



From VHF to 800 MHz

A PHASED APPROACH TO IMPLEMENTATION





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BY JAMES TAYLOR

For years, the Providence (R.I.) Fire Department has been on VHF 154.370 MHz, and, in 2009, we switched over to 800 MHz (Astro Digital P25). It was a long process with many phases.

COVERAGE

In 2007, the sites began to go up in the city of Providence. Four sites were originally planned. We wanted to make sure we had enough sites for coverage to saturate the city, and our research revealed that with the original four sites we had a large coverage gap in the city's west end. So we decided to go with five sites: Brown University, Providence College, the Rhode Island Public Transit Authority (RIPTA) at 325 Melrose St., Hartford Park Housing at 335 Hartford Ave. and the Public Safety Complex at 325 Washington St.

These sites were built, and then came Phase 2—testing various buildings in the city of Providence.

We tested many buildings in every grid on a map Motorola gave us. We tested everything: apartment buildings, high-rises, hospitals, schools and houses that fell within the grids. With two teams the testing took about a month.

When we tested the many buildings and high-rises, we went down to the lowest point, whether it was in a parking garage or basement. When we got below grade results on digital testing, we received bonks and digital breakup. The concern now was how we were going to communicate with the firefighters who are always going below ground level to shut off electricity, gas and water. We noted these buildings when we tested them. When we completed testing, we had a list of more than 150 buildings at which we received bonks or digital breakup somewhere within the building.

We could not transmit to or from one high-rise at all—we received bonks on the 1st floor, as well as the 17th floor. After some investigation, we discovered this building used a metal flake in its windows that was interfering with the communications signal. This building brought forth another project: drafting a Bi-Directional Ordinance that had to be submitted to the city council for approval. The Bi-Directional Ordinance was passed and included new and existing construction.

For existing construction, buildings must have a bi-directional amplifier installed to improve communications within five years. With the exception of one high-rise, a vehicle repeater fixed most of the communications problems we found.

PROGRAMMING

Next came Phase 3, which was programming all the mobile and portable templates. With the new 800 MHz radios, we had three banks with 16

FROM VHF TO 800 MHZ

channels in each bank. Bank “A” was for each city or town, and banks “B” and “C” were designated for statewide use and are all programmed the same.

The first and last position on the radio was designated as the main Fire Dispatch Channel 1. This was a safety feature for firefighters. If a firefighter gets lost or disoriented, they can go one way or the other on the dial, and they’ll be on our main dispatch channel on any bank. Channels 2–4 are our fireground channels, which ended up being analog simplex.

We also have three channels, Mutual Aid Channels 1–3, that we use to communicate with our incoming mutual aid rescues. All the surrounding communities have an 800 MHz mobile radio in their vehicles, and because we were transitioning off the VHF system we would not be using the traditional fire intercity. When outside rescue companies come to our city, we assign them a mutual aid channel and our on-scene companies can talk directly to them.

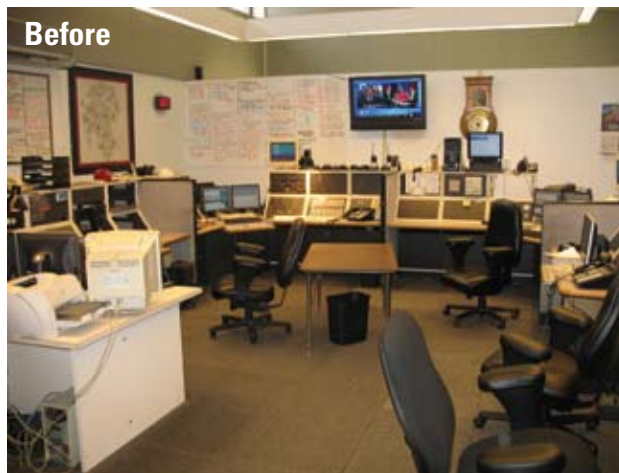
We also programmed Channel 15 as Providence Police Channel 1 so we have interoperability with our police, which is essential.

THE COMM CENTER

Next came Phase 4, transitioning the Fire Alarm Office. We have two civilian dispatchers, one sworn fire dispatcher lieutenant and one sworn fire dispatcher captain. They work eight-hour shifts with six groups. We do roughly 41,000 runs a year, which includes both fire and EMS calls. We previously had three dispatch positions, and we upgraded to four dispatch stations with Motorola MCC 7500 consoles, which have patching capabilities.

During this phase, we dispatched out of our mobile command unit for about a month.

