format. Analog scanners and radios cannot pick up messages sent with digital voice modulation. If, for example, digital encryption were active to avoid access by criminals listening to scanners, analog radios would not be able to translate the signal, resulting in a communications blackout.³⁶

However, it is possible to use patching and repeaters to convert the digital modulation to a form the analog users can hear.

4. BARRIERS TO INTEROPERABILITY

In a September 2005 description of Vermont's "Three Year Strategy," the state's Homeland Security Unit reported that Vermont law enforcement organizations have utilized both government and public communications assets to facilitate "an extensive data network." The same report claims that, regarding the first responder community, "there is no system that will permit immediate and secure communications to police, fire, and emergency medical personnel simultaneously."³⁷ The report also details several barriers to interoperability and immediate intelligence sharing, including:

- lack of public awareness about the need for improved interoperability
- inadequate radio coverage throughout the state
- channel congestion
- interference issues
- dramatically changing wireless communications environment

The first responder community in Vermont is still trying to determine the most effective approach to interoperability. The Vermont Department of Public Safety has developed the New Mobile Data Radio Network and Two-way Voice System Replacement Project, with the intent of providing Vermont with a new interoperable communications infrastructure as well as expanded two-way radio capabilities for the state's 14 sheriff's departments, 52 municipal police departments, 246 fire departments, and 123 emergency medical services.³⁸ As recently as March 2006, the Vermont first responder community has been meeting as Vermont Communications (VCOMM) to discuss interoperability-specific issues. The group convened to determine ways to work through the federal and state authorities "to create a Public Safety communications network throughout the State of Vermont capable of meeting the two-way voice and data needs of all first responders."³⁹ In addition, the group was tasked with finding potential sources of funding for new construction and equipment purchases to lessen the burden on the first responder organizations themselves.⁴⁰

As of December 8, 2005, the committee had not yet been structured as a not-for-profit corporation, a governor's commission, or a group in the Department of Public Safety's Homeland Security Unit. This organizational classification is important because the group cannot start the grant-request process and formalized activities within the state legislature without it.⁴¹ Until then, VCOMM may encounter obstacles interfacing with state leaders and federal grant makers.

VCOMM has identified a number of other potential obstacles to first responder interoperable communications. These include:⁴²

- limited funding
- self-sufficiency of some public safety first responders
- Vermont’s terrain and the impact on system coverage requirements
- natural tendencies to develop low-cost work around solutions instead of long-term global solutions
- desire for local control of communications systems by first responders

The group’s analysis characterizes a Vermont first responder community that has been “going it alone” in terms of communications equipment, with each municipality developing its optimal, low-cost solutions in a vacuum.

5. INTEROPERABILITY AT THE MUNICIPAL LEVEL

5.1 Methodology

To research first responder communications capabilities and interoperability beyond those reported by statewide organizations and studies, local police and fire services were contacted by phone and asked a common series of questions related to communications. The towns and cities were chosen based on population, geography, and proximity to security interests. Those studied were St. Johnsbury, Bennington, Rutland, and Burlington.

City/Town	Department(s) Interviewed	Person Interviewed	Rank/Office
St. Johnsbury	Police Fire	Mark Gilleland Troy Ruggles	Supervisor, Dispatch Chief
Bennington	Fire	Jeffrey Gauthier	Chief Engineer
Rutland	Police	Kevin Gino	Lieutenant
Burlington	Police Fire	Michael Schirling Kevin J. Williams	Lieutenant Training Officer

This study found serious barriers to communication due to a lack of appropriate technology. While commissions have recently been convened to address the quality of interoperable communications in Vermont, only those municipalities whose first responders have taken the initiative to apply for grants have addressed the problem in a substantive way to date. Some towns may not be able to upgrade their communications systems because of age and incompatibility with upgrades currently offered. Finally, certain towns may be buying older analog equipment from device manufacturers at discounted prices, thereby lowering cost at the expense of interoperability.

Underlying these shortcomings is, in part, a lack of commitment to interoperability. Many communities reported satisfaction with their infrastructure despite low interoperable communications capabilities and lower-grade technology than that used in adjacent regions. First responders with outdated equipment can effectively communicate

within their community. In the event of a terrorist attack or major disaster, however, those same responders would need to communicate regionally or even nationally.

