2017 Hurricane Season After-Action Report

ARRL
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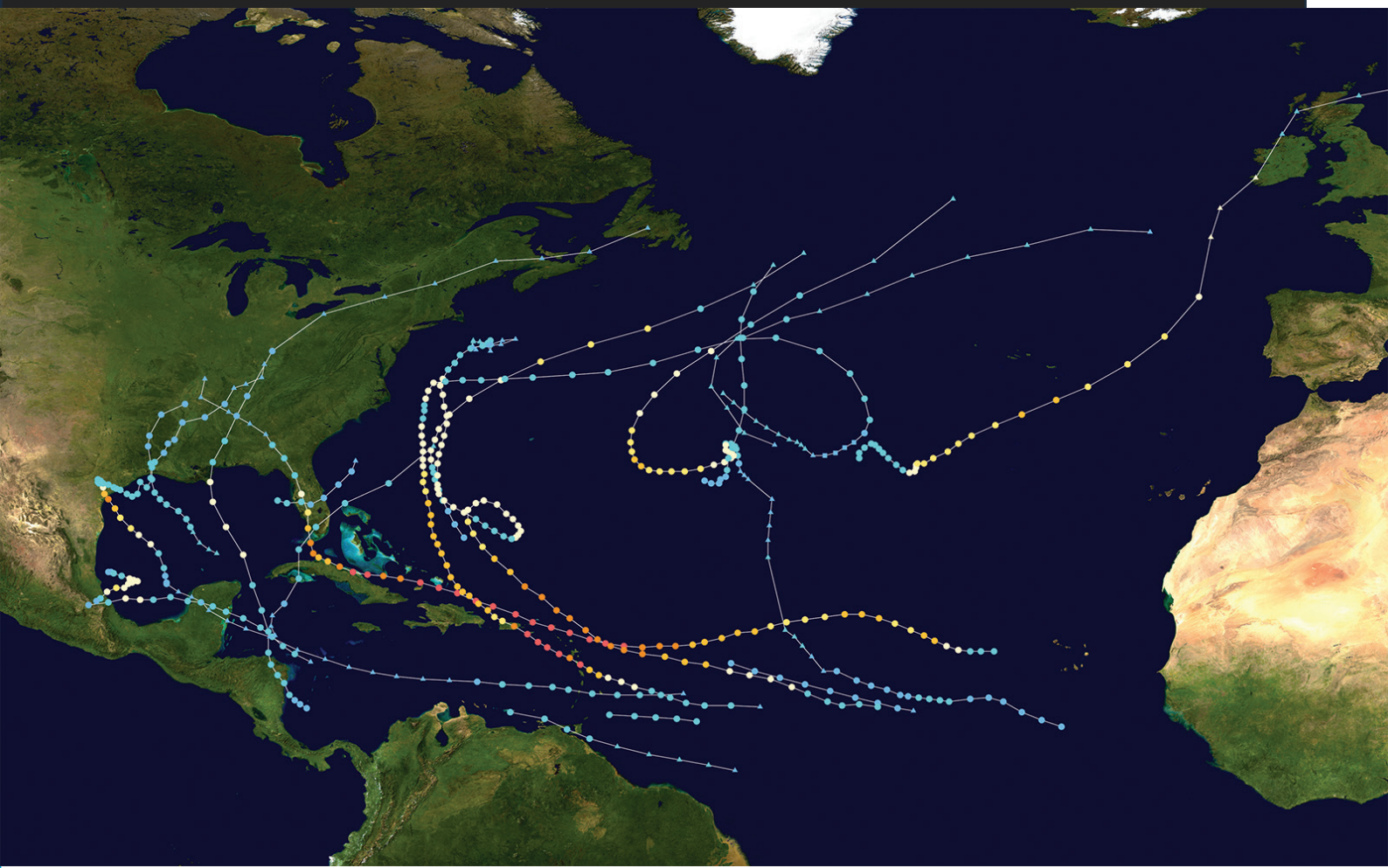
2017 Hurricane tracks. [Wikipedia, data from National Hurricane Center]



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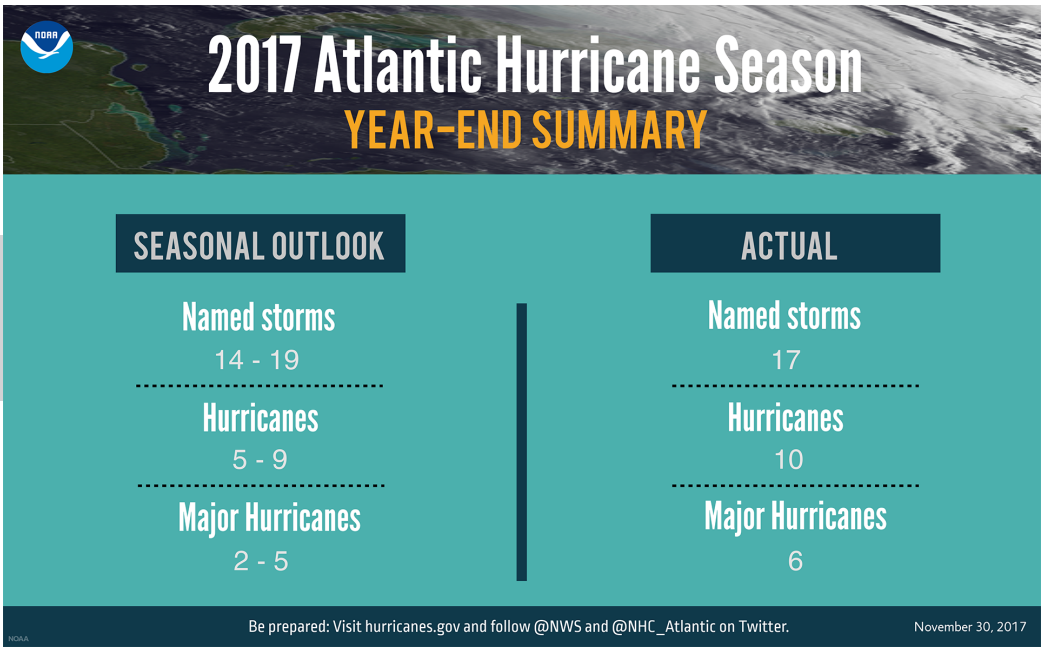
ARRL Irma/Maria Response Roster

Section 1 Overview of the 2017 Atlantic Hurricane Season and the Amteur Radio Response

The 2017 Atlantic hurricane season, which was predicted to be a near average season, turned out to be a hyperactive season with 17 named storms and 6 major hurricanes. There are many significant aspects to this hurricane season that will set it apart for years to come:

- It was the fifth most active hurricane season on record, tied with the 1936 hurricane season
- In terms of Accumulated Cyclone Energy (ACE), a measurement of the activity of individual storms based on wind energy over the storm's lifetime, the 2017 season had the highest seasonal ACE on record
- This season had the highest number of major hurricanes (6) since the 2005 hurricane season (7), the season that produced hurricane Katrina
- This season is the costliest on record, with preliminary damage estimates at $292.3 billion; most of the damages were due to hurricanes Harvey, Irma, and Maria
- The season was more active than expected due to El Niño conditions failing to develop and a La Niña developing, making 2 consecutive years of La Niña conditions

The response role for the Amateur Radio Service varied over the three largest storms of the season, from minimal support, to providing communications after total devastation of infrastructure. This report will cover what happened, what worked well, challenges faced, and recommended improvements from several perspectives, including the ARRL Field Organization, the volunteer "Force of 22" in Puerto Rico, and ARRL Headquarters.



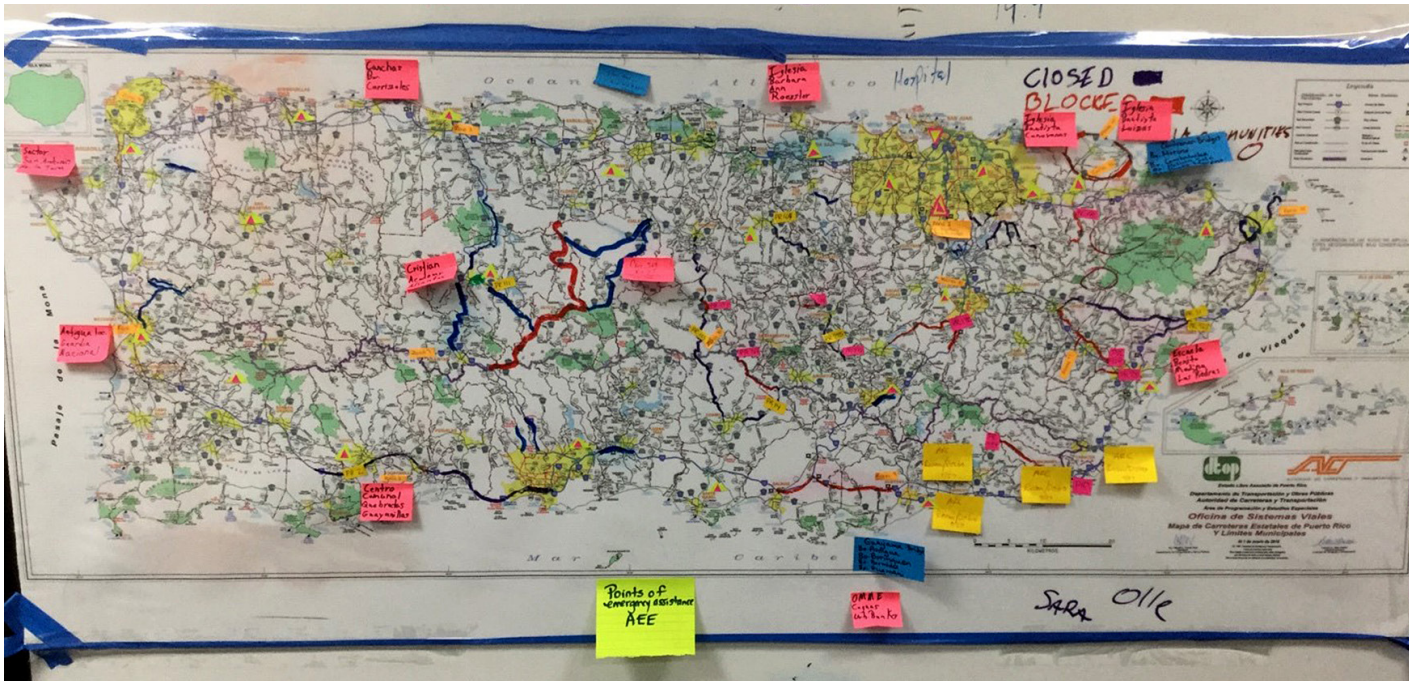
2017 Hurricane tracks. [Wikipedia, data from National Hurricane Center]

Section 2 Reports from ARRL Sections

Section 2.1: Hurricane Maria After-Action Report — Puerto Rico Section

Radio amateurs were very active during the emergency of hurricane Maria from September 20 until the end of November as communications were reestablished. Category 5 hurricane forces devastated the island, affecting the normal life of a population of 3.4 million US citizens. From the catastrophic impact, we experienced a power outage of a 100%, including a communication loss of 98%. We have documents, situation reports, and press publications that evidence the active participation of the Amateur Radio operators. These reports contain messages of requisitions from hospitals, Mayors, Autoridad de Energía Eléctrica (AEE), and Emergency Management, among others. These were channeled through the Disaster Relief Operation (DRO) of the American Red Cross (ARC) in Puerto Rico and directly through FEMA Joint Force Operations (JFO). Among the messages transmitted/relayed for emergency requisition were requests for medicines, diesel, power generators for hospital, the AEE Technical Plazas, and even water, not forgetting the emergency of the possible collapse of Guajataca dam that can flood valleys, putting thousands of citizens in danger. Also, we communicated the coordination of the transfer of Intensive Care Unit patients between hospitals, and the reunification between Puerto Rico citizens and their families in the continental United States, for which radio amateurs covered the communications gaps in the disaster region of Puerto Rico.

During the relief operation, the Power Authority (AEE) lost all communication. We developed a compromise with AEE to provide emergency communication from Monacillo Control and the Technical Plazas. Amateur Radio operators provided tactical and technical communication for the reestablishment of the electrical infrastructure on 23 Technical Plazas located at the electrical grid nodes across the Puerto Rico territory.



Map of volunteer Amateur Radio operator coverage at Power Authority (AEE) Technical Plazas (yellow triangle with magenta).

By September 23, after the hurricane, we had “eyes and ears” on the whole island on VHF frequencies, which enabled us to create an incident map following the Memorandum of Understanding (MoU) that the American Radio Relay League (ARRL) Puerto Rico Section and the American Red Cross local chapter signed in April 2017. This incident map contained the assessment of the road conditions and the descriptions of high-level damage over Puerto Rico, made by the communications of the AEE Technical Plaza Operators and the drivers of Power Authority service trucks.

We copied reports for needs of water, diesel, power poles, wires, transformers, gasoline, and food for the operators. This situation appraisal allowed for decision analysis to deploy our amateur communications resources. We knew how to get from one town to another as we received reports of road and traffic obstructions.

The incident map was also presented to FEMA. Immediately, their Emergency Support Function (ESF-2) requested that the local ARRL Section Manager (SM) report and participate in their daily meetings and help reestablish the communications across the island, as we were the only communication available in the impacted region. In addition, they requested that we cover the communications needs for the 11 main hospitals across the island.

The active participants were 131 local radio amateurs that operated at the AEE Technical Plazas. Shortly after Maria, more than 22specialized Amateur Radio operators arrived under the MoU of the American Red Cross and ARRL to provide communications for the relief operation and reunification.

With assistance from the ARRL team leads and the SM, we developed a compromise with the Fire Department’s Lieutenant Figueroa, and Chief Alberto Cruz. We deployed an operator to the Fire Department headquarters in Juncos, establishing communications to the JFO in San Juan. We received access for operators to install portable stations at all firehouses in Puerto Rico, including Vieques and Culebra, supplying shelter,

Sign outside the Puerto Rico Convention Center, location of the JFO and Puerto Rico EOC. [Mike Corey, KI1U, photo]

water, food, electricity, a place to sleep, and help to install the antennas, as well as runners to meet the mayors and government representatives near the firehouses. Operators also collected emergency requisitions for transferring directly to ARC DRO K1M and FEMA JFO W1M. We were able to deploy teams of one at each firehouse required, per impacted region. Taking advantage of the firehouse resources, we were able to manage the operators more efficiently from teams of two, to teams of one, keeping ARRL operators safe.

On the east coast, my assistant SM Jose (Otis) Vicens, NP4G, covered the region of Humacao to Fajardo, and Section Emergency Coordinator Juan Sepulveda, KP3CR, covered from Lares toward the west coast. They both covered the traffic at the most needed times for emergency communications.

Many of the local radio amateurs had limited communication participation during the emergency because they were directly impacted by the loss of their station and the lack of electricity, which resulted in an emotional impact. American Red Cross/ARRL relief radio operators were located on the main stations including the Red Cross DRO at the Angel Ramos Building, the headquarters of the Disaster Relief Operation, and FEMA (JFO) at the Pedro Roselló Convention Center. Emergency portable stations were installed in many municipalities such as Vieques and Culebra, Mayaguez, Guayama, Juncos, Fajardo, Bayamon, Caguas, Lares, Castañer, Ponce, Guajataca, and many others. The amateur operators collected and retransmitted the requisitions and patients' orders on Amateur Radio frequencies via voice/CW and Winlink e-mails.