Before the room was finished, we went into Phase 5, which was training on the consoles. During the transition, we would be using the new consoles with both our old VHF and the new 800 MHz systems. On the VHF system, we had a Centra-



com 2, which was operated by buttons with LEDs. The 800 MHz MCC 7500 is operated via point and click using a mouse. There was a learning curve, as with anything.

Next, came the problem of how we were going to address the various bunks and digital breakups we were receiving in several buildings below grade.

We went on a field trip to Maine and checked out what system the Portland Fire Department was using. It was using an older version and vehicle repeaters made by Futurecom. Portland FD demonstrated the system at a hospital, and it seemed to overcome the digital errors and bunks. We ended up ordering one for testing purposes, and our radio division programmed it to be fully digital.

The testing began, and we still received bunks and digital errors. We went back to the table and the radio division decided to program it for both digital and analog systems. This still did not work. When two portable radios were near each other, they desensitized and the portable radio would not pick up the other portable

radio, which was right next to it. There was also a loud helicopter noise that we could not get rid of, and it impeded communications. The radio division later found out that two vehicle repeaters were assuming primary status simultaneously. To solve this, we made some adjustments to the sensitivity of the vehicle repeaters.

Our next resolution was to program the vehicle repeater to analog simplex. After much research, we decided to keep the fireground channels in analog. We found that the vocoder board was unable to process digital/audio from fireground scenes. We also tested various noises, such as saws, jaws, PASS devices and the vibra alert, which is used on the Scott Air-Pak mask. We found that these noises did in fact impede communications, especially when the vibra alert went off. To Motorola’s credit, it was addressing this issue with an advanced vocoder and newer radio, but when we were going live with the system, it had not yet been resolved.

This is a brief overview of why we went analog simplex with our vehicle repeaters. Analog simplex is basically a talkaround, as firefighters call it in the VHF or UHF world. The signal would go to the repeater, and then go out digital to responding companies and our Fire Alarm office. This seemed to work, except in some places we might not hit the repeater, but all companies on scene can hear the communications.

We ordered more repeaters because we wanted each company—15 engines, eight ladders and three chiefs, plus a few for the reserve engine and ladders—to have a vehicle repeater.

We tried to simplify usage by installing a separate toggle switch near the mobile radio head, labeled VRS, and also decided to have the Fire Alarm dispatchers assigned to that fireground channel say to responding companies, “*All responding companies, when you get on scene, turn on your vehicle repeaters.*”

This serves as a reminder to responding companies to turn on the vehicle repeater when they arrive on scene and *not* before.

This is so responding companies don't assume primary status from an existing unit on scene, which could result in poor or no communications back to dispatch. Also when companies go in service, we remind them to shut off the vehicle repeater. This procedure was new to both firefighters and dispatchers. This procedure is still practiced.

With the addition of the analog simplex channel, we needed to get three 700 MHz analog simplex channels that could be used for our operations, which we obtained from the frequency coordinator for Region 19.

Next, we ordered and installed the vehicle repeaters. Unlike previous installations and systems, this new system came with a learning curve; much research and preparation was involved.

A couple of things we went with were that when the repeater is turned on, it sends out a series of three tones to let everyone know that repeater is on. We also used the feature of turning the vehicle repeater on via the emergency button in case the company forgot to turn on the vehicle repeater with the switch. We wanted to ensure all vehicle repeaters on scene are turned on

for maximum communications. The new XTS2500 series now has voice announcement, eliminating the need to physically look at the radio. *Another feature:* When someone pushes the emergency button, it sends out a tone through all the portable radios operating on scene.

The end of Phase 5 was bringing companies out to train with the vehicle repeater. We showed them the difference between 800 MHz and our VHF system, which was very important because it was hands-on training. We went to a high-rise downtown with all the companies and groups, and we tested in the parking garage, which goes three levels below ground level. We tested our VHF system, which could not get out for the most part and if it did, the signal was scratchy and unreadable. The 800 MHz digital received bonks, but the vehicle repeater worked perfectly.

At first, many firefighters were skeptical. We brought all the companies out and tested with them and got the firefighters involved with the system. After testing the system and comparing results, most agreed that the 800 MHz was far superior to the VHF system.

GO-LIVE

Each firefighter was trained for four hours; in August 2009, we went live. The system was a learning curve for everyone.

Our first change after going live was to use a microphone without an emergency button because this caused too many accidental false alarms. During the first four months, the radio division and I monitored on scene for proper communications.

It has been one year since our conversion, and we continue to make improvements. For example, instead of using numeric IDs, the actual company call was programmed into their respective radios for safety purposes during emergencies. Overall, the system works very well.

A few things I would suggest are training, training, training, letting firefighters see it work and getting their input, as we did. You will never please everyone, but the 800 MHz system compared to our old VHF system is hands-down far superior.

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