5.2 Technical Aspects and Band/Frequency Usage

According to a 2005 report conducted by the Macro Corporation for Vermont's Communication Studies Committee, communications quality and interoperability vary across the state. According to the report, 73 percent of those interviewed in the Vermont first responder community cited "inadequate radio coverage" as the largest communication problem.⁴³ Towns using older equipment confront "dark spots" in some buildings and other areas. This impedes potential rescue and disaster-response efforts. For example, in our investigation, we found that poor radio coverage was evident in St. Johnsbury due to a lack of portable radio coverage in buildings, creating a dangerous situation for first responders in fire and rescue situations.⁴⁴

While all of the agencies we interviewed use computer-assisted dispatch strategies, interoperable communications vary at the dispatch level. Some dispatch centers/base stations have directly interoperable communications capabilities (e.g. Burlington, Rutland). Others rely on relays and patches to communicate between agencies, especially with portable/handheld communications devices (e.g. Bennington). The status quo for Vermont dispatch and communications relays, with the exception of Burlington and South Burlington, is the traditional push-button analog set.⁴⁵ This technique, referred to as common-band protocol, is used by 20 percent of the first responder community, while 17 percent use another protocol called console patching.⁴⁶ However, the most common option across Vermont is the use of multiple radios, with 28 percent of first-respondent agencies carrying two or more radio devices for mobile, trunked, and even portable communications.⁴⁷

Poor portable radio coverage, congested frequencies, and the use of more than one radio cause problems for first responders during an emergency. In addition, analog communications can be easily intercepted using commercial police scanners. This poses a problem for first responders because terrorists or other criminals would know the location of their assets.⁴⁸ One advantage to upgrading to digital voice modulation would be that communications could not be intercepted using such scanners.

Market forces and a lack of funding for upgrades have also hindered the improvement of radio technology in Vermont. Problems with technology continue as manufacturers offer low-cost upgrades for older radios, encouraging municipalities to maintain the status quo instead of purchasing a newer, fully interoperable system.

5.3 Interoperable Capability and Communications with Surrounding Communities

The ability of agencies in different communities to communicate with each other varies across Vermont. Some areas, like Burlington and South Burlington, are currently upgrading their systems to improve intercommunity communications. Improvements

involve the installation of mobile data terminals (MDTs) in police cruisers, upgrading of all radio towers with repeaters and relays, and a switch to digital voice modulation.⁴⁹ Such upgrades give the two cities an ability to communicate over voice and computer data relays, allowing transmission of important information over both channels. Most towns in Vermont rely on relays and repeaters at the dispatch level to communicate across their municipality and with assets from surrounding communities. Communication between a portable from one town and that of another is possible only if the second town's band, frequency, and channel are programmed into the portable, which is often not the case.

Towns in Vermont do not have the regimented mutual-aid agreements that, for example, towns in New Hampshire share. As a result, it is the responsibility of the town's emergency management director to set up and maintain a mutual-aid system. For example, in St. Johnsbury, Chief Troy Ruggles has maintained a set of "run cards" corresponding to different communities. These cards list the resources that St. Johnsbury would send to a particular event in each town and those that could be expected from each town in an emergency situation. While Chief Ruggles has 10 to 12 communities listed with run cards, St. Johnsbury typically would not respond to an incident in Burlington or Rutland. The presence of a statewide formalized system could help facilitate mobilization of resources from around the state and direct them to a particular region. In the event of a large-scale disaster, first responders in St. Johnsbury could rely on statewide frequency bands to learn what resources Burlington had or what was needed.⁵⁰

5.4 Training, Community Outreach, and Grant Programs

In terms of training, all four municipalities surveyed for this report have participated in exercises in the past, but only St. Johnsbury has participated in an exercise that specifically addressed interoperability. Jessica Stolz, Exercise Planner for the Vermont Homeland Security Unit, confirmed that there have been no statewide exercises designed solely to evaluate interoperability. She reported, "Vermont has not conducted communications exercises to date because responders in the state acknowledge that communications need improvement and, in most cases, these issues cannot be solved during a single exercise. Most of these communications issues identified in previous exercises are being improved upon and will not be exercised again until the improvements identified have been completed."⁵¹ Funding allocations for local training exercises across the state have recently increased from \$0 in 2004 to \$500,000 (plus \$280,000 from the 2003 allocation) in 2005.⁵²