A few repeaters were utilized during the 6 weeks relief efforts, due to the extensive antenna/tower damage, and the power outage. About 13 repeaters came back into service after minor antenna repairs and reconfiguring the electrical power to emergency generator lines. A linked repeater administrated by Ramón E. Ramos, KP4DH, had coverage from the east to the west cost of Puerto Rico, allowing emergency portable stations to coordinate easily with the ARC DRO K1M and FEMA JFO W1M.

ICS-205 INCIDENT RADIO COMMUNICATIONS PLAN		Incident Name: Hurricane Maria				Date/Time Prepared: 9 OCT 2017		Operational Period Date/Time: 1600 28 SEP 2017 Z	
Ch #	Function	Channel Name/Trunked Radio System Talkgroup	Assignment	RX Freq N or W	RX Tone/NAC	TX Freq N or W	Tx Tone/NAC	Mode A, D or M	Remarks
1	Amtr Comms	**KP4DH**		146.67	94.8	146.07	94.8	A	North Central; Linked
2	Amtr Comms	**KP4IA**		145.37	No PL	144.77	No PL	A	Aguas Buenas; PR wide
3	Amtr Comms	**Local Repeater**		147.31	88.5	147.91	88.5	A	East PR to St. John
4	Amtr Comms	**Local hams**		146.59	No PL	146.59	No PL	A	Power company and local amateurs
5	Amtr Comms	**ARRL Deployment**		146.55	No PL	146.55	No PL	A	Inter-team comms
6	Amtr Comms	**SATERN**		14.265	No PL	14.265	No PL	A	Assistance passing traffic to CONUS
7	Amtr Comms	**NVIS**		7.085 LSB	No PL	7.085	No PL	A	ARRL HF comms
8	Amtr Comms	**EOC/COE**		5.235 USB	No PL	5.235 USB	No PL	A	Primary
9	Amtr Comms	**EOC/COE**		7.360 USB	No PL	7.360 USB	No PL	A	Secondary
10	Amtr Comms	**Local Repeater**		147.05	127.3	147.65	127.3	A	South and North
11	Amtr Comms	**Local Repeater**		147.29	123.0	147.89	123.0	A	West
12	Amtr Comms	**Local Repeater**		147.23	123.0	147.83	123	A	West
13	Amtr Comms	**Local Repeater**		147.31	88.5	147.91	88.5	A	East
14	Amtr Comms	**Local Repeater**		147.25	88.5	146.65	88.5	A	East
15	Amtr Comms	**Local Repeater**		147.07	146.2	147.670	146.2	A	Southeast and West
16	Amtr Comms	**Local Repeater**		145.25	88.5	144.65	88.5	A	Linked to 147.31
17	Amtr Comms	**Local Repeater**		447.80	136.5	442.80	136.5	A	Arecibo
18									
19									

Frequencies utilized as described in ICS-205

I can't finish my report before I personally acknowledge the American Red Cross and ARRL for the unconditional support and effort post-hurricane Irma/Maria in the Caribbean region. I can't forget the invaluable help of the operators that traveled to Puerto Rico, for the unconditional support during our catastrophe. This team and the four team leads helped 24/7 for the benefit and relief of our citizens in distress. You have our gratitude for this example, in which amateur operators joined our emergency communications at the most needed time in modern history. I also can't forget FEMA and Homeland Security, especially EFS-2, SHARES team, and the Winlink organization's support during this period. Also I have to recognize the sacrifices of the 131 local Amateur Radio operators who devoted their time, with limited resources, to maintaining local communications across Puerto Rico, even at times when they were directly impacted by a Category 5 hurricane. My personal gratitude to all of them. I can share thousands of stories and anecdotes. This is a short report of an incredible ham radio event. Amateur Radio is the only thing that works, when everything else fails. This is a fact!

This is an example of what the volunteer radio amateurs did during hurricane Maria. The FCC, FEMA, Homeland Security Emergency Management, and the Red Cross recognize the effort for Puerto Rico, where the works are documented.

https://1drv.ms/f/s!AgrrieEUycbFgaUJn_VfzhT1BvVA-g

http://www.cnn.com/2017/09/27/us/puerto-rico-maria-ham-radio-operators-trnd/index.html

http://www.arrl.org/news/amateur-radio-volunteers-aiding-storm-ravaged-puerto-rico-us-virgin-islands

http://www.arrl.org/news/force-of-50-volunteers-puerto-rico-hurricane-recovery-mission-ends

http://www.arrl.org/news/fcc-chairman-recognizes-amateur-radio-in-praising-those-assisting-puerto-rico

Oscar Resto, KP4RF

ARRL Puerto Rico Section Manager

January 30, 2018

Section 2.2: St. Croix ARC Response to Hurricanes Irma and Maria

Summary

The St. Croix Amateur Radio Club (SCARC) supported the Virgin Islands Territorial Emergency Management Agency (VITEMA) acting as ESF-2 radio comms from 5 SEP 17 through 2 OCT 17. A total of 2,232 volunteer man-hours were provided through the efforts of a team of 13 dedicated amateurs on all US Virgin Islands. The SCARC acted as the Net Control Station for USVI emergency radio communications. The 60-meter amateur band was heavily used for nets involving numerous Territorial, Federal, and non-governmental agencies. SCARC coordinated many medical evacuations and supply flights, and provided other logistical communications support.

- Things to Sustain
  - ICS training and exercises
  - Good working relationships with served agencies

  Training on use of EOC equipment and tools
- Things to Improve
  - Further define SCARC scope and roles
  - Harden Territorial amateur repeater system
  - More exercises with served agencies

The SCARC appreciates the opportunity to support its served agencies and the people of the Territory of the US Virgin Islands.

Fred Kleber, K9VV

ARRL Section Manager, US Virgin Islands

ARRL Section Manager, Virgin Islands, Fred Kleber, K9VV (left), and Jarrett Devine, KB1VBK, of FEMA.

Repairing the damaged antenna for NP2VI/r are Sean Cullinan, WP2SC (left), and ARRL Section Manager, Virgin Islands, Fred Kleber, K9VV.

Section 2.3: After-Action Report — South Texas Section

What Happened

Texas experienced two separate event types out of this storm. First, we had the wind event, which impacted the central Gulf communities (Corpus Christi, Rockport, Aransas Pass, etc.), then the storm went back into the Gulf and came back ashore over the Houston area (and eventually east towards Beaumont along the Louisiana border). This time it was a rain event, dropping record amounts of rainfall, upwards of 60" in some spots.

While most of the world focused on the flooding, the impacts spread along the entire Texas coast, from Corpus Christi to the Louisiana border. The impacts were significantly different from each other.

What Worked

Although there were several communication outages that occurred from the wind impact, the communication outages tended to be short term. Rockport was hit the most, with cellular, public safety, and other communications taken down. But the resources available by both commercial cellular services and public safety response agencies resulted in portable COWS, communication trailers, portable antenna structures etc., being put in place, sometimes within hours after the winds died down. And while there were exceptions, most communications were back on the air within a much quicker time than in previous large storm events.

In Houston, there was a flooding event and again, with some exceptions, most communications stayed up through the event. This is due to commercial and public safety agencies having learned from tropical storm Allison. They moved their equipment and generators to higher locations. This prevented any widespread outages.

The Beaumont area did experience large-scale power outages, but due to availability of generator-backed communication sites, communication outages were limited there also.

Amateur Radio

For the wind events, most local, county, and state EOCs were activated and, in most cases, we had ARES presence at those locations. While we did collect situational awareness and health and welfare traffic as requested by the agencies, again there was not a widespread communication issue so large-scale activation and response was not requested.

For the flooding events, the Houston area EOCs (Transtar primarily) did activate ARES on a 24/7 basis. We staffed the EOCs and several shelters. The primary mission turned out to be having hams at NRG Stadium, where response efforts were being organized and we assisted with traffic coordination, shelter needs, and were available as backups to communications as needed.

An interesting side note is that one of the most valuable communication tools we provided was Citizen Band communications to coordinate all of the 18-wheelers bringing supplies into the center for redistribution. As most truckers have CB, this became a viable way to communicate with them and provide directions, etc.

What Didn't Work

For us, very little did not work. ARES groups activated as needed, HF and local nets were brought up and traffic was passed. Jeff Walter, KE5FGA, the South Texas Section Emergency Coordinator, and I did receive several offers of assistance from outside the Section, but in the end, they were not needed.

One other item that I noted was, there were some requests for help by agencies such as the Red Cross, but the requests were not seen as "ham radio related," and we had operators that declined to assist because of that. (The request was to contact shelters each night to get accurate bed counts and pass that info on to Red Cross coordinator at State EOC. This involved more telephone than radio, hence the pushback.)

General Thoughts Overall

Harvey was unique in that Houston mainly got rain, and Corpus Christi mainly got wind.

If each area had gotten equal amounts of both, there might had been more communications failures and a bigger need for a traditional ham radio response.

The commercial and public safety communications systems either did not fail, failures were isolated or what failures there were, were taken care of very quickly.

As it was, there was not a widespread call for Amateur Radio communications assistance, as there was in Ike and before. The needs were very local and answered by the local groups.

Cases in Point

Cellular service in the Rockport Port Aransas area; restoration was begun in 6 hours rather than 6 days

Reason why: COWs, COLTs, caches, platforms, assets, and generators were pre-staged and many more of them were available for deployment even before the winds had died below the 40 MPH for reentry criteria

Public Safety Communications in the Houston area saw only three sites go down — two because of the loss of land-based data circuits and in one case it went underwater

Towers and antennas that were damaged were replaced, or temporary ones placed into service within hours rather than weeks

Reason why: In the time from Ike to Harvey, agencies had spent billions of dollars on platforms such as mobile PSAP/dispatch centers, portable 100-foot towers, Communications/Command trailers, Sites on Wheels (SOWS), huge caches of radios, backup power planning, replacement of land based (T-1) data circuits with microwave and most of all…

Training, planning, training, planning and do it all over again until you could do it in your sleep.

All of the above resulted in the very systems for which in Ike, Katrina, Rita and before; Amateur Radio had stood up and replaced or augmented were themselves hardened, strengthened, and prepared to withstand the onset of the storms and not fail.

Who Made This Happen

At least in Texas, when one pulls back the covers and sees who is in command of many of these non-ham systems, it becomes very apparent that while hams were thinking like hams, they were doing their day jobs.

Over the past 12 years since Ike, many people who were in the trenches during storms Ike, Katrina, et.al., doing the work of ham radio, public safety radio, commercial radio etc. are also Amateur Radio operators. They have moved into decision-making positions of the public safety communications agencies and commercial and cellular entities, where they brought with them the ham radio attitude of "it is not going to fail," and applied it to their day jobs.

In Texas, the public safety communications community is actually very small.

Texas has 254 counties, over 6,500 agencies, and two of the top five metropolitan population centers of the US with hundreds of thousands of radios, towers, sites, and users.

The Texas Public Safety Communications Community is around 200 people. We all know each other or are only one person removed from each other. We network, talk, e-mail, coordinate, cooperate, conspire to get a job done, system built, and the issue handled.

Of those 200 people, it is fair to say over 60% are Amateur Radio operators, and of that 60% about 40% of them are of one statewide group of hams.

These are people who look at this job, not as a job but as a passion. Something we love to do, are willing to do, and will do it right — the first time.

Work the numbers and you can see that these hams, who now are the decision-makers of the public safety communications systems apply the same passion to their job as they do their hobby.

It is once again, Amateur Radio and that forward thinking, forward planning mindset of the Amateur Radio Service, brought the right people and tools to the fight.

No longer be there when it fails, but ensure *it is not going to fail*.

Moving Forward

Ham radio is going to have to find its new "self" as public safety and commercial communications infrastructure become more hardened and resilient.

For decades, we have had hams that sat at home and said, "Call me when you need me, otherwise I will be out playing hobby." ARES and ham radio in general is moving toward more of a Disaster Intelligence and Situational Awareness mission, along with health and welfare communications. Many agencies are starting to see the value of having us provide "ground truth" to situations and provide data that assists in making good response decisions.

Amateurs need to realize and focus on the fact that this means more training, advanced training on protocols and procedures needed to work with the PSA of today. We also need to stress that we can help where needed, but must understand that sometimes it might mean using a cell phone, a fax machine, or an online app to provide those messages, and while it might not always include using a microphone, it does provide a needed service, which is what we are all about.

So, in the world of "we will not let it fail," it is also about providing the information requested *by any means possible.*

Lee Cooper, W5LHC
Section Manager
South Texas Section
West Gulf Division

Section 2.4: South Florida Section Hurricane Irma After-Action Report

South Florida (SFL) ARES activated for Hurricane Irma response in the following counties: Osceola, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, Miami-Dade, Monroe, Lee, and Hendry. I was deployed at the Palm Beach County Red Cross communications center at their Chapter house in West Palm Beach for the duration of Irma.

Statewide conference calls were conducted pre-landfall with the SFL, WCF, and NFL Sections.

As some SFL counties were potentially at "ground zero," some ARES operators could not be available for the pre-landfall local deployments.

We had issues with the system in place for requesting mutual aid to cover our ARES operator shortfall. These requests were denied in all cases.

Intercounty communications were via HF nets and SARNet, the statewide UHF linked repeater network.

For the most part, local standalone repeaters held up during Irma, with the exception of Monroe County. Cell phone service proved to be quite resilient in most SFL counties.

We also experienced no requests for ARES operator assistance from affected county officials post-landfall.

Many offers of mutual aid were received from in-state and out-of-state ARES groups.

SFL ARES and Red Cross operators were deployed to Big Pine Key in Monroe County post-landfall on a Red Cross order. They were supplied with an HF support package through the ARRL Ham Aid program.

Most ARES units secured operations shortly after landfall where reliable communications existed or were restored.

At the Melbourne Hamfest on October 13 and 14, I conducted a statewide Irma hotwash session while the activation was fresh in our minds. However, only 10 county ECs participated.

I wish to thank all our dedicated SFL ARES team members for a job well done.

Respectfully submitted,

Jeff Beals, WA4AW

SFL Section Manager

January 26, 2018

Section 2.5: West Central Florida Section After-Action Report — Hurricane Irma

Summary of Events

On Tuesday, September 5, 2017, West Central Florida (WCF) Section ARES went to Level 2 activation, due to the impending activation of ARES in Hillsborough and Polk Counties later that day. Daily conference calls with the other two ARRL Sections and the State EOC began on Thursday September 7, as did daily nets on the NI4CE Repeater System, to receive reports from the 10 county ARES groups and to see if they had any unmet needs at that time.

West Central Florida Section ARES went to Level 1 activation on Saturday September 9, due to the activation of all ARES groups in the West Central Florida Section. On Monday September 11, in the mid-to-late afternoon, all ARES groups were given permission by their respective agencies to stand down, and WCF Section ARES went down to Level 3 activation, which is a standby mode. However, the Section Manager (SM) and Section Emergency Coordinator (SEC) had little-to-no commercial communications after deactivation, due to deactivation at their assignment locations and the fact that their normal commercial communications infrastructure had failed. This failure lasted 3 – 7 days. The SM was checking on the daily NTS traffic net (Eagle Net) to receive any messages. Public Information Coordinator Rich Kennedy, N4ESS, was available to receive and send commercial communications (as he was in Pasco County and far enough north to still have telephone, e-mail, and internet service) and was in communication with the SM on a local repeater that has emergency power. On Monday September 17, West Central Florida Section ARES stood down to a No Activation level, due to the threat of imminent tropical systems being diminished, and the restoration of commercial power to many areas.

