EMCOMM-1: **Case Study**

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Interoperability and Wide Area Disasters
Hurricane Matthew

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Emergency response teams typically prepare for worst-case scenarios in their respective jurisdictions, but rarely does it involve a disaster zone that spans hundreds of miles and across dozens of adjacent counties. In November 2016, Hurricane Matthew did just that to northeast Florida. This Category 4 hurricane was the first Atlantic hurricane to threaten the Florida shores in over 10 years.

EMCOMM-1 is an emergency communications vehicle, fully equipped with state-of-the-art Icom communication equipment. It is a mobile communications van that includes Icom interoperability products that enable communications between myriad radio and commercial technologies. EMCOMM-1 was on the scene for this historic Florida storm.

Featured Products:

- VE-PG3

Interoperability and the 800 MHz Band

Over the years the availability of 800 MHz frequencies has become more prevalent. The lure of 800 MHz is smaller antennas and better coverage. As always there are promises and there is reality. Only five interoperability channels in the 800 MHz band plan that are reserved for public safety interoperability. In many cases the availability of only five interoperable channels is not an issue, as there is rarely a need for additional channels. However, sharing the five channels across a swath of 15-20 counties that are ravaged by an event, like Hurricane Matthew, requires some creative thinking.

During Hurricane Matthew, EMCOMM-1 needed to communicate with agencies throughout the state, who use 800 MHz, P25 and VHF conventional systems. Plus EMCOMM-1 needed to monitor UHF for medical incidents and air frequencies. Now we begin to see the true issue of interoperability. It is not just a situation of having five channels in the 800 MHz spectrum, but of radios in different bands and modes at the same time, on the same incident.

EMCOMM-1 was expected to be “ground-zero” during this storm. Resources from state law enforcement and the National Guard all needed to communicate with our Emergency Operations Center (EOC). This myriad of communications requirements is not atypical in a large-scale disaster and needs to be considered for future risk mitigation and response efforts.

The Need for Portable versus Fixed-Based interoperability

Aside from the situation of needing multi-band and multi-mode interoperability, the storm validated that we needed portable capability as well. We implemented portable interoperability on EMCOMM-1.

Fixed-based interoperability generally implements low-level antennas. For EMCOMM-1 the antenna was about 80 feet, and primarily for communicating with mobile devices. However, in search and rescue or damage assessment efforts portable operation is generally the rule. Being able to deploy portable or transportable interoperability on a multi-site basis would have been beneficial. What we found was that the ability to have a “localized” repeater, which could communicate back to our Dispatch (PSAP) and EOC location would have made communications more seamless to the field units.

Add the Florida Highway Patrol and National Guard

Florida Highway Patrol and Florida’s National Guard responded immediately after the storm passed through, with over 250 troops to assist with traffic control, law enforcement and emergency supply distribution. Their standard communication is through the state-wide 800 MHz EDACS system, which only has coverage along major state highways. This leaves the possibility for many “dead spots” within the area. Therefore we had to ensure that there was sufficient coverage from the statewide system in their assigned Areas of Operation (AO).

Add the Utility Companies

The massive response by Florida Power and Light, with over 300 trucks, was staged on an airport taxiway prior to the storm in anticipation of massive power outages. While able to communicate amongst their own units and to their dispatch centers, there was no direct communications between FP&L field units and our EOC. This was due to the lack of interoperability. Any communication to the field units was done through cell phones, which remained operational (for the most part). **Note: As expected, power outages affected over 96% of the county residents and businesses, with restoration taking anywhere between two to eight days.*

Handling Multi-Band and Multi-Mode

Multi-band and Multi-Mode interoperability brings specific challenges that are not normally considered. For the most part different agencies that do not normally work together on a regular basis and rarely have each other's systems programmed in their own radios. Adding target county's frequency and trunk groups in the field is not routine and often frowned upon. The consideration of implementing encryption keys is a further complication.

We have resorted to programming adjacent and non-adjacent (but cooperating) systems into our interoperability radios, as this handles around 90% of our incidents. But in situations like Hurricane Matthew we found that being able to use another agency's radio and just plugging it into our interoperability infrastructure was the best solution. Especially since EMCOMM-1 is guaranteed to have all the other agency's simplex and repeater frequencies and their encryption keys are not compromised by disclosure to us or another agency.