In order to improve the technological capabilities of first responder units, municipalities must seek and receive funding. None of the four municipalities interviewed has dedicated grant writers, but where agency officials interact regularly with the Vermont Homeland Security Unit and other grant programs, they are successful in procuring funds. Since 2002, Burlington has received more than \$3.4 million in homeland security funds, much of that for communications upgrades. Not all municipalities seem to be interested in pursuing funding, however. The city of Rutland, for example, is aware of and considers

grant opportunities but has determined that it does not need the upgrades, even though grants are awarded less than once a year.⁵³

Differences exist in the case studies with regard to community outreach and education. While some officials cast outreach as the highest priority, others fear that an unnecessary focus on terrorism preparedness might raise “red flags” in the community and create needless public alarm.⁵⁴

5.5 Border Cooperation

While those surveyed reported few Vermont/New Hampshire joint emergency operations, such operations do occur. Interoperable communications have been, and will continue to be, a key issue in these interactions. For example, while Vermont law enforcement operates on UHF analog, New Hampshire’s equivalent agency operates on VHF frequencies with digital voice modulation, making it impossible for the two agencies to communicate on the same band and necessitating multiple radios or patching. While both states’ fire agencies use the VHF band, New Hampshire’s fire departments will soon use digital voice modulation instead of analog, thereby creating another communications barrier across the Connecticut River.⁵⁵

6. BEST PRACTICES AND POLICY OPTIONS

Through a qualitative assessment of Vermont’s first responder communications infrastructure and interoperable capabilities, this report found potential problems with technological advancement and infrastructure, community outreach, grant seeking and awareness, training, and the routine utilization of interoperable communications. Interviews with municipal law enforcement and fire services officials have shown that some first responders believe that use of multiple radios or patches through base stations are the most effective ways to achieve interoperability. However, there are numerous technological advancements available in portable radios and parallel systems. Vermont’s first responder community is just beginning to come together (as VCOMM) to address the problem, and a statewide evaluation of interoperability may benefit by consideration of the best practices and policy options discussed in this section.

6.1 Technologies and Interoperability

An array of interoperability technologies used around the country may provide solutions for barriers to interoperability in Vermont. One inexpensive and immediate remedy for problems in radio communication is that of sharing channels, whether through emergency mutual-aid channels or channel-sharing agreements. Vermont has a statewide emergency management channel on VHF low band, as well as a statewide RACES program that allows amateur, licensed radio operators to provide civil preparedness information in the event of a disaster.⁵⁶ The establishment of one or two statewide mutual-aid channels would ensure that in the event of a major disaster or terrorist event, responding agencies would have a direct communications link to each other. The advantage of a mutual-aid

channel is that once an agreement is made and minimal infrastructure is in place, coverage can be wide-reaching and effective under the supervision of a dedicated dispatcher or support technician. One example of a mutual-aid channel system is in place in Montana's Missoula and Mineral counties, where there are 14 such channels available statewide. Channels are set aside for statewide EMS, fire, and police responders, and there is a channel for interagency coordination. The mutual-aid channel system was an integral part of the response to a chlorine spill in both counties that led to the longest highway closure in U.S. history.⁵⁷

An alternative method of channel sharing – and one that does not carry as heavy a cost for upgrading the communications infrastructure – is the establishment of a parallel system for interoperability using cellular phone technologies. The International Association of Fire Chiefs endorsed the concept of a parallel phone system to supplement radio communications during disaster response, highlighting the potential of Sprint Nextel's "push-to-talk" function.⁵⁸ A similar system was implemented in Charlottesville, Virginia, where existing handsets were replaced by the Motorola handsets powered by Nextel. The new handsets allow users to enter a "talk group," where a number of first responders can communicate with their incident command structure and leaders. Communication is handled digitally over an 800-megahertz network that, when combined with mobile data terminals (MDTs) and trunked systems, can provide wireless data transfers.⁵⁹

6.2 Obtaining Grants

Grant seeking at the local level is normally the responsibility of a fire chief, assistant fire chief, or law enforcement communications officer. Federal government grants are available to first responders through the Vermont Homeland Security Unit. While Vermont's first responder training program Web pages provide information about how to apply for grants, first responders may still have trouble applying due to either time constraints or the complexity of the grant application.⁶⁰ This means some available grants go unused. The inability to take advantage of the grants could be remedied by statewide training of grant writers within each department (or group of departments) to analyze municipal-level needs and apply for funding at the state and federal level.