What Worked and/or Improvements that Were Made

Daily conference calls via GoToMeeting were implemented for the first time between the three ARRL Florida Sections and the State EOC. Implemented a Section Activation Level indicator on the Section website's main page, to show the status of ARES throughout the Section, reflecting the activation levels in the upcoming ARES plan rewrite. Continued information dissemination in the form of WCF SPECIAL BULLETINS to amateurs in the Section, and information dissemination to ARRL HQ by using one mechanism, which saves considerable time. Individual ARES groups as well as the SEC made extensive use of the ARESDB database that we use for ARES membership registration. The database functioned well and was very useful. All ARES groups but one were activated and provided communications services to their respective primary served agencies. In many cases, these ARES volunteers were better trained than personnel in the agencies for which they provided service. Numerous individual ARES volunteers went well beyond their normal "job description" out of the necessity to provide other services.

Areas in Which Improvement Needs to be Made

Had some inaccurate e-mail addresses for notifying the Emergency Coordinators or their designee of upcoming conference calls and reminders for special Section Nets. Also the SM, the SEC, and one Assistant Section Manager were in the path of the center and right quadrant of the storm (being they are in the interior counties of the WCF Section: Highlands and Polk Counties) and lost reliable commercial communications upon deactivation of the ARES groups in the Section. They have been stationed at the Hardee County EOC, the Highlands County EOC, and the Sebring Police Department. A contingency plan is being developed for next hurricane season, in the eventuality that the SM and/or the SEC lose their commercial communications, in which other WCF Section Cabinet members outside the area can be placed in a "chain of command" for commercial communications availability (e-mail and telephone) and update the WCF Section website.

Darrell Davis, KT4WX

Section Manager

ARRL West Central Florida Section

Section 2.6: After Action Report for Georgia ARES Operations at the State SOC for Radio Communications during Hurricane Irma

Items That Need Improvement

Getting Reports from ARES Emergency Coordinators (EC) on Status of County Emergency Operation Centers (EOC) and the Status of Cellular Phone Service

It was requested that the ARES County Emergency Coordinators determine if any county EOCs were still operational and if they were staffed by any ARES radio communicators. In addition, a request was also made to assess the state of cellular communications for all of the commonly known providers. Gathering this information at the height of the event is difficult, time-consuming, and generally not productive, and is often out of date by the time it reported. Most ECs were unprepared to collect this information, due to not having adequate contact information or knowledge of who to contact.

I recommend that we work with our GEMA coordinator and identify pertinent information that would typically be requested by GEMA and other requestors, and develop a standard list for distribution to ARES DEC and EC personnel. This list should also be included in standard EC and DEC documentation and training for the positions. But, more importantly, it would be reviewed in the planning stage or prior to an activation. ECs would then have a standard list of information they know they must gather and report progressively during the event, as opposed to an unexpected request.

Dependence on Communications Equipment Provided by Individual Communicators

In the preparing for establishing radio communications from the GEMA SOC, radios, antennas, and other equipment were gathered from various radio operators. Not all of the necessary equipment was collected by the time it was needed. Equipment that is randomly collected from various sources may not be compatible or easily connected to work together.

This manner of acquiring equipment causes wasteful time delays or creates a less-than-adequate ability to communicate. In addition, one of the operators collected his antenna in the middle of the communications event because he was concerned that it might sustain damage from the approaching storm. This forced the operators to switch to an antenna that required a tuner, which was not available and was never obtained. From this point, it was not possible to conduct state-wide HF communication. D-STAR provided the remainder of communication from limited points around the state for the remainder of the event.

I recommend that a cache of essential and compatible radio communications equipment be established and stored at the SOC and made readily accessible to the ARES management team. This cache will consist of radios, antennas, and other related equipment that is configured and outfitted specifically for the SOC location and the communication needs of ARES. In addition, ARES will periodically evaluate the state of the equipment and test it to determine if it is operationally functional. This approach would take into consideration the new SOC building and the planned location of radio equipment.

Generator Failure

During the course of the event, a generator was brought in, which had been provided by the National Guard. The generator functioned for a period, and then stopped. It was eventually discovered that the batteries used to start the engine were not being recharged. Once the generator failed it was not possible to restart it. Additional requests for generators were requested and supplied. However, additional problems occurred with keeping them running, requiring more attempts at restarting and troubleshooting. In addition, in more than one instance, manual configuration of the proper wiring to the communications trailer needed to be performed. These persistent generator problems and wiring issues impacted communications reliability.

I recommend that at least two reliable and fully tested generators or other local reliable power source be provided and ready for connection.

Loss of D-STAR Conference VOIP Reflector at a Critical Point

On Sunday evening, the VOIP conference reflector computer (known as reflector 30B, it shares VOIP traffic to all connected D-STAR repeaters) was having internet connectivity problems from its data center. The system administrators for the reflector computer made the decision to switch all of the D-STAR repeaters in Georgia to another reflector on a more reliable system (VOIP conference reflector 004D). While this solved the connectivity problem, many D-STAR users providing communication support did not hear the announcement given prior to the switch, and were confused when they saw an unfamiliar VOIP reflector in use. In some instances, some D-STAR users switched their local repeater back to reflector 30B, and others stopped communicating, thinking that their traffic was not going to the proper location. In most cases, most did not notice the change and continued to convey emergency and health and welfare traffic. Nevertheless, this was an unforeseen and critical disruption to the communications network and the flow of information.

I recommend that Georgia ARES arrange to set up another reflector computer system at a different data center facility and make it commonly available to the Georgia D-STAR system and use it as a standard backup system. Update: VOIP reflector 30 has been moved to Amazon's managed services for AWS.

Changing Location and Equipment During Critical Communication Periods

During the course of the event, initial radio communications were handled from the GEMA MCV vehicle. At a point, the radio communications were moved from the MCV to a communications trailer. This required a "tear-down" and setup transition. Coupled with the problems of equipment described previously, while necessary, created an additional delay in sustaining minimally disrupted radio communications with the field.

I recommend, to the extent possible, that an initial radio installation be maintained from a single location throughout the event. This recommendation takes into consideration the new SOC building and the planned location of radio equipment is currently under construction.

Items That Were Positive

Working Relationship with GEMA

Clearly there is an improved working relationship with Georgia Emergency Management Agency and Homeland Security (GEMA/HS). Georgia ARES leadership has established a professional working relationship with GEMA's ESF-2 unit through Edwin Whitworth and Matt Webb. This working team relationship communicates and coordinates well to identify needs, coordinate activity, and solve problems.

ARES leadership has learned about the organizational structure and the order of its mission. This has helped ARES leadership to align itself more affectively to meet the needs of GEMA as a served agency. This includes learning about GEMA's documentation needs, procedures, paperwork, and supervisory structure, which essentially allows ARES to act similar to a contractor to help with the overall communications mission.

D-STAR Linked Repeater Communications System

While the D-STAR system was not without problems (intermittent internet connectivity between repeaters and the VOIP conference server, the VOIP reflector switch described above, and some user familiarity issues), it did have limited but significant resilience providing the primary point of contact when the HF communications failed (described previously). Primary net control shifted to the D-STAR system with Bret Smith, W4HBS, operating as the Net Control Station (NCS). Reports from around the state continued to be reported for the remainder of the event until stand-down.

Identification of Important Training Needs

This event has caused Georgia ARES to recognize that it needs to modify its approach to its current training process. Some existing training, such as Winlink, needs to be expanded with more training classes around the state. New training needs to be focused on commonly used forms used by GEMA and other EM agencies. While some forms are already used, this event made us aware of additional forms that we need to become familiar with.

Desirables

Fixed Radio Facilities at GEMA

Ideally, Georgia ARES would like to have a fixed working location where an adequate radio operation can be set up and easily usable by at least two individuals comfortably. This would include a technically appropriate location for HF and VHF/UHF antennas, preferably a permanent fixture.

Training

For appropriately vetted ARES volunteers, ARES would like to participate in relevant regularly scheduled Emergency Management training and AUXCOMM ComT and ComL training. Currently, experienced and enterprising ARES members who have a willing EMA/EOC Director or contact can generally get scheduled into a training class representing their respective county. ARES would like to be a recognized sponsor for arranging and managing training for rising ARES volunteers recognizing priorities and class size limitations.

From the Lessons Learned

What follows is a list of advice, recommendations, and "don'ts" that were learned from our experience with hurricane Irma. These preparation practices are essential, if not crucial, to minimizing wasteful and possibly critical time delays and downtime that can impact a successful and problem-free communication operation. One may think that a short time impact is not something significant. However, when a series of persistent and unpredictable time delays accumulate that cause downtime, it erodes confidence in the reliability of the network and of the served agency.

Issues with using voluntarily provided equipment.

Avoid using or depending on voluntarily provided communication equipment that is randomly gathered. Dissimilarly gathered equipment may not work together. For example, a transceiver may not have the proper interface to a tuner. Attempting to sort equipment interface issues, missing equipment, attempting to establish a reliable configuration (or jerry-rigging), and equipment of questionable status can cause critical delays in event preparation or failures during the event. Equipment to be used in a critical communications event should be equipment that is designed to work together and have the necessary capability for the communication need.

Do not use equipment from volunteer providers if they are not willing to accept the potential that their equipment may suffer damage as the result of the event (i.e. hurricane, storm, etc.). They should be told that they cannot recover their equipment until stand-down, or that they will be compensated or given a new purchase replacement. If they cannot agree to those terms, the offer should be declined. If they are allowed to recover their equipment during the event, at the very least it may cause a recovery time delay or a significant impact on active critical communications.

Issues with using generators and replacement generators.

If field generators will be used to run the radio operation, make sure that there is more than one available. Provided generators from sources where the condition and history of the generator is unknown can be a surprise at the most inconvenient time (this includes generators from sources thought to be reliable and well maintained). If one generator fails, get it replaced immediately while depending on the backup generator (and

get another backup generator). It is probably a good idea to have two backup generators if their disposition is unknown.

There can be additional and crucial time delays when an emergency replacement generator shows up. How one connects to a generator can vary from generator to generator. It is possible that a wiring modification may be required for a replacement generator because the receptacle, power provisioning (120, 208, 220, etc.) and phase connections may be different from the previous generator connection. Technically, only a certified electrician should evaluate and make any manual wiring changes if such a circumstance occurs. While some Amateur Radio operators are experienced with such connections, it may be judicious to leave these changes to an electrical contractor to avoid possible liability concerns. It cannot be said enough to observe safe conditions and be prepared to manage a life-threatening emergency situation. If you are even remotely uncertain about proper electrical connections, you should get someone who is known to be qualified.

Prepare Emergency Coordinators for collecting essential information from their counties.

Prepare a list of information items that ECs need to collect as they cover their respective county or counties. The Georgia Emergency Management Agency (GEMA) wants to know the status of pertinent infrastructure. If possible, see if GEMA can provide contact information that can be passed to ECs so they can more effectively gather this information. This information gathering list should be sent to the ECs well ahead of any event when possible so they can prepare and inform their participating ARES members. Asking for this information after an event is well underway is difficult for the EC to "re-tool" for, and usually yields little useful or timely information. If there is time to prepare for an event (i.e., hurricane, inclement weather, or other events that can be predicted ahead of time), find out if there is other information that may need to be collected for GEMA or other engaging agency or VOAD.

Typical information requested includes:

- Status of electric power outages
- General status of cellular phone service outages for the primary cellular providers
- Number of ARES members deployed to an EOC (county, hospital, etc.) if applicable

Make ARES members aware of possible alternate D-STAR reflectors.

As planning and time permit, coordinate with D-STAR administrators and determine what could be used as an alternate D-STAR reflector, and make this information available to ARES members state-wide ahead of the event. If the primary reflector used by ARES fails or has problems, ARES members will not be confused by unexpected or strange reflectors if they see that a change has been made. As the primary reflector becomes active for conveying and gathering traffic, several announcements over time should be made on the D-STAR net indicating what the alternate reflectors will be if there are data network problems. This strategy will mitigate confusion, lessen questions from confused operators about what is happening, and prevents operators unaware of the change from attempting to switch a repeater back to the failed reflector.

Establish and off-site alternate State Operations Center (GEMA) Net Control Station.

Make arrangements at some alternate location(s) away from the SOC that is adequately equipped to act as an alternate or backup to the main state ARES HF net control station. If the main location loses its ability to communicate with the state, the alternate site maintains continuity of communication.

Other critical operations activities:

Attempt to identify an Amateur Radio Operator (ARO) or non-ARO person willing to provide certified electrical support on call

Ensure that arriving radio operators are adequately briefed and given an equipment overview

Ensure that participating ARES members around the state are kept informed as needed by making repetitive announcements on all nets of updates, changes, and advisories (a single announcement may not be heard by all participating members the first time)

Develop a core management team for handling operation of the SOC ARES Communications.

Note: The following is *preliminary* and is not fully developed. Additional assessment and development is being considered. This is presented here as a reflection of lessons learned and developing a strategy for reacting more effectively in a future event.

The core communications management team (CCMT) *does not exist* until an event occurs where it is apparent or evident that a significant disaster event is imminent or will become so in the near future. Ideally a CCMT should be convened when there is opportunity to plan for an approaching possible disaster (i.e., high-impact hurricane). The CCMT consists of key ARES leadership and ARES members that plan, design, and construct the communications process that includes:

- Equipment needs, configuration, and testing for on-site (SOC) and off-site net control stations
- Observing "lessons learned"
- Interfacing with GEMA
- Scheduling radio operators
- Arranging for shift changes and briefing updates for radio operators
- Ensuring proper logging of pertinent communications (ICS-309, ICS-211)
- Constructing ICS-217a and ICS-205 (and sharing with GEMA)
- Monitoring radio communications for issues
- Coordinating internal communications within the CCMT and field ARES and non-ARES communicators
- Ensuring ARES field personnel are apprised of problems, changes, and updates
- Inform ECs of requested information from GEMA or CCMT ahead of event
- Check ahead of time to make sure that login accounts and passwords still work (i.e. WebEOC)
- Among other needs, requirements, etc. identified by the CCMT

The CCMT would be constructed by the Section Emergency Coordinator (SEC), the Section Manager (SM), and other members as they are brought on to the team. Members are selected from the leadership and ARES membership based on their availability, willingness, commitment, qualifications, and capability to manage or service a given area of need for the event. The SEC and SM or other designated team member, or, collectively as a group, insures that GEMA is engaged and has input into the process. Subject matter experts (SME) may also be brought in for management, advisory, or technical expertise from anywhere in the ARES or non-ARES Amateur Radio ranks.

Team Manager Positions

- Section Emergency Coordinator
- Alternate to SEC
- ASEC for Mutual Assistance Team (MAT)
- Internal Information Officer (IIO)
- Scheduling and NCS Manager
- ASEC for DPH/Hospital Operations
- ASEC for Digital

Other Coordinating or Subject Matter Positions

- Scribe (documents, notates chronological activity, meeting notes, etc.)
- Communications equipment and setup manager (comm vehicle, MCV, etc.)
- Propagation assessment advisor

Manager Position Descriptions and Roles

Section Emergency Coordinator

The Section Emergency Coordinator is essentially the Incident Commander (IC) for conducting Amateur Radio communications at the SOC (or other significant government facility related to the event).