While provisioning for simultaneous bridges, we found involving 24 different radios is likely an over-kill. Six to eight is a more reasonable number, since we do not normally have more than that number of agencies participating. But scalability above eight ports was a must and needed to be quick, seamless and affordable.

Analog Versus Digital

Going digital was a requirement from the beginning. Digital systems have the benefit of being able to perform level adjustments using "Digital Pots" and they do not exhibit the typical analog system problem of cutting off the first syllable of a conversation due to PTT switching time delay and falsing. Digital system typically buffer everything that they "hear" and re-transmit the full conversation.

The right digital system also gave us the capability to connect IP phones, both wired and software-based, using applications for smart phones and tablets. This allows for IP phones of various types to communicate DIRECTLY to RF devices, allowing a Section Chief in the Incident Command Post (ICP) to have the equivalent of a radio directly patched into the scene of operation, from their IP telephone.

Why We Chose the Icom VE-PG3 System

As I started experimenting with the Icom VE-PG3 about six months prior to Hurricane Matthew, we found it to meet all our requirements, as well as some that we did not realize we needed, specifically:

- **Interface ANY radio with Icom VE-PG3:** We created cables for commonly used radios. Cables for the Icom mobiles were already available from Icom directly.
- **Achieve "plug-and-play" ease once a radio is connected:** Our objective was to be able to have the other agency's radio operational on our system within 30 minutes.
- **Add a radio to a "bridge" without operator intervention:** It also allows a console operator to add and remove, if the situation requires.
- **Add radios and IP phones together:** We were able to add them together in a bi-directional fashion where either the phone or the radio can initiate the conversation. We were also able to add them to a conference bridge with virtually unlimited capability.
- **Add the M-SAT (PTT satellite) system into the Interoperability mix:** This allowed outside agencies to monitor radio frequencies in use on the ground thru their satellite talk groups.
- **Add IVR capability to an incoming phone line:** An agency outside of the disaster area can dial a standard POTS number and be able to monitor the situation on-ground. This would have been useful if the state EOC wanted to listen to our radio traffic at any point during the incident.

Some Surprises from Hurricane Matthew

Nothing ever goes as planned. Even though we had contingency plans for many scenarios, we noted several surprises on our After-Action-Report:

- **Our 800 MHz trunking system never went down:** We were expecting at least the microwave links to be misaligned due to the hurricane force winds. Had we experienced the forecasted Category 4 level winds, we may not have been so lucky. As is, practically all our user base was able to continue using their radios.
- **None of the cellular networks went completely offline:** Two major networks survived with nearly 100% uptime. This was a complete surprise to us, since some of the tower locations experienced wind gusts of well over 100 mph. Their survival aided significantly in the utility company and other agencies being able to coordinate using cell phones, as they normally do.

- **Neither the State or FP&L's radio systems experienced significant outages:** Although both were ready with their own contingency plans in case of communications failure.

Validation from Hurricane Matthew

We planned for the worst case, which allowed us find holes in our pre-planned response and interoperability capabilities that need to be addressed going forward. We found the following statements to be further validated by Hurricane Matthew:

- **Mobile or transportable interoperability is better than fixed-base:** It can target communication capability where it is needed the most.
- **Plug-and-play of radios to the interoperability is essential:** The ability to add communication capability on-the-fly is imperative. With our construction of cables for commonly used radios (in addition to the already available Icom cables), we have over 95% of the public safety radios covered.
- **Scalability is a must, as we have eight ports:** We could have expanded to 12, 16, 24, or 32 ports easily and seamlessly
- **Digital interoperability wins, hands-down:** It does not require PTT, VOX operates without first syllable cut-off, easy bridging and no hardware level adjustments.
- **Conference bridge capability is CRITICAL:** It allows agencies to get on the "same page"

As all of us on the ground recognized, even with power outages lasting upwards of seven to eight days in some areas of the county, this could have been much worse. With a suitable contingency plans, coupled with EMCOMM-1 and Icom's VE-PG3 Interoperability System, we were prepared to tackle a much worse communications situation.

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