There may be advantages to implementing a centralized system for coordinating and training first responders and emergency response staff from across the state. This system could make decisions regarding communications equipment purchases, coordinate and test different methods of interoperability, and provide a common training base for all state responders. Rhode Island has created such a centralized system and uses it to strongly encourage officials from towns, hospitals, public-health offices, fire departments, police departments, and EMS departments to apply for grants. The Rhode Island Emergency Management Agency (RIEMA) develops a state homeland security strategy and approves all grant proposals. RIEMA contacts individuals and offices to inform them directly of relevant grants and to encourage them to apply. RIEMA also supplies them with printed rules and application materials. Meetings between applicants

and RIEMA officials help the agency walk the first responders through the application process.

6.3 Improved Training Procedures

Rhode Island also has training procedures that Vermont may consider during planning and development. Rhode Island trains first responders in 39 communities through RIEMA. Most of this instruction takes place in classrooms, but independent studies are also offered for those who do not have the time or resources to attend classes. The U.S. Office for Domestic Preparedness operates the Homeland Security Exercise and Evaluation Program, which assisted Rhode Island in designing, developing, conducting, and evaluating its training exercises.⁶¹ While Vermont has identified some communications issues as objectives in its statewide exercise program, it has not had any statewide drills or tests to specifically evaluate interoperable communications.

6.4 SAFECOM's Interoperability Recommendations

SAFECOM is a federal program established to provide first responders with information resources regarding interoperability and compatible communications devices. SAFECOM recommends six strategies for improving interoperability:⁶²

1. Gaining leadership commitment from all disciplines (emergency medical services [EMS], fire, law enforcement)
2. Fostering collaboration across disciplines (EMS, fire, law enforcement) through leadership support
3. Interfacing with policy makers to gain leadership commitment and resource support
4. Using interoperability solutions on a regular basis,
5. Planning and budgeting for ongoing updates to systems, procedures, and documentation
6. Ensuring collaboration and coordination across all elements (governance, standard operating procedures [SOPs], technology, training/exercises, usage)

Routine use can be accomplished at air shows, county fairs, and other gatherings where municipal police, EMS, and fire services are present. Turning these types of events into training events in interoperability and multidisciplinary/multi-jurisdictional communications enhances emergency response capability and tests compatibility. Standards-based technological approaches and shared information systems would ensure compatibility in technology and facilitate coordination among different actors.

It may be beneficial for Vermont to go beyond federal mandates and establish standards for communications equipment in the first responder community. The establishment of an online service, much like the federal “first responder knowledge base” would constitute an important step towards setting up a statewide interoperability project. Training and

technology tips, best practices, and mutual-aid features would increase first responder interaction across the state.

7. CONCLUSIONS

Since September 11, 2001, great strides have been made across the nation in providing funding, resources, and support for the first responder community. However, our study finds that, with the exception of two cities that have upgraded their communications infrastructures through millions of dollars in homeland security grants, Vermont's first responder agencies have not fully mobilized to improve their interoperable communications. We document a perception among agency officials that using multiple radios or frequencies is an effective example of an interoperable infrastructure, when, in fact, interoperability can be improved on many more levels:

- The communications infrastructure, equipment, and technology could be improved. Efforts to replace older analog radio systems with new interoperable equipment and computerized dispatch and communications hubs may be beneficial. Digital-voice modulation and data transfer to MDTs represent the forefront of interoperable communications.⁶³ In lieu of such infrastructure upgrades, a parallel interoperable system could be established with cell phones and portable radios.
- While there is training at the statewide level, there have been no exercises designed exclusively to test interoperability. A combination of classroom instruction, tabletop drills, and live drills specifically designed to address interoperability could be useful. Even without these drills, routine communication between local, state, and federal authorities could be encouraged to open these channels as much as possible. Some localities turn air shows, state fairs, and other events into opportunities to test communications between multiple first responder organizations.
- Steps could be taken to improve the grant application process for first responders at the municipal level. Often, police and fire chiefs are burdened with applying for grants and only do so through the state Homeland Security Unit. It is possible that encouraging local law enforcement and fire services to apply for grants and run workshops about grant seeking and proposal writing would benefit first responders as they tackle federal and state grants.