Alternate to SEC

The alternate to the SEC works side-by-side with the SEC and assisting the SEC. This position can assume the IC role as the SEC when the SEC is not available. The idea here is to have a fully informed alternate ready when the SEC is unavailable. Other duties include:

- Oversight for documenting ARES involvement in the event for the After-Action Report and other documentation required by GEMA either directly or through the scribe position.
- Ensures that appropriate ICS forms are developed and shared with GEMA, ARES membership, and others appropriate parties (i.e. VOADs)

ASEC for Mutual Assistance Team (MAT)

The ASEC for MAT is the communications oversight manager for the SOC. Among his duties are to insure that during non-emergency times that an adequately numbered and trained staff are available for handling at least two initial 12-hour shifts so that the first 24 hours of emergency operation at the SOC are covered while additional communicators are acquired for follow-on communications. There is significant coordination with the Scheduling and NCS Manager role.

Internal Information Officer

The purpose of the Internal Information Officer (IIO) is to ensure that any potentially useful or essential information is transmitted to communicators serving in affected areas on a timely and, if necessary, repetitive basis. The key objective of this role is to keep field communicators informed of useful, pertinent, and critical information about problems, changes in operation, updates, failures, requests for information, follow-up on information requests and other communications as needed and repeated as necessary to ensure that new, returning, or recovering field communicators are likely to receive the information. This position addresses one of the key complaints that information was inadequately conveyed to the field during hurricane Irma.

This is a highly active position requiring constant follow-up with key members of the CCMT, monitoring the state of the event to identify issues that need to be communicated to the field, and coordinate with net control station (NCS) operators who will need to transmit the information. All of the CCMT roles are expected to coordinate on a regular basis with the IIO.

Scheduling and NCS Manager

The purpose of the Scheduling and NCS Manager is arrange for qualified volunteers to serve as net control station (NCS) operators at the State Operations Center (SOC) or alternate NCS operators at the off-site alternate to the SOC. This includes polling for operators, scheduling shifts, scheduling shift changes, and briefing operators as they come on duty. In addition, this position also coordinates the NCS operators for, not only voice communications, but also NCS operators for digital assets, particularly Winlink. The Internal Information Officer (IIO) works with this position and interfaces with NCS operators.

ASEC for DPH/Hospital Operations

The Assistant Section Emergency Coordinator (ASEC) for the Department of Public Health and Hospital Operations manages the hospital communications net and coordinates communications with the SOC through the CCMT team. They are part of the same communications network, convey the same type of information, and can assist with non-hospital traffic but their communications is primarily hospital related as they operate specifically out of hospital locations.

ASEC for Digital

The Assistance Section Emergency Coordinator (ASEC) for Digital maintains oversight of digital communication activities during the event. This position monitors digital communication assets, particularly the D-STAR network, but also the status of Winlink operations and coordinates with the CCMT team to assist with digital communication adaptations as they are needed.

Additional Coordinating or Subject Matter Positions and Roles

Communications Equipment and Setup Manager

This position may not be necessary if ARES is using the permanent radio equipment in the SOC. However, if an off-site Net Control Station (NCS) is set up, then this position may have a role in configuring and maintaining equipment at that location. The Equipment and Setup Manager is responsible for setting up the communications equipment (i.e. communications van, MCV, etc.). This includes, testing radio equipment for proper operation, interfacing electrical power or power generators to the equipment, setting up antennas, coax, etc.

Propagation Assessment Advisor

The objective of the Propagation Assessment Advisor is to use information sources (NASA, National Weather Service, etc.) to evaluate the state of HF radio propagation and the impact of Coronal Mass Ejections (CME) and other factors that affect radio propagation and convey them to the CCMT management group — in particular the IIO, so that knowledge of the possible effects can be communicated to the field. This information may also be used to make changes to how information is communicated to and from the field that involves HF frequencies. This position needs to be handled by someone with knowledge and some experience with RF propagation and can make reasonable assessments of the impact to communications.

David Benoist, AG4ZR

Section Manager

Georgia Section

Section 2.7: After-Action Report Hurricane Irma, September 2017 ARRL North Florida Section

Gilchrist County, Florida

September 7 – 9

As in the past, Gilchrist ARES group began the nightly Gilchrist 2 meter Hurricane Net at 7:30 PM on 147.285 coordinating with Alachua ARES 2 meter Hurricane Net nightly at 8 PM on 146.820. The Gilchrist Hurricane Net is started when the 3-day cone shows tropical storm winds likely to enter our area.

Gilchrist County Sheriff Volunteers (GCSV), Community Emergency Response Team (CERT), and the Amateur Radio Emergency Service (ARES) were e-mailed, reminding them to charge batteries and devices well ahead of the storm, and to please check with team leadership for any activation or deployment info. As always, do not self-deploy. Do prepare and help neighbors get prepared.

September 10

The Gilchrist Emergency Operations Center (EOC) called for some CERT to deploy to shelters, and I was asked to operate radios at the EOC during the storm. The EOC call is NF4EC.

My ARES storm plan was to monitor the 147.285 repeater frequency, and when we began to get threatening wind conditions, I would put out a call every hour at the bottom of the hour (30 minutes past the hour) for any emergency traffic. If they were on emergency power, they could call me at that time and save battery power the rest of the hour. At the top of the hour (on the hour) I would do a frequency change to 146.820 to confer with Alachua ARES EOC, where I would be for 10 minutes to relay and pass traffic/info as needed. In practice this time I ended up mostly monitoring the Alachua Net at the top of the hour, as they had their hands full opening 21 shelters in Alachua County. The hurricane net on HF and morning check-in on 3.950 (NFL ARES Net) complemented the 2 meter coverage.

I planned for our ARES group to monitor in place. I asked that, if they lived in a quadrant of the county that has easy access to Levy, Dixie, and Columbia county repeaters, it would be helpful to monitor them and relay or pass any emergency traffic to the EOC in Bell as needed.

In my deployment to the EOC I was going to wait until winds exceeded 40 MPH before going in, however, the county was calling for a curfew at 2 PM the day of the passing of the storm. Around the time of the lifting of curfew the following day, I was released to go home.

September 11 – 14

Many of the ARES group had to lower antennas or towers in advance of the storm. I maintained communication with those that chose to shelter in place at home. Due to massive outages of the electric grid, I continued the nightly ARES Storm Net for many days after the passing of the storm until Thursday night's regular 2 meter net on Sept. 14 had 11 operators check in.

River flooding, especially on the Santa Fe River, just recently crested at near record levels.

JG 9/20/2017 John Greiner, KJ4YPZ, ARRL ARES EC, Gilchrist County

Volusia County, Florida

Event Prep: September 6 – 8, 2017

Start: September 9, 2017

End: September 11, 2017

Preparation

The week before the event, we monitored Irma's approach closely. On Wednesday 9/7/17 I had our normal monthly on-air net. The primary discussion was Irma. We covered deployment to shelters if Irma made landfall, and what was expected from the volunteers. Level III Monitoring activated.

Friday, September 8, 2017

20:30 I started an on-air net asking for people to prepare for deployment and to be on air to assist ARES if needed. I gave updated information on Irma and its path.

Event Activation

Saturday, September 9, 2017

James Lea, WX4TV, deployed to the VEOC and activated the ARES net in a standby mode. I also raised the activation level to II Partial Activation. John Clere, N8TUY, volunteered to deploy to Heritage Middle, a special needs shelter, with his family. He wanted to deploy a day early in the event the shelter was full. He had no equipment. James, WX4TV, redeployed with equipment to Heritage.

13:30 Warren Greenberg, AE4WG, deployed to the VEOC.

15:00 I, Karl Martin, KG4HBM, arrived.

20:30 James, WX4TV, redeployed to his home to act as NCS.

21:00 I sent Warren, AE4WG, home to rest and prepare for VEOC duty on Sunday, September 10, 2017

Having a volunteer deployed, I stayed for overnight duty.

Sunday, September 10, 2017

02:00 The operator was told the AC outlet he was using for the equipment was on the backup generator, but when power was lost, there was no power in the room he could use. The only outlet in the room that was still working was to the refrigerator, which held perishable medications. He was unfamiliar with the radio and portable antenna given to him and was unable to make the repeater. He alerted us that he had lost power and was on a handheld radio. To use the handheld, he had to be outside the building. The operator was relieved and sent home so he could recharge the handheld batteries. I told him to contact us if he needed us.

07:00 Warren, AE4WG, arrived at VEOC.

09:00 I went home to get a few hours of sleep.

15:00 I returned to the VEOC. Level I Full Activation.

Monday, September 11, 2017

07:00 Warren, AE4WG, made the decision to go to his home.

13:00 Curfew was lifted and Jim Judge, Director of the EOC, had ARES stand down. I relayed this information to everyone on the net. I left the VEOC soon after, but I stayed on frequency to make sure all stations arrived at their home location safely.

Needs Improvement

There was still some confusion as to who ARES was, and why we had been assigned to their shelter. This was told to Mr. Judge and the situation was quickly resolved. The operator was moved to the location where a pre-positioned antenna had been installed.

I was disappointed in the turnout of radio operators willing to deploy. After Matthew in 2017, we ran new programs to attract volunteers. We held public events and training exercises. These events did attract a few new operators, but no one other than John Clere, N8TUY, deployed.

We are currently discussing a new plan to address this issue.

Overall

In general, this activation was much smoother than hurricane Matthew. Communications between the VEOC and deployed operators went very well.

Last year, the Health Department approached us to test the antenna at Heritage Middle. After our report, the antenna was moved higher, and on a more secure pole. This was the only antenna they wanted checked, and it worked perfectly. We are still trying to get into the shelters to check the condition of the other equipment.

Section 3 Force of 22

Section 3.1: Overview of the ARRL/American Red Cross Collaborative Deployment to Puerto Rico

The response to hurricane Maria included the largest ARRL/American Red Cross collaboration since hurricane Katrina in 2005 and the most complex, from a logistics perspective, in the more-than-75-year-long relationship between the two organizations. The lead team for this effort was Jacqueline Yannacci, Director of Community Mobilization and Partnerships for the American Red Cross, and Mike Corey, KI1U, Emergency Preparedness Manager for ARRL. To understand how this effort came together it is best viewed in the timeline of events that follows.

Friday, September 22, 2017

ARRL Emergency Preparedness Manager Mike Corey, KI1U, was contacted via e-mail by Jacqueline Yannacci from the American Red Cross about Amateur Radio support for the Red Cross *Safe and Well* system in response to hurricane Maria. Corey and Yannacci had previously worked together on the coordinated response to the 2017 Total Eclipse event. The issues that came up in the initial e-mail were 1) How many Amateur Radio operators are already in Puerto Rico? 2) Can they get on the air? 3) We need to think about a team of operators that can go to the island to support *Safe and Well* registrations. It was agreed to set up a conference call for September 23.

Saturday, September 23, 2017

After coordination with ARRL CEO Tom Gallagher, NY2RF, and CFO Barry Shelley, N1VXY, a conference call was held with the American Red Cross. Details worked out included the possible number of volunteers needed for deployment to Puerto Rico, qualifications and requirements for the volunteers, the communications mission, liability concerns, and cost sharing. Once all concerned parties at ARRL and the American Red Cross signed off on these decisions, ARRL put out a call for 50 Amateur Radio volunteers. Initially the call went to known ARRL field organization members that likely had volunteers who could deploy. It was also originally envisioned that the amateurs would deploy as 25 two-person teams. This eventually changed, based on Red Cross needs.

Volunteers Bill Kollenbaum, K4XS (left), and Gene Roll, KM4FUD (center), meet with Puerto Rico Section Manager Oscar Resto, KP4RF (right), at Red Cross HQ San Juan. [Mike Corey, KI1U, photo]

The qualifications and requirements to be considered for the deployment to Puerto Rico included:

- Processed in as a Red Cross volunteer
- General Class Amateur Radio license or higher
- Familiarity with Winlink, HF voice, and VHF simplex communications
- Strong technical skills
- Ability to work under difficult conditions
- Ability to deploy for up to 3 weeks
- Ability to work as part of a team

Skills considered important, but not required, included:

- Ability to speak Spanish
- Previous experience in disaster response
- Previous or current experience as a Red Cross volunteer
- Previous experience with shelter operations

Volunteers Rafael Ortiz, W4RAO (left), and Joe Bassett, W1WCN (right), man net control, K1M, at Red Cross HQ in San Juan. [Mike Corey, KI1U, photo]

ARRL agreed to provide equipment to the volunteers through ARRL's Ham Aid program. This required the purchase of additional equipment, as inventory had been seriously depleted following the 2016 Ecuador earthquake and because significant inventory had been pre-staged in Texas, Oklahoma, and Washington. Prior to hurricane Maria, Ham Aid equipment had been deployed to Florida and the US Virgin Islands in support of response efforts to hurricane Irma.

Sunday, September 24, 2017

Additional coordination took place between ARRL and the American Red Cross. The Salvation Army's SATERN program was brought on board. SATERN had been supporting communications through their 20-meter phone net. The first list of Amateur Radio volunteers was turned over to the Red Cross. The Red Cross shared with ARRL the forms that volunteers would need to complete for the deployment.

Monday, September 25, 2017

A message went out from ARRL President Rick Roderick, K5UR, with a call for action to volunteer for deployment to Puerto Rico, or donate to the Ham Aid fund. Fifty operators had been identified, and their contact information turned over to the Red Cross. In all, 465 radio amateurs volunteered to go on the Red Cross mission. The American Red Cross informed ARRL that 20 of the volunteers would be deployed initially, with preference given to those who were bilingual. The volunteers would stage in Atlanta on Wednesday, September 27, and be on a flight to Puerto Rico the morning of Thursday, September 28.

ARRL began purchasing additional equipment to deploy with the volunteers. Items were ordered from DX Engineering and sent via overnight shipment to ARRL Headquarters in Newington. A briefing webinar was scheduled for the volunteers to review the contents of the Ham Aid kits and basics of the deployment.

Tuesday, September 26, 2017

Mike Corey sent the volunteers an e-mail containing basic instructions. The e-mail reminded them to complete all forms sent to them by the American Red Cross, and included briefing webinar information, as well as the following bullet points:

• Do not bring radios or computers. You will be provided with a radio kit that includes an HF transceiver, antenna tuner, power supply, 40-meter dipole, a handheld and all necessary cabling and instructions, and tool kit. Each kit is designed to support a two-ham team. The Red Cross will

Volunteer Gary Sessums, KC5QCN, installs a VHF antenna on the roof of the Puerto Rico Convention Center. [Mike Corey, KI1U, photo]

Ham Aid equipment arrives at the San Juan airport cargo facility. [Mike Corey, KI1U, photo]

provide you laptops. You will need to set up *RMS Express* software on the laptops before you depart from Atlanta.

• Your primary mission is to support Red Cross shelters by getting information into the Red Cross Safe and Well system. The Safe and Well Helper Tool is attached. This can be sent by Winlink *RMS Express*, however you need to first convert it to CSV format to reduce the file size. Second, please limit the number of entries on the form sent to 150. Tests run have shown it takes about 5 minutes to send a 150-name file via *RMS Express*.

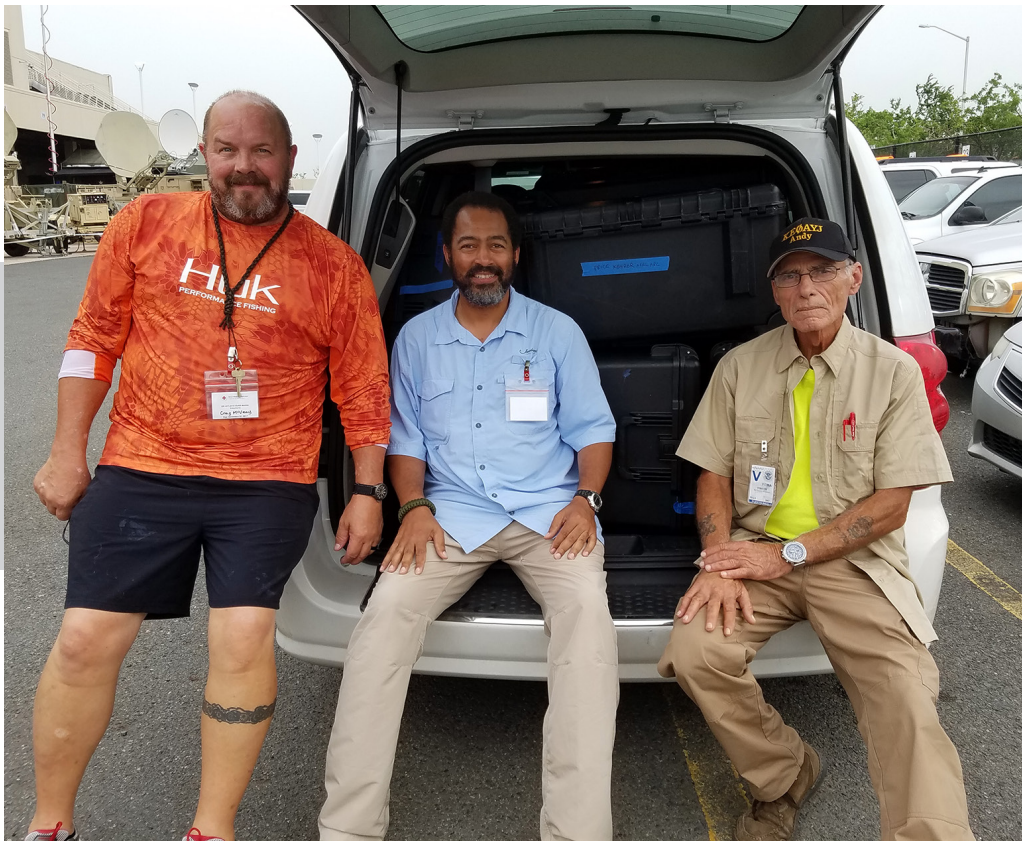
• Please take photos and help us tell your story. What you are doing is admirable, and we want to share the news about your good work. Take photos, keep notes, write it up! Send materials to ARRL when you get back.

The Georgia Section Manager, David Benoist, AG4ZR, was the contact for assisting the volunteers in shuttling their Ham Aid kits from the airport to the staging area. David provided several volunteers that helped those going to Puerto Rico.

The additional equipment ordered arrived in the morning. ARRL staff began an assembly line process to unpack the new equipment and assemble the kits. A team of staff members shuttled the 22 completed kits to Bradley International Airport Air Cargo facility in Windsor Locks, Connecticut for shipment to Atlanta.

Wednesday, September 27, 2017

Ham Aid kits arrived in Atlanta and, through the assistance of the volunteers from the ARRL Georgia Section, were shuttled to the staging area. At this point it was uncertain if any more volunteers from the list of 50 would be needed. JetBlue, the contracted airline for the volunteers, agreed to waiving the checked baggage fee for the Ham Aid equipment.



"Force of 22" volunteers Craig McVeay, NØCSM (left); Bobby Price, KB4ROR (center); and Andy Anderson, KEØAYJ (right). [Mike Corey, KI1U, photo]

Two additional volunteers were brought on board, with the plan to send them to the US Virgin Islands. Eventually, it was decided to send them to Puerto Rico with the others, bringing the total to 22 Amateur Radio volunteers going to Puerto Rico.

An additional conference call was set up to go over radio configurations. W1AW Station Manager Joe Carcia, NJ1Q, was brought in to cover setup for Winlink. One of the volunteers began negotiating with a FEMA representative at the staging area for generators. Volunteers were instructed to work through appropriate channels. It was in the staging area that the first indications emerged that there could be issues with the volunteers working together.

An issue was found with an antenna tuner in one of the kits. David Benoist purchased a replacement part from Ham Radio Outlet in Atlanta. Final instructions were sent to the volunteers.

Thursday, September 28, 2017

Twenty-two volunteers from the “Force of 50” departed Atlanta for San Juan, Puerto Rico, along with 22 ARRL Ham Aid kits.

Conclusion

The deployment of the volunteers went from concept to boots on the ground in 6 days; a remarkable effort by anyone’s standards. The call for donations to the Ham Aid fund yielded $179,000 in total. Additional Ham Aid kits were deployed later with Mike Corey during his deployment to Puerto Rico, October 6 – 20, 2017.

Section 3.2: Results of the Survey of the 22 American Red Cross/ ARRL Volunteers

Following the deployment of the 22 Amateur Radio volunteers to Puerto Rico, a survey was distributed to them assessing information on operators, deployment, and lessons learned. The survey, designed using Google Forms, was sent via e-mail to all 22 volunteers, 17 of whom completed the survey. Survey results were shared with Jacqueline Yannacci from the American Red Cross, who served as the primary point of contact for this deployment. The Red Cross also provided input on survey questions.

Survey Questions

What is your Amateur Radio License Class?

- 59% Amateur Extra
- 6% Advanced
- 35% General

How many years have you been licensed as an Amateur Radio operator?

- 1 – 5 years (6)
- 6 – 10 years (2)
- 11 – 20 years (3)
- 20+ years (6)

Years of experience in Amateur Radio disaster response?

- No experience (5)
- 1 – 5 years (8)
- 6 – 10 years (1)
- 11+ years (3)

How many days were you deployed in Puerto Rico? (Deployment requirement was 3 weeks.)

- Less than 21 (3)
- Exactly 21 (8)
- More than 21 (6)

Where were you deployed in Puerto Rico? Please provide all towns and locations, i.e. Lares/hospital, San Juan/Red Cross HQ. (Volunteers were deployed multiple places, responses record more than one answer.)

- Shelter (1)
- Hospital (4)
- Search and Rescue (1)
- Fire Station (5)
- Red Cross HQ San Juan (6)
- School (1)
- Joint Field Office/Emergency Operations Center (3)
- Guajataca Dam (1)
- Reunification teams (3)

Municipalities served by volunteers included Aguadas, Aguadilla, Castaner, Ciales, Culebra, Guayama, Jayuya, Juncos, Mayaguez, Moca, Orocovis, Patillas, Ponce, Rincon, San Juan, San Sebastian, Vieques, and Yauco.

When you arrived in Puerto Rico, did someone from the Red Cross greet you? (Give the person's name and position, if known.)

- No greeting (7)
- Not sure (7)
- Yes (3)

Red Cross volunteers, including members of the Force of 22, at the Atlanta airport ready to depart for Puerto Rico. [American Red Cross photo]

What directions were you given from the Red Cross about your assignment?

- None (6)
- Received directions once on assignment (4)
- Briefed by Puerto Rico Section Manager Oscar Resto, KP4RF (2)
- Little more than information contained in pre-deployment documents (4)
- Minimal (1)

If you worked outside of the Red Cross mission, how were you assigned that mission?

- Self deployed (1)
- Based on information from JFO/EOC (1)
- Not clear that we were inside or outside the Red Cross mission (1)
- Not applicable (7)
- Net control (2)
- Unknown (3)
- From a member of our radio group (1)
- Directly from Puerto Rico Section Manager Oscar Resto, KP4RF (1)

What support did the Red Cross give you as you carried out your mission?

- Lodging (9)
- Cash (4)
- Radios (6)
- Transportation (4)
- Food/water (9)
- Miscellaneous supplies (2)
- Emotional and spiritual care (1)

Did the Amateur Radio equipment provided meet the communications needs at your assigned location? If not, what was needed?

- Yes (9)
- No (3)

Items mentioned included electrical tape/duct tape, volt-ohm meter, cable ties, SO-239 connectors, insulators, soldering iron, 50' runs of coax and barrel connectors, mini mag-mount VHF/UHF antenna, VHF/UHF J-pole antenna, compass, headset with boom mic and footswitch, extension cords, power strips, hook-up wire, wire strippers, end-fed antenna, cheat sheets for radios.

Did you have to add anything to your equipment kit?

- Yes (14)
- No (3)

If yes, what did you add and where did you acquire it?

Generally, additional equipment was acquired through the Red Cross, FEMA, fire stations, local radio amateurs, or home improvement stores. Items acquired were left with the Red Cross in San Juan. Items included:

Extension cords, antenna wire, car battery, hex nuts (used as weights for antennas), rope, notepads, pens, markers, electrical tape, crimpers, wire connectors, pulleys, shackle, slingshot, power strip, coax seal, HP OfficeJet printer, printer paper, headphones, batteries, terminals, PVC pipe, hose clamps, tape measure, power inverter.

What modes of Amateur Radio communication did you use during deployment?

- HF SSB (14)
- HF Winlink (14)
- HF CW (2)
- VHF/UHF FM (15)

What means of non-Amateur Radio communication were available at your assigned location on arrival?

- None (8)
- Radio (3)
- Internet (2)
- Cellular (4)
- Landline phone (1)
- Satellite phone (2)

What means of non-Amateur Radio communication were available at your assigned location at the end of your assignment?

- None (3)
- Radio (6)
- Internet (5)
- Cellular (10)
- Landline phone (2)
- Satellite phone (5)

What means of power were available at your assigned location on arrival?

- None (1)
- Generator (13)

What means of power were available at your assigned location at the end of your assignment?

- None (1)
- Generator (11)
- Commercial (2)

If your assignment was at a location other than net control, on a scale of 1 to 5 rate the availability of net control, K1M, with 1 being unavailable and 5 being always available.

- Unavailable (0)
- Occasionally available (2)
- Generally available (6)
- Available most of the time (5)
- Always available (2)

If your assignment was outside Red Cross HQ or the JFO/EOC, did you feel you were adequately staffed for the assigned task?

- Yes (11)
- No (2)
- Not applicable (4)

If you were at the Red Cross HQ or the JFO/EOC, did you feel you had adequate staffing for your assigned task?

- Yes (5)
- No (1)
- Not applicable (11)

Additional Survey Information

The volunteers were asked to identify the top three successes and top three challenges they encountered during their deployment, as well as what they felt worked well, and what they felt the lessons learned were.

The top three successes identified:

- Adaptability of the volunteers; complex problems were solved through “MacGyver-like” thinking
- The speed of deployment, from identification of volunteers to “boots on the ground”
- Amateur Radio successfully provided communications to meet a wide range of needs — reunification, sheltering, military, public safety, and municipal

The top three challenges identified:

- ARRL/American Red Cross interface not available in Atlanta
- Poor understanding, on the part of Red Cross, of capabilities of Amateur Radio
- Poor vetting of volunteers

Key components identified as having worked well included:

- Reliable communications on VHF and 40 meters. Specifically called out: the KP4IA repeater and Monacillo control
- Red Cross missions
- Standardized radio kits
- “Opened up” Icom 7200s
- Local contacts that provided translation service
- Cooperation and coordination between ARRL and the Red Cross
- Red Cross material support

The key observations offered on lessons learned included:

- Clearer chain of command
- ARRL representation at the staging point
- Deployable VHF repeaters
- Better screening of volunteers
- Screen out those who have no experience in Amateur Radio disaster communications
- Screen out those who have no experience in the needed forms of communications
- Factor in personality to the screening process; some personalities are not suitable for such deployments
- ARRL needs to provide education to Red Cross on the capabilities of Amateur Radio
- ARRL representative on site during deployment (at JFO/EOC)
- Form a national response cadre that is pre-screened for deployments such as this
- Smaller and lighter Ham Aid kits
- Encourage radio amateurs to volunteer with Red Cross Disaster Services Technology
- Language was a barrier; being bilingual is important
- Clearly defined list of capabilities of all deployed volunteers
- Substantive pre-deployment briefing
- Substantive debriefing
- Better net structure

Section 4 Reports from ARRL Headquarters

Section 4.1: Memo from ARRL Chief Financial Officer

Date: December 14, 2017

To: Mike Corey, KI1U

ARRL Emergency Preparedness Manager

From: Barry J. Shelley, N1VXY

Chief Financial Officer

Re: After-Action Report — 2017 Hurricane Season

You've asked the participants for their thoughts/comments on ARRL's response to the emergency communications needs presented during the hurricanes in the Caribbean and Southern United States. My comments are from my perspective as the Chief Financial Officer and the small role that function played in the overall response.

Overall, I think my comments can be summed up by saying I think we need to have better plans in place before an event occurs. While I don't think there were any big mistakes made during our response, we always seemed to be in a reactive mode, rather than knowing in advance what we would do in certain situations. I realize that we'd never been asked to deliver 50 volunteers at one time for a severe deployment, however, now that we've done it, I think we should put better plans and processes in place to be able to handle the next incident of such a magnitude.

To that end:

1. Acquisition of equipment, from my perspective, seemed very haphazard. The creation of the go-kits was done on the fly, from the selection of the equipment to the choice of vendors. There didn't seem to be any rhyme or reason to whether equipment was purchased or donated and, in the end, how much actual equipment was needed.

   Recommendation: Develop a standard equipment list for the kits, based on what worked and didn't work in the field during this past season. Identify makes, models, etc. (need to keep this updated over the years as new equipment/technology is introduced) for each kit. Negotiate with vendors in advance, if possible, to create a list of preferred vendors to use in case we need to acquire additional equipment in the future. This might also eliminate the need for the use of a personal credit card to make large purchases.

2. I'm not sure I have a recommendation but, given the original request was for 50 radio amateurs and the number actually deployed was only 22, we ended up with much more equipment than was necessary. If there was a way to have discussions with the served agency to help frame/define their request, it would be better. We seemed to simply assume that the Red Cross knew what they were doing when they requested 50 operators.

3. Control and tracking of the equipment, once purchased, was a little lax. This is tied to the process we went through to acquire all the gear.

   Recommendation: Develop a process for identifying and tracking deployment of equipment so we know, at any time, the status of equipment owned by the organization.

4. We were unsure what the situation was regarding liability and other insurance issues related to the volunteers. While the MOU with the Red Cross was specific in this instance — the responsibility for the volunteers was on the Red Cross — we didn't have a ready answer to the question, which is certainly of concern to volunteers and could impact our participation in a deployment.

   Recommendation: While I'm not suggesting that ARRL attempt to provide liability or any other kind of insurance for volunteers in this type of deployment, we should make this issue clear in any MOUs to which we are a party. This will remove any potential last-minute negotiations which could slow down or derail a deployment.

Those are the issues I think we need to address, from my perspective, going forward. If you have something else you would like me to address, please let me know. Otherwise, I thought our internal communications process went well throughout the events. Having periodic meetings to keep everyone informed and dealing with the same information is a good idea.