Vermont is already beginning to address these interoperability issues with the implementation of the VCOMM group, which enables community outreach and cooperation between different parts of the state.

Disclaimer: All material presented in this report represents the work of the individuals in the Policy Research Shop and does not represent the official views or policies of Dartmouth College.

Appendix A: First responder Communications Case Studies

St. Johnsbury, Bennington, Rutland, and Burlington

Technical Aspects and Band/Frequency Usage

St. Johnsbury's police and fire dispatch are based in one building and cover nearly 36 square miles of surrounding communities. Fire and EMS in St. Johnsbury operate on a VHF frequency, with a base station in their command center. The municipal police generally operate on UHF, but cruisers and patrol sergeants have dual-band capability. One problem St. Johnsbury Fire Department Chief Troy Ruggles sees is the lack of advancement in communications technology, as his department is still using the same technology as it did in 1976. Chief Ruggles notes upgrading existing devices and technology is often cheaper than purchasing new communications systems. Even with changes in wattage and signal output, portable radios in his jurisdiction often cannot penetrate basements of steel structures, and wireless data equipment has some shortfalls given the unique geography of northern Vermont.⁶⁴

The base station for the Bennington Police Department has both UHF and VHF frequency capabilities, though handhelds used by police are mainly UHF while fire services and EMS operate on VHF.⁶⁵ The Rutland Police Department uses a computer-aided OrbaCom dispatch system, and all of the police cruisers have VHF/UHF radios. Both the police cruisers and firefighters operate on the UHF band.⁶⁶ Rutland City's EMS operates on the VHF band. However, across Rutland County, police generally operate on UHF, while fire services operate on VHF.⁶⁷ In Burlington, Vermont's largest city, police, fire, and EMS operate on the UHF band.

Interoperable Capability and Communications with Surrounding Communities

From its base station, St. Johnsbury's fire department communicates with agencies from up to 15 surrounding towns, of which 13 are primarily fire services and two are EMS. All 15 operate on their own frequencies and also have the UHF frequency to contact municipal police.⁶⁸ St. Johnsbury has mutual-aid agreements with 10 to 12 of the surrounding communities and can communicate effectively with their various departments. There is a predetermined list of frequencies to be used in a range of situations.

Due to St. Johnsbury's location near the border with New Hampshire, the town's fire assets respond to calls from the neighbor state four to six times per year, with successful communications between the two states' resources through Twin-State Dispatch.⁶⁹ The town is also within miles of the Canadian border, and St. Johnsbury's police officers claim that they occasionally pick up individuals and later find out they are illegal immigrants. They transfer those individuals to the U.S. Border Patrol, with whom they have cooperated well in the past.⁷⁰

Interoperability in Bennington is achieved through patching at the base station. While fire services, the police department, and surrounding communities may not be able to communicate directly via handheld or mobile devices, they can be patched together through relays at the base station. The police department carries all of the fire and EMS channels on its dispatch console and can communicate effectively across jurisdictions and disciplines.⁷¹

The Rutland Police Department, as in many cities across the state, serves as an interoperable hub for public works, fire, and EMS units. Police Lieutenant Kevin Gino claims that all of these organizations, in addition to the sheriff's office, could use their dispatch and communicate effectively in the event of a disaster.⁷² Likewise, police resources could be dispatched from the state police regional headquarters. While the city has communications capability with surrounding communities, it does not communicate with first responder organizations in nearby New York State, but some ambulance services from New York do occasionally provide assistance through mutual-aid agreements.⁷³

All of the Burlington Fire Department's mobile radios in trucks and command vehicles are interoperable and comply with state and federal recommendations. Since 2002, the department has replaced all of its portable radio equipment, purchasing Motorola HT 1000 handhelds and MC 2000 mobile radios. These pieces of equipment are interoperable in that they have dedicated frequencies for multiple-agency response such that any agency with similar radios can easily switch frequencies to communicate with them.⁷⁴