Section 4.2: ARRL Emergency Preparedness Manager After-Action Report — Deployment to Puerto Rico

Overview

During the period of August 21 – October 5, my primary responsibility was to manage the ARRL HQ Emergency Response Team (HQ-ERT) activities related to the 2017 Solar Eclipse and hurricanes Harvey, Irma, and Maria. My responsibilities included coordination with national partners and ARRL field organization responders, ARRL HQ resource management, the Ham Aid program, and media appearances (addressed in the public relations after-action report).

The week of October 6, it was decided by management that I would deploy to Puerto Rico and assist the ongoing response in several specific areas — field organization support for the Puerto Rico section manager, Ham Aid inventory management, national organization liaison to the Joint Field Office (JFO), and any media and public relations matters at the JFO. I arrived the afternoon of October 6 and was on site through October 20.

My primary work area was at the federal JFO located at the Puerto Rico Convention Center. I worked within the JFO Emergency Support Function 2 (ESF-2) area as a liaison for ARRL. During my 2-week deployment I did spend some time at the Red Cross HQ facility and did field visits to the Guajataca Dam and a repeater site southwest of San Juan.

This was the first time since hurricane Katrina that ARRL staff deployed on a major disaster.

Successes

The three key successes I observed during my time in Puerto Rico were:

- Successful interface of Amateur Radio to the ESF-2 function. This paved the way for SHARES to deploy operators toward the end of the Force of 22 mission.

Volunteer Valerie Hotzfeld, NV9L, and ARRL Emergency Preparedness Manager Mike Corey, KI1U, at the JFO in San Juan. [Gary Sessums, KC5QCN, photo]

Gary Sessums, KC5QCN (left), Mike Corey, KI1U (center), and Valerie Hotzfeld, NV9L (right), delivering supplies to Angel Vazquez, WP3R, for the Arecibo Observatory. [Oscar Resto, KP4RF, photo]

- The dedication of the Puerto Rico Amateur Radio community. Despite taking heavy losses, they took the lead in the response effort. The work they had done prior to Maria in building relationships was apparent and a key to the overall success of the Amateur Radio response.
- The collaborative effort between ARRL and the Red Cross was remarkable. To go from concept to implementation so quickly is a testament to the good relationship the two organizations enjoy.

Challenges

The biggest challenges I observed were:

- Due to hasty vetting of the volunteers, there were clearly some who deployed that should not have gone. A robust vetting process is needed if another deployment such as this happens in the future.
- Based on my observations at Red Cross HQ in San Juan, it was apparent that the person in charge did not know what to do with Amateur Radio operators. Their mission was uncertain at first, and only firmed up when the Puerto Rico Section Manager took charge.
- Transportation of Ham Aid equipment to impacted areas was a serious challenge. Under our current arrangements, we have no way to transport gear to the US Virgin Islands. Transportation to Puerto Rico was difficult at first, but became easier as commercial flights into San Juan resumed.

There were many other successes and challenges in the response, however I will leave those to the observations of the volunteers and field organization leadership.

Mike Corey, KI1U

ARRL Emergency Preparedness Manager

Section 4.3: Sequence of Events and After-Action Report for ARRL's Ham Aid Program During Hurricanes Irma and Maria

Sequence of Events

September 5, 2017 — Hurricane Watch Net activated for hurricane Irma.

September 6, 2017 — Hurricane Irma makes landfall in Dominica, USVI, as a category 5 hurricane.

September 6, 2017 — Ham Aid request received from WCF Section Manager.

September 7, 2017 — Two Ham Aid kits were sent to WCF at the request of the Section Manager. Kits consisted of eight Icom IC-V82 handhelds with AA batteries, and two VHF/UHF mobile transceivers with power supplies.

September 7, 2017 — US Virgin Islands Section Manager Fred Kleber, K9VV, reports that he has HF capability on 80, 60, 40, and 20 meters. St. Thomas, St. John, and St. Croix as well as outlying islands have sustained major damage from hurricane Irma.

September 7, 2017 — ARRL HQ Emergency Response Team meets to discuss hurricane developments. The Ham Aid inventory was assessed, and six Icom IC-7300 HF transceivers were ordered to supplement the existing Ham Aid inventory and were delivered to ARRL Headquarters overnight.

September 8, 2017 — ARRL HQ Emergency Response Team meets to discuss latest hurricane developments.

Ham Aid kits ready to ship to Puerto Rico. [Mike Corey, KI1U, photo]

September 9, 2017 — The five new IC-7300s packaged in Pelican cases along with power supplies, digital cables, some handhelds, and other accessories were sent to San Juan, Puerto Rico to be pre-staged if needed.

September 10, 2017 — Irma made landfall in the Florida Keys and parts of Southern Florida. It was later downgraded to a tropical storm, but not before causing significant damage, especially in the Florida Keys.

September 10, 2017 — W1AW activated for health and welfare messaging from Southern Florida and the Keys.

September 14, 2017 — Five Pelican cases trucked to Newark Airport for shipment via United Airlines to Red Cross HQ in San Juan.

September 15, 2017 — Two Ham Aid kits were recalled from WWA, where they had been pre-positioned.

September 15, 2017 — Two Ham Aid kits were recalled from Texas, where they had been pre-positioned.

September 17, 2017 — Hurricane Watch Net activated for hurricane Maria.

September 17, 2017 — Forecasters predict USVI and Puerto Rico will be heavily impacted by hurricane Maria.

September 19, 2017 — ARRL HQ Emergency Response Team meeting.

September 19, 2017 — WCF held off on returning the Ham Aid kits, in case Maria tracks in their direction.

September 19, 2017 — Four model 1620 and three model 1650 Pelican cases purchased. Delivered on September 20, 2017.

September 20, 2017 — Hurricane Maria made landfall in Puerto Rico.

September 20, 2017 — HQ Emergency Response Team meeting. Needed were additional HF transceivers, WinLink capable, VHF/UHF dual-band transceivers, Pelican cases, antennas, power supplies, tools, and other items to place in the cases to send to Puerto Rico.

September 24, 2017 — Icom IC-7200 radios were purchased along with antennas, power supplies, digital cables for interfacing with radios, Heil headsets, and other items to make a complete HF radio system. All items were overnighted to ARRL HQ.

September 25, 2017 — Twenty Pelican cases were purchased (models 2950, 2975), and were delivered that day.

September 26, 2017 — E-mail sent to ARRL HQ staff requesting volunteers to assist with the packaging of 19 Pelican cases with Icom IC-7200 radios, power supplies, antennas, and other accessories. Preparing for transport to San Juan, Puerto Rico via Atlanta, Georgia.

September 26, 2017 — In less than 8 hours, all 19 Pelican cases were fitted out with equipment to make 19 HF radio systems.

September 26, 2017 — At 6:00 PM, 19 Pelican cases were brought to Bradley International Airport in Windsor Locks, Connecticut for transport via Southwest Airlines Cargo for a flight to Atlanta, Georgia.

September 27, 2017 — In Atlanta, members of the volunteer Force of 50 were assigned a Ham Aid kit. They would carry the kits to Puerto Rico, where they were used to provide messages for the Red Cross *Safe and Well* program, and other tasks.

October 18, 2017 — Completion of mission. Nineteen Ham Aid kits were returned to Southwest Airlines Cargo in San Juan and staged for return to Connecticut.

W1AW Station Manager Joe Carcia, NJ1Q (left), and ARRL Emergency Preparedness Manager Mike Corey, KI1U (right), assemble a Ham Aid kit for Puerto Rico. [Michelle Patnode photo]

October 24, 2017 — Pallet with generators picked up at ARRL HQ by trucking company, to be delivered to FEMA warehouse in Atlanta, Georgia.

October 27, 2017 — Seven Honda 2000 W generators and power cords that had been purchased arrive at FEMA warehouse in Atlanta, Georgia for first stage of trip to San Juan, Puerto Rico.

November 2, 2017 — Nineteen Ham Aid kits arrived back at HQ after being held up in San Juan because of electrical power issues at airport. Seven kits remain in Puerto Rico, where they continue to be needed.

November 3, 2017 — The seven generators and power cords arrive in San Juan, confirmed by Section Manager Oscar Resto.

ARRL staff members Eric Casey and Amanda Grimaldi, N1NHL, assemble Ham Aid kits for Puerto Rico. [Michelle Patnode photo]

After-Action Report

1. What could we do better?

Additional HQ staff trained and can be called upon to assist with emergency preparedness tasks.

- Improve process for vetting deployed communicators.
- Process for verifying training of communications volunteers.
- Better understanding regarding air transportation of prohibited items.
- Establish MOUs with ground transportation organizations ahead of disasters.

2. What did we do well?

Teamwork in getting the kits prepared and out the door in less than 8 hours.

- Having air transportation pre-established with Southwest Airlines.

3. What do we need to change?

- Radios worked well. Possibly replace Icom IC-7200s with IC-7300s for consistency and ease of use.
- Make sure every radio is digital-capable, with all needed cables and accessories.
- Vetting process.
- Improve training, especially with digital communications.
- Multiple band antennas or several antennas for individual bands.

Section 4.4: ARRL Media & Public Relations Hurricane Maria After-Action Report

Note: Because I came to ARRL at the tail end of the Hurricane Maria-Puerto Rico deployment, and was not involved in the planning or execution of a communications strategy for this operation, I am not able to offer detailed comments. However, I can share some general observations.

Also, I think it is important to state that we all understand that media and public relations were not, and should not, be among the top priorities of those involved in relief efforts.

What Worked

ARRL experienced a significant increase in awareness of Amateur Radio and the service that ham radio operators can offer in times of emergency. Several positive stories were broadcast/published by national media outlets about the work that ham radio operators did in Puerto Rico. There were also lots of stories in local media outlets about how family members were getting messages from loved ones on the island via ham radio. Even after the deployment ended, we continued to get queries from reporters interested in talking to those who were deployed and doing stories about the positive role Amateur Radio played in the relief efforts.

Being involved from the earliest stages of the relief effort was helpful, as we were able to take pictures and video of the assembling and shipping of Ham Aid kits, which we could provide to media outlets to use in their stories.

The daily e-mail reports from the field were very helpful in letting us know what was going on. This allowed us to develop story pitches to the media and to share information with ARRL members

ARRL CEO Tom Gallagher, NY2RF, speaks to local media about the Amateur Radio response to Maria. [Mike Corey, KI1U, photo]

What Could Be Improved

While I understand the conditions that the deployed force was dealing with, getting still images and/or video on a regular basis that we could post to the ARRL website and on our social media channels or distribute to media outlets would have been very valuable.

The daily e-mail reports worked great, but there were a few days when there were no updates. Maintaining a consistent messaging schedule is very important.

Having direct voice-to-voice contact with a liaison on the ground would also have been very beneficial. It would have helped us get questions answered more quickly.

A brief communication strategy session prior to deployment would have been valuable, as it would have insured that proper expectations were set for what communication officials at ARRL HQ might receive and when.

Suggestions

I realize that "feeding the media beast" was not the responsibility of those who were deployed to Puerto Rico, and should not be a responsibility of those who will be deployed on similar missions in the future. However, perhaps consideration could be given to the idea of having a press liaison person embedded with the deployed ham radio operators. That person could work directly with media on the ground in the affected areas, leaving the ham radio operators free to do the work they were deployed to do. This would also allow for more stories to be generated in the media, as someone would be providing information to reporters on the ground (who are scrambling to generate daily content).

David Isgur

ARRL Communication Manager

Section 4.5: ARRL Public Relations and Social Media 2017 Hurricane Season After-Action Report

What Was Done

During the 2017 hurricane season, each news story was posted to the ARRL news crawl, and on social media. Posted with these was a Puerto Rico-Caribbean Recovery 2017 logo created by ARRL's designer.

We used the ARRL Facebook, Instagram, Twitter, and ARES Twitter accounts. In addition to this, marketing created separate pages on the ARRL website to organize media hits, news stories, and helplines. I assisted with embedding the corresponding news stories from the news crawl to the appropriate page, and in summary writing for the hurricane news stories for the ARRL Board of Directors.

We received many phone calls for interviews from CNN, NPR, WFSB, VICE, Fox 61, The Weather Channel, NBC CT, The Verge, WNYC, and KGO 810 Radio. These calls were also made and received after work hours.

Lots of photos of Ham Aid kits were taken at ARRL HQ and sent to various news outlets, and posted on ARRL's social media feeds.

What Worked

This was my first experience being involved with the process of hurricane season. This was during a transition time where the former Public Relations Manager had left ARRL, and a new one had yet to be hired. With being new to the job, I received immediate firsthand experience on what to do in these situations, and how they work.

When media outlets called, it was very important to ask what they were looking for, get their contact info, and ask for their deadline. The next step was to find out who can attend the interview and when, and see if that met the media outlet's deadline. Interviews were done in person, over the phone, and via Skype from the ARRL Media Room.

Suggestions for Improvement

- Having one person to contact for interviews would eliminate confusion, along with an interview calendar (SharePoint) where everyone has access to see who is interviewing with who and when.
- An RSS feed from the news crawl to the separate web pages would be helpful.
- An RSS feed from the news crawl stories to Twitter and ARES Twitter.
- Photo credits for pictures sent to us for social media use.

Michelle Patnode

ARRL Media and Public Relations Assistant

Section 4.6: ARRL Regulatory Information After-Action Report — Fall 2017 Hurricane Deployments

What Worked Well

1) Rapid response from the FCC for the Special Temporary Authorization that allowed the use of higher-speed digital communications.

2) Relatively few reported problems of interference to ongoing relief and/or support communications.

   a. The major problem reported domestically (in Louisiana) was given to the FCC, who gathered data and appears to be pursuing an enforcement action.

   b. The amateur community as a whole seemed to understand the important role of the ongoing support communications in each of the events, with widespread cooperation to minimize interference to request channels.

3) Amateurs on the ground adapted well to assessing the communications needs they were presented in their various responses, then adjusting their operations appropriately to meet those demands within the context of the pertinent FCC rules.

4) Cooperation within the amateur community to abide by the conditions established by the FCC's STA and only those stations actually participating in disaster-related communications using the temporary authorization. There were no reports of licensees who were not participating in the response taking advantage of the provisions of the waiver.

Areas of Concern

1) Few concerns, as the need did not seem to materialize for more time-valued communications with the FCC.

2) No contingency plans were in place regarding how US amateurs could have provided communications assistance to non-US territories impacted by the storms.

From an ARRL administrative perspective, things that I was involved with at ARRL HQ seemed to come together. The ability to be resilient and flexible in shifting from normal HQ functions to disaster relief needs seemed to be chaotic at times, but was quite dynamic in getting the task done.

Dan Henderson, N1ND

ARRL Regulatory Information Manager

Section 4.7: Report on 2017 Hurricane Activities at W1AW

During the most active part of the 2017 North Atlantic Hurricane season, W1AW's primary responsibilities were to monitor various HF nets active during the hurricanes, and in some instances, check into these nets, in addition to the sending and receiving of any possible hurricane-related e-mail traffic via Winlink 2000.

W1AW is always ready to assist in emergency communications when necessary. It's worth noting that hurricane Katrina (2005) prompted the station to be *even more* visible and active in such situations. Federal grant monies received in early 2006 precipitated the purchase of additional equipment to be used for just such a thing.

During Katrina, a separate telephone line was set up in W1AW to pass any storm-related calls to station/HQ personnel after normal business hours. That line was reestablished for this storm season, and is now a permanent aspect of the station for its emergency communication functions.

Given the current equipment complement and emergency backup power capabilities of W1AW, it can be argued that the station is ready to assist in such emergencies, at least in the short term. Were there to be a long-term need, the station can participate in this function as well, so long as enough trained personnel were available to fill that need.

Although not necessarily a function of W1AW, the station manager was involved with some technical support for the ARRL Ham Aid kits. This support included the assembly of HF antennas; configuration of H/VHF radios being sent to the affected areas; configuration of laptop computers for Winlink 2000 use;

Rob Macedo, KD1CY, the Director of Operations for VOIP WX Net, took time to visit W1AW and help pass traffic from Puerto Rico on the SATERN net.

culling together mobile antennas for VHF operations; and the construction of power and coaxial pigtails for radios.

While not performed during hurricanes Harvey or Irma, operators at W1AW passed some outgoing traffic — from people in Puerto Rico who were affected by Hurricane Maria — to family members or friends in the US. This traffic — the content of which essentially contained messages that the senders were okay — were received via the SATERN and Caribbean Health and Welfare (*Friendly*) nets. The station operator in turn would contact the recipient of the message via telephone, and pass along the traffic to them.

W1AW's presence on the various HF nets was welcomed by all net participants. The station was active not only to assist with any outgoing traffic, but to also listen for any possible interference — intentional or otherwise — that might be experienced by the net. In at least three instances, W1AW was forced to keep the frequencies clear.

With rare exception, the station is physically capable to perform its technical functions properly for emergency communications. However, the need for properly trained (HF/net) operators is usually where the station tends to be lacking. During one of the outgoing traffic response sessions for Hurricane Maria, a W1AW operator who was checked into the SATERN net at that time stumbled with net protocol on multiple occasions. The NCS at the time graciously assisted that operator with proper procedure. While this incident didn't adversely affect communications, the fact remains this did not reflect properly on W1AW or the operator at the time.

A recommendation is that any and all operators who may staff W1AW during these types of events — actual communications emergencies or training sessions — should be properly trained with net procedures beforehand.

Aside from this issue, W1AW's participation was beneficial. The staff involved performed their responsibilities properly and without hesitation.

Respectfully submitted,

Joseph Carcia, NJ1Q

W1AW Station Manager

Trustee, W1AW

Section 5 Recommended Actions and Improvements

The lessons learned following an event are only beneficial if they lead to improvements and better prepared the organization for the next major event. The following items were identified in the after-action report as areas of action or improvement. Once approved and assigned, they should have a completion date for follow up.

Action/Improvement	Approval for work	Assigned to
Reassess ARRL disaster plan and identify areas where we can be more proactive with training, deployment, equipment.		Emergency Preparedness
Preferred vendor list — would be useful with a defined purchasing process developed so we would not have been rushed to find equipment to deploy.		Emergency Preparedness Purchasing
Re-examine MOU with partner agencies detailing their needs and expectations as well as that of ARRL specifically related to liability and insurance issues.		Emergency Preparedness General Counsel
Inventory control process — improve process with ID tags, tracking of equipment. A better inventory management tool should be investigated.		Emergency Preparedness CFO
ARRL HQ Emergency Response Team — expand team to include staff to assist with Ham Aid deployments when needed.		Emergency Preparedness
Establish MOUs with commercial carriers so we will have other alternatives to get equipment to where it's needed.		Emergency Preparedness

Standard training for all ARES and communications volunteers. Could be useful at all levels of Amateur Radio disaster response.		Emergency Preparedness Public Service Enhancement Working Group
Getting a steady flow of still images and/or video that we could post to the ARRL website/social media channels and/or distribute to media outlets would have been very valuable.		PR Social Media
Voice contact with ARRL liaison on the ground would be helpful in gathering real-time disaster news.		Emergency Preparedness PR
A brief communication strategy session prior to deployment would have been valuable, as it would have insured that proper expectations were set for what communication officials at ARRL HQ might receive and when.		Media Social Media
Have a press liaison embedded with the deployed team, gathering news for ARRL news feed and news networks. ARRL would be the source and control the news.		Emergency Preparedness Media
Having one person to contact for interviews would eliminate confusion, along with an interview calendar (SharePoint) where everyone has access to see who is interviewing with who, and when.		PR
RSS feed from the news crawl to separate web pages, and RSS feed from the news crawl stories to Twitter and ARES Twitter		Media PR
Photo credit for pictures sent to ARRL for social media so we can provide photos to other news outlets.		Media PR
All volunteers operating W1AW should be properly trained on net procedures.		Emergency Preparedness W1AW ARRL volunteer staff
National Response Team — several issues identified (vetting, staging, equipment, personality issues, and briefings) could be effectively be addressed by the formation of an ARRL sponsored national response team.		Emergency Preparedness

Reassess Ham Aid kits — many equipment issues were brought up, ranging from radios to basic tools.		Emergency Preparedness
Amateur Radio training for American Red Cross personnel		Emergency Preparedness
ARRL presence in JFO — it became clear that the one place ARRL needed presence was the Joint Field Office. A plan should be developed, perhaps within the national response team concept, on establishing a liaison position with a JFO.		Emergency Preparedness
Defined volunteer capabilities — a standard list of capabilities could be useful at all levels of Amateur Radio response to disaster.		Public Service Enhancement Working Group
PACTOR 4 — While use of Winlink was minimal during the deployment, the waiver for PACTOR 4 was helpful, allowing for greater bandwidth if needed.		Regulatory
Amateur Radio information sharing — many Amateur Radio organizations and programs played a part in the Puerto Rico response. Additionally, many VOADs utilized volunteers who also were license radio amateurs in their response efforts. A platform for Amateur Radio information sharing should be developed.		Amateur Radio National Emergency Communications Consortium (ARRL, MARS, SATERN, HWN, WX4NHC, VOIP WX Net)
Clear affiliation — a point of confusion during the deployment was who an individual represented. The Puerto Rico Section Manager and ARRL Emergency Preparedness Manager both wore the ARRL "red badge" and an ARC badge. ARRL should provide instruction on avoiding confusion through appropriate badging.		Emergency Preparedness Field Services
Disaster messaging — the prioritization of messaging throughout the event was — lifesaving, outbound, inbound. Furthermore, what we typically call health and welfare traffic is now appropriately routed through Red Cross Safe and Well. ARRL needs to promote Amateur Radio support for the Red Cross Safe and Well system during major disasters.		Emergency Preparedness

ICS-205 — Throughout the hurricane season and during the solar eclipse in the summer of 2017 it became clear that a master ICS-205 (Communications Plan) was helpful for coordinating HF communications. The ARRL should develop a major event ICS-205 Communications Plan Form and encourage its use in the field organization.		Emergency Preparedness
Amateur Radio best practices — the events of 2017 and smaller events around the country are great sources for the development of a "Best Practices" repository. ARRL should develop a process to identify, vet, and publish these best practices.		Emergency Preparedness Field Organization

Appendices

ICS-205 Incident Radio Communications Plan — Hurricane Maria

ICS-205 INCIDENT RADIO COMMUNICATIONS PLAN		Incident Name: Hurricane Maria			Date/Time Prepared: 5 OCT 2017			Operational Period Date/Time: 1600 28 SEP 2017 Z	
Ch #	Function	Channel Name/Trunked Radio System Talkgroup	Assignment	RX Freq N or W	RX Tone/NAC	TX Freq N or W	Tx Tone/NAC	Mode A, D or M	Remarks
1	Amtr Comms	**KP4IA**		145.37	No PL	144.77	No PL	A	Aguas Buenas; PR wide
2	Amtr Comms	**Local Repeater**		147.31	88.5	147.91	88.5	A	East PR to St. John
3	Amtr Comms	**Local hams**		146.59	No PL	146.59	No PL	A	Power company and local amateurs
4	Amtr Comms	**ARRL Deployment**		146.55	No PL	146.55	No PL	A	Inter-team comms
5	Amtr Comms	**SATERN**		14.265	No PL	14.265	No PL	A	Assistance passing traffic to CONUS
6	Amtr Comms	**NVIS**		7.085 LSB	No PL	7.085	No PL	A	ARRL HF comms
7	Amtr Comms	**EOC/COE**		5.235 USB	No PL	5.235 USB	No PL	A	Primary
8	Amtr Comms	**EOC/COE**		7.360 USB	No PL	7.360 USB	No PL	A	Secondary
9	Amtr Comms	**Local Repeater**		147.05	127.3	147.65	127.3	A	South and North
10	Amtr Comms	**Local Repeater**		147.29	123.0	147.89	123.0	A	West
11	Amtr Comms	**Local Repeater**		147.23	123.0	147.83	123	A	West
12	Amtr Comms	**Local Repeater**		147.31	88.5	147.91	88.5	A	East
13	Amtr Comms	**Local Repeater**		147.25	88.5	146.65	88.5	A	East
14									
15									
16									
17									
18									
19									
20									
Prepared By (Communications Unit)					Incident Location County State Latitude Longitude				

The convention calls for frequency lists to show four digits after the decimal place, followed by either an "N" or a "W", depending on whether the frequency is narrow or wide band. Mode refers to either "A" or "D" indicating analog or digital (e.g. Project 25) or "M" indicating mixed mode. All channels are shown as if programmed in a control station, mobile or portable radio. Repeater and base stations must be programmed with the Rx and Tx reversed.

ICS 205 Excel 3/2007

Letter of Thanks From American Red Cross Senior Vice President, Disaster Cycle Services Harvey Johnson to ARRL

American National Red Cross
8550 Arlington Blvd
Fairfax, VA 22031

October 30, 2017

Mr. Rick Roderick, President, ARRL
Mr. Tom Gallagher, Chief Executive Officer, ARRL
225 Main St.
Newington, CT 06111-1494

Mr. Gallagher and Mr. Roderick,

On behalf of the American Red Cross, I would like to express my sincerest thanks to you, ARRL, and all your amazing volunteers for the unwavering commitment demonstrated during the response to this unprecedented disaster in Puerto Rico. The actions of your team made a significant difference in the lives of so many who were affected.

I also want to specifically thank Mike Corey for his leadership in planning and managing the mission. Mike was fast acting and thoughtful, constantly working to make the mission effective through transparency and collaboration. We simply could not have achieved the outcomes without him.

This mission marked an exciting new path for our two organizations with it being the first time we deployed ARRL volunteers to a Red Cross relief operation. I continue to hear incredible stories about how the ARRL volunteers supported individuals, communities, and partner organizations during their time in Puerto Rico. It was a complex operation in an austere environment and the mission certainly had its challenges. While we have much to learn from this new experience and areas to improve upon, we remain committed to working with you, ARRL, and your cadre of talented volunteers.

We thank you again for partnering with us to alleviate suffering, open lines of communication, reunify concerned loved ones and foster response and recovery efforts following the devastation inflicted by Hurricane Maria.

We look forward to our continued efforts working together to serve those impacted by disasters.

In partnership,

Harvey Johnson
Senior Vice President, Disaster Cycle Services
American Red Cross National Headquarters

CC: Michael Corey

Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
RESPONSE EFFORTS UNDERTAKEN	)	**ET Docket No. 17-344**
DURING THE 2017 HURRICANE SEASON	)	

To: The Chief, Public Safety and Homeland Security Bureau
Via: ECFS Electronic Filing

COMMENTS OF ARRL, THE NATIONAL ASSOCIATION FOR AMATEUR RADIO

ARRL, the national association for Amateur Radio, formally known as the American Radio Relay League, Incorporated (ARRL), by counsel, hereby respectfully submits its comments in response to the *Public Notice* (the Notice), DA 17-1180, released December 7, 2017.[1] The *Notice* requests comment on the resiliency of the communications infrastructure, the effectiveness of emergency communications, and government and industry responses to the 2017 hurricane season. This season included four hurricanes which made landfall in the United States and its territories, which caused significant damage. The Commission notes that the purpose of the instant *Notice* is to understand the extent to which reliable communications services were provided during and after these hurricanes in order to assess what lessons may be learned for the future. The Public Safety and Homeland Security Bureau will ascertain areas for further discussion in one or more workshops to be held later, with respect to improving future hurricane response efforts. For its comments relative to the performance of the Amateur Radio Service in this recent series of hurricanes, ARRL states as follows:

[1] The Notice established a comment date of January 22, 2018. Therefore, these comments are timely filed.

I. Introduction.

1. The *Notice* asks a series of questions with respect to the damage to infrastructure; the Commission's regulatory response to these disasters; and the perspectives and experiences of communications users and communications providers. With respect to the value of Amateur Radio in the role of volunteer communications provider (and facilities restorer) in these hurricane relief efforts specifically, the Commission asks two questions: (1) To what extent were response efforts facilitated by Amateur Radio operators; and (2) Going forward, should efforts be made to increase the use of Amateur Radio services in connection with the planning, testing and provision of emergency response and recovery communications? ARRL is pleased to address these questions and others in the *Notice* applicable to Amateur Radio's performance, with reference to its extensive recent experience in assisting Puerto Rico and the U.S.Virgin Islands in the aftermath of Hurricane Maria; and more generally in virtually all natural disaster relief efforts in the United States and its territories for more than a century.

II. Background.

2. Since its inception and at the commencement of Federal licensing in the early 1910s, the Amateur Radio Service has always been far more than a "hobby"- a means for those curious in electronics and radio to expand their knowledge. The varied purposes and goals for the Service summarized by the Commission's rules (47 C.F.R. §97.1) establishing the Amateur Service illustrate its versatility:

> *The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:*
>
> *(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, particularly with respect to providing emergency communications.*

(b) Continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art.

(c) Encouragement and improvement of the amateur service through rules which provide for advancing skills in both the communication and technical phases of the art.

(d) Expansion of the existing reservoir within the amateur radio service of trained operators, technicians, and electronics experts.

(e) Continuation and extension of the amateur's unique ability to enhance international goodwill.

3. Each of those five principles is interrelated, having in common as a foundation the radio Amateur's ability to communicate effectively and efficiently in a variety of circumstances. Of these fundamental purposes, volunteer emergency communications are most obvious to the public. Emergency communications efforts of radio Amateurs are enhanced and facilitated by their ability to refine, adapt and improve equipment. They experiment with new and varied communications technologies and systems in order to better understand and utilize the propagation of radio waves. By virtue of this technical self-training and the educational programs available to the Amateur Radio community, the Service can effectively provide supplemental and restorative communications for emergency and disaster relief agencies and organizations.

4. A non-commercial, public service avocation, Amateur Radio emergency communications are provided on a voluntary basis. They are nonetheless reliable because their infrastructure is largely decentralized and not dependent on commercial power mains or fixed facilities that can fail. This resiliency is based on the multitude of individual stations deployed ubiquitously throughout towns, counties, and States. These volunteers offer their stations and their skills for emergency and disaster relief communications at no cost to States, municipalities, disaster relief agencies, and agencies of the Federal Government. Radio amateurs respond immediately, upon a call from served agencies following any type of emergency or disaster, with

working communications facilities and systems, manned by volunteer, trained communicators. They assist in restoring public safety communications facilities that have failed because they possess the technical knowledge and innovative creativity to do so. The wide geographic distribution of residential Amateur Radio stations ensures that there will always be located, within and outside the affected disaster area, functional Amateur Radio stations ready to relay information into and out from the location of the disaster.

5. Amateur Radio operators provide communications for the benefit of first responders until public safety facilities are restored to operation. They conduct temporary dispatch operations and substitute 911 services, cellular and conventional and trunked land mobile systems. Amateurs provide interoperability and mutual aid communications between and among public safety and other entities (interoperability that typically does not, even now, exist generally on an interagency basis). They provide efficient communications for disaster relief agencies, such as the American Red Cross and the Salvation Army, for the duration of disaster recovery efforts. Amateurs are known for their immediate responses to hurricanes, tornadoes, earthquakes, snow and ice storms, floods, fires and other natural disasters. They are available during and in the aftermath of such events, and they are prepared to deploy and commence communications without any advance requests.

6. This preparation for emergency communications deployment is enabled by the technical self-training that is inherent in the Service and facilitated by the licensing process. Many, perhaps most, telecommunications professionals derived their interest, and most of their basic technical and communications skills, from their avocational activities in Amateur Radio. Many developments in modern telecommunications, including low-Earth-orbit microsatellite technology, and many refinements and adaptations of new technologies, were and are the direct

result of Amateur Radio experimentation and inventiveness. That innovative spirit still exists today, despite the complexity of modern digital communications. Amateur broadband systems and other high-data-rate multimedia systems are in full deployment now. Software-defined radio systems are now widely available and are used daily in the Amateur high-frequency (HF) and VHF and UHF bands. The potential for improvement in Amateur Radio emergency communications and interoperability communications for served agencies as a result of the adaptation and regular use of SDR and broadband technology is limitless.

7. Worldwide, nationwide, statewide and local communications networks of Amateur Radio stations are in operation twenty-four hours per day, every day of every year, using Amateur Radio stations located in licensees' homes and via mobile stations. Since the Amateur Service is not dependent on fixed infrastructure and is ubiquitous, the ability of radio Amateurs to provide reliable communications instantly over any path cannot be defeated by any disaster, act of terrorism, or by any other means whatsoever. The volunteer services provided by radio amateurs cannot be duplicated by governmental entities at the Federal, state or local level at any cost. However, these services are provided at no cost. The Commission has at times described the Amateur Service as a "priceless public benefit." It has also specifically found that the Amateur Radio Service is "a service that is a model of public responsiveness in times of emergency and distress and a service that is a model of self-enforcement and volunteerism."[2]

8. Congress has repeatedly expressed similar sentiments. In Public Law 103-408 in 1994, Congress declared that Amateurs are to be "commended for their contributions to technical progress in electronics, and for their emergency radio communications in times of disaster;" that the Commission is "urged to continue and enhance the development of the Amateur Radio

[2] Report and Order, Docket 83-28, released December 23, 1983.

Service as a public benefit by enacting rules and regulations which encourage the use of new technologies" in the Amateur Service; and to make "reasonable accommodation for the effective operation of Amateur Radio from residences, private vehicles and public areas;" and that regulation at all levels of government should "facilitate and encourage amateur radio operation as a public benefit." Earlier, in 1988, in Public Law 100-594, a sense of Congress resolution, at Section 10 thereof, Congress held that it "strongly encourages and supports the Amateur Radio Service and its emergency communications efforts;" and that "Government agencies shall take into account the valuable contributions made by Amateur Radio operators when considering actions affecting the Amateur Radio Service." In the Communications Amendments Act of 1982, Public Law 97- 259, Congress, in praising the accomplishments of the Amateur Service, held that: "the Amateur Radio Service is as old as radio itself. Every single one of the early radio pioneers, experimenters, and inventors was an amateur; commercial, military and government radio was unknown. The zeal and dedication to the service of mankind of those early pioneers has provided the spiritual foundation for amateur radio over the years. The contributions of amateur radio operators to our present day communication techniques, facilities, and emergency communications have been invaluable."

9. The service of the more than 750,000 licensed US Amateurs continues to the present time. In the post-Hurricane Katrina report undertaken by the Department of Homeland Security and issued by the White House, Amateur Radio was cited by the investigating commission as one of the things that "went right" during what became one of the greatest natural disasters in United States history.[3] Lives were saved because of Amateurs being able to relay information out

[3] See United States, Executive Office of the President. The Federal Response To Hurricane Katrina – Lessons Learned" Washington: GPO, 2006 at Appendix B page 135.

of the impacted area and routing it to the appropriate emergency response service.[4] This dedication to service is exemplified almost daily across the country. In May, 2011 at an FCC forum on earthquake communications preparedness, former Federal Emergency Management Agency (FEMA) Administrator Craig Fugate described the Amateur Radio operator as "the ultimate backup, the originators of what we call social media." Referencing Amateur Radio, Fugate said "During the initial communications out of Haiti (following the January 12, 2010 earthquake there), volunteers using assigned frequencies that they are allocated, their own equipment, their own money-- nobody pays them-- were the first ones oftentimes getting word out in the critical first hours and first days as the rest of the systems came back up. I think that there is a tendency because we have done so much to build infrastructure and resiliency in all our other systems, we have tended to dismiss that role: 'When Everything Else Fails.' Amateur Radio oftentimes is our last line of defense." Mr. Fugate continued: "we get so sophisticated and we have gotten so used to the reliability and resilience in our wireless and wired and our broadcast industry and all of our public safety communications that we can never fathom that they'll fail. They do. They have. They will. I think a strong Amateur Radio community [needs to be] plugged into these plans... when you need Amateur Radio, you really need them."

10. There is no single model for effective communications during disasters and emergencies. Emergencies range from a localized situation affecting one community, or an insular area such as Puerto Rico or the Virgin Islands, to regional events affecting multiple

[4] In the aftermath of Hurricane Katrina, Amateurs provided communications of all types: riding with first responders in helicopters, via VHF/UHF bands, communications were provided to first responders on the ground to facilitate rescue operations; High Frequency (HF) communications relayed information out of the affected areas and back to the appropriate emergency response groups. Interoperability communications were provided by Amateurs between and among groups of first responders. In addition to the large number of radio Amateurs in and near New Orleans, Louisiana whose home stations were used extensively, there were at one point more than 1,000 Amateur Radio volunteers in the greater New Orleans area providing communications for the benefit of those who were endangered or harmed by the flooding. This level of organization and preparedness is the direct result of regular drills, exercises and emergency simulations conducted from home stations as well as mobile facilities.

counties or larger areas. Wide area disasters may affect multiple states or entire regions of the country (such as a hurricane which, in its course, can impact states from Florida up the entire Eastern portion of the United States to Maine, as occurred in Hurricane Sandy and/or the entire Gulf coast and southern United States into Texas as occurred with Hurricanes Katrina and Rita). Disasters and emergencies do not respect county or state lines or the limits of jurisdiction of a State or municipal public safety agency. Differences in communications needs of a multiplicity of emergency management and disaster response officials dictate varied approaches to disaster planning and the configuration of Amateur Radio facilities to be used. Because of the differences in propagation at various times of the day and the distances and paths that emergency communications may need to cover, the ability for Amateurs to utilize any and all of their authorized frequency allocations [from medium-frequency (MF) through ultra-high frequency (UHF) and above] efficiently is necessary in order for the Service to be fully effective in disasters and emergency relief.

11. The frequency agility, resiliency, ubiquity and flexibility of the Amateur Radio Service and the communications skills of its licensees are principal reasons why it is considered a valuable resource by emergency officials. Regardless of atmospheric conditions, radio wave propagation, availability of commercial power, or the need for varied emissions types, the Amateur Service has a frequency allocation that will allow communications to be conducted into, within and out of an affected area and the ability to provide voice and data interoperability for disaster relief agencies and public safety services, most especially medical facilities. Amateur Radio emergency preparedness exercises emphasize the operation of residential fixed, portable and mobile stations without reliance on commercial power mains for extended periods of time. Amateur volunteers can continue operation regardless of the status of commercial

telecommunications facilities, wireline facilities, commercial antenna support structures, or maintaining an active connection to the Internet. With efficient, though often very simple antennas and a power source (such as a small portable generator, batteries, or alternate power sources such as a small solar array), the Amateur Radio Service is capable of providing its own portable infrastructure. If the basic communications infrastructure in a disaster area is available, Amateur Radio can leverage it. If the infrastructure is not in place, the Amateur Service can still provide support communication without any dependency on it.

12. The use by radio Amateurs of the radio spectrum in small segments of the medium, high, very high, and ultra high frequency bands and on microwave frequencies serves two fundamental purposes. First, it ensures that radio Amateurs have spectrum to use at all times of the day and night to provide long distance and short distance communications, voice, data or video, as needed with relatively flexible bandwidth emissions. A radio amateur in the continental United States can communicate with his or her counterpart in Puerto Rico, the Virgin Islands, Alaska, Hawaii, American Samoa or Guam before, during and after hurricanes or typhoons to coordinate relief efforts and delivery of medical supplies when other facilities are inoperable or overloaded. They may work with international relief organizations providing time-sensitive, lifesaving communications into disaster stricken areas such as Haiti after its earthquake or following the Japanese tsunami. He or she might provide video transmissions from helicopters in support of, and to coordinate, fire crews fighting the Colorado forest fires or overlooking flood areas. Short- distance voice transmissions among Amateurs allowed interoperability services by relaying of messages, for example, between NASA personnel and FBI agents in efforts to locate Space Shuttle Columbia wreckage in Texas. Amateur Radio continues to be a critical communications medium, contributing to the response to tornadoes in Alabama, Missouri or

Oklahoma; wildfires in New Mexico or California; hurricanes on the Eastern seaboard and the Gulf Coast; snow emergencies in New England; flooding along the Mississippi River basin; and more recently and most notably, in Puerto Rico and the Virgin Islands. Any transmission mode, any path distance and azimuth is possible via Amateur Radio. Frequency bands allocated to the Amateur Radio Service throughout the radio spectrum are used by groups of radio amateurs for different emergency communications applications. High speed, relatively wide bandwidth data communications and television transmissions are conducted in the microwave bands (as are very narrow bandwidth voice transmissions to study propagation and to improve receiver and preamplifier technology).

13. Radio Amateurs, especially since the events of September 11, 2001, have sought ever-greater volunteer roles in disaster relief, homeland security, and emergency communications. The Amateur Service has since then been afforded a Board seat with the National Public Safety Telecommunications Council (NPSTC) which provides opportunities for closer integration of Amateur Radio and public safety in emergency communications planning. ARRL has an affiliation with Citizen's Corps, a program for neighborhood alerting and security organized by the Department of Homeland Security. ARRL has long had memoranda of understanding with the Federal Emergency Management Agency (FEMA); with the National Weather Service; with the National Communications System of the Department of Defense; and with other entities such as the American Red Cross and the Salvation Army SATERN disaster response teams. Amateur Radio is included in virtually all state emergency communications plans. Through ARRL's Amateur Radio Emergency Service® program (ARES ®), hundreds of memoranda of cooperation are in place with state and local emergency management agencies, local disaster relief agencies, hospitals and other groups involved with disaster relief and

emergency response delineating the role of Amateur Radio operators in emergencies in local areas and for specific purposes. ARRL's work with the National Communications System (NCS) of the Department of Defense in its SHARES program, combines existing high frequency assets from 99 Federal, state, and industry organizations into a single emergency voice and data message handling network, supporting national security and emergency preparedness (NS/EP) when normal communications are destroyed or unavailable.

14. While the exact nature of an event constituting a communications emergency that would necessitate the use of Amateur Radio cannot be predicted, the two most common categories of events are natural disasters and weather-related emergencies. Hurricanes, tornadoes and winter storms are among the most common of these events. Because of this, the Amateur Radio Service interfaces with the National Weather Service (NWS) and the National Hurricane Center (NHC). The SKYWARN program of the NWS provides thousands of volunteers nationwide to serve as the "eyes" of the NWS using Amateur Radio stations at their residences when severe weather is imminent. These spotters also provide critical meteorological data that cannot be observed at the altitudes below NWS radar systems.[5] While there are some trained SKYWARN spotters who participate from their personal vehicles as mobile units positioned at certain strategic locations, the majority of SKYWARN participants provide their detailed observations from their home station locations. Effective and reliable antennas are needed in order for these home stations to provide these detailed observations. The timeliness of SKYWARN reports submitted via Amateur Radio confirms what NWS sees on weather radars; it substantially increases the precision of severe weather forecasting; and it allows NWS to increase the warning and preparation times for those citizens in harm's way. The program works

[5] NWS radar systems are inherently incapable of providing ground-level meteorological data provided by radio Amateurs.

very well: according to statistics from the NWS, approximately 290,000 trained SKYWARN spotters – *the majority being licensed Amateur Radio operators* – assist the NWS in providing accurate, reliable and immediate information on approximately 10,000 severe thunderstorms, 5,000 floods and 1,000 tornadoes on average each year.

15. The National Hurricane Center, on the campus of Florida International University in Miami, is the second major National Weather Service program supported by Amateur Radio. For the past 32 years, volunteer operators at the NHC's dedicated Amateur Radio station (callsign WX4NHC) are active during any hurricane activation. Because reports arrive from the Atlantic and Pacific basins, HF communication serves as a core component of this valuable NWS tool. The utility of HF communications in this life-saving effort reflects the need of Amateur stations in the field to provide their information to the NHC via effective, reliable HF stations at residences of licensees.

16. ARRL conducts emergency communications certification courses that provide the educational background and initial training necessary for such serious work. Thousands of local and state ARES groups regularly drill with local and state authorities and agencies in order to maintain their skills and improve the quality of their service. Emergency preparedness and training necessitates active, on-air communications experience and coordinated drills and exercises. This cannot be done unless an Amateur Radio licensee is able to conduct reasonably effective communications regularly from his or her residence.

III. Hurricane Harvey and the Amateur Radio Response

17. There were substantial differences in the impact of the four hurricanes on telecommunications infrastructure in the United States and its territories. In Houston, for

example, following Hurricane Harvey there was widespread flooding, but Amateur Radio operators in the area were *not* called upon to provide extensive restorative communications for first responders; it was not a communications emergency *per se*. Instead, the principal work of radio Amateurs was to provide communications for disaster relief agencies such as the American National Red Cross and the Salvation Army, and to conduct typical health-and-welfare traffic, weather spotting, and backup readiness planning. That is not to minimize the extensive, diligent work of radio Amateurs in the area; they simply assumed different roles than they would have in a different type of hurricane response. For example, Amateurs rotated shifts staffing the Harris County Emergency Operations Center (EOC) and operating the hurricane net control station there. There is an extensive network of repeaters in south Texas, makes it possible for local radio amateurs within the disaster area, serving as "eyes and ears," spotting and reporting problems that require official attention, dispatched from the EOC. During the hurricane relief effort, emergency power supporting the county's 800-MHz trunked radio system was in danger of being flooded out. Radio amateurs were involved in planning for contingency communications via Amateur Radio should there have occurred outages of the trunked public safety facility.

18. Amateur Radio Emergency Service volunteers provided support communication at some Red Cross shelters in South Texas for displaced families in the aftermath of catastrophic flooding. At least 3 dozen volunteers were assisting at those shelters. Another dozen were available to serve as Office of Emergency Management liaisons. The ARRL Emergency Preparedness Manager worked with the Red Cross to provide radio Amateur volunteers to serve as Red Cross-trained shelter managers and volunteer management specialists. A variety of emergency, health-and-welfare, traffic, and tactical nets in South Texas were active on HF bands