Training, Community Outreach, and Grant Programs

In terms of training, St. Johnsbury has hosted two events, including one full-scale drill in October 2004 to test communications capabilities between multiple agencies of different disciplines. The second drill was a full-scale, condensed-time simulation of a terrorist event that involved local, state, and regional response units.⁷⁵ The first drill, which specifically involved interoperability, was deemed a success and revealed some areas for improvement. One issue identified by Fire Chief Troy Ruggles was the belief by some that the entire country operates on the same frequency, which is a myth. He believes that frequencies must be split and that interoperability entails the breaking down of frequencies to lessen congestion, with a corresponding assignment system to permit ease of switching between agencies and jurisdictions.⁷⁶ Ruggles personally sits on at least two homeland security-specific boards/panels and sees a good relationship between Vermont's Homeland Security Unit and the St. Johnsbury first responder community. He also is a member of the Troop B advisory board through the state police organization's breakdown of state regions.⁷⁷

Bennington Fire Department Chief Engineer Jeffrey Gauthier reported that the city had a tabletop drill for general emergency response in the winter of 2005 and a mock drill during the summer of 2005, during which some communications problems were found. He says the use of different codes by various departments, not the inability to actually

contact each other, was to blame for interoperability problems. For this reason, the department eliminated the “ten-code” and now uses plain text. Chief Gauthier stressed the significance of the installation in police cruisers of MDTs, which are powerful laptops designed to communicate with the base station’s computers in order to alleviate some of the strain on radio frequencies.⁷⁸

The Rutland first responder community does yearly exercises, with an evaluation aspect that generally lasts one to three hours immediately after the three-to-four-hour exercise.⁷⁹ There have been many exercises with terror threats, and two years ago the tabletop training involved a gasoline tanker/terrorist threat. Last year, the first responders had a drill involving an overturned bus. Lt. Gino is vice president of Rutland United Neighborhoods. In addition to regular meetings with Department of Public Safety representatives, he holds monthly community meetings to discuss potential disaster threats. In terms of grant writing, the department has written proposals for very few grants recently as it had no need for many of the programs and upgrades being offered. The department does not have a dedicated grant writer.

In the past, the Burlington first responder community has participated in a number of training exercises. Generally, these are tabletop or incident simulations that evaluate the entire response system. While communications interoperability has not been specifically tested, the evaluations have been generally positive, according to Burlington Fire Department Training Officer Kevin Williams. The city’s “Emergency Operations Plan” has been undergoing revisions for the past two years and is nearing completion. Burlington Fire Department and the first responder community engage in public education at the “individual level,” though they strive not to cause public stress by pushing for mass education and training in emergency preparedness. While the Burlington Fire Department has no dedicated grant writer, it has been successful in acquiring funding by focusing on writing grant proposals to the state and the Vermont Homeland Security Unit. Since 2002, the department has received seven homeland security grants, totaling over \$3.4 million in funds. A large portion of the funds obtained in 2002 and 2003 was dedicated to the purchase of the new interoperable communications system.⁸⁰

Appendix B: Table of Interviews

Gauthier, Jeffrey – Chief Engineer, Bennington Fire Department – 2/6/2006

Gilleland, Mark – Supervisor of Dispatch, St. Johnsbury Police Department – 1/28/2006

Gino, Kevin – Lieutenant, Rutland City Police Department – 1/28/2006

Ruggles, Troy – Chief, St. Johnsbury Fire Department – 2/3/2006

Schell, Robert – Emergency Management Liaison Officer, Vermont Emergency Management – 2/8/2006

Schirling, Michael – Lieutenant, Burlington Police Department – 1/27/2006

Stolz, Jessica – Homeland Security Unit Exercise Planner, Vermont Homeland Security Unit – 2/8/2006

Toof, Shawn – Sergeant, Burlington Airport Police, Burlington Police Department – 1/27/2006

Williams, Kevin J. – Training Officer, Burlington Fire Department – 2/6/2006

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- ¹³ Vermont Yankee's reactor has stainless steel steam dryers, which are used to provide structural integrity. (Vermont Yankee Nuclear Power Station, License Renewal Application, Technical Information, p. 264)
- ¹⁴ Stress tests can be "temperature/humidity stresses on microprocessor-based systems in controlled environments," to ensure that the steam dryers can sustain the production increase. (Operating and Maintenance Experience with Computer-Based Systems in Nuclear Power Plants, A report by the PWG-1 Task Group on Computer-based Systems Important to Safety, p. 19)
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- ¹⁸ Plume Phase Exercises are conducted once every two years and tests the ability of first responders and the power plant to protect citizens within the 10 mile EPZ. (Vermont Emergency Management, 2005 Annual Report, p. 30-31, <http://www.dps.state.vt.us/vem/AnnualReport2005.pdf>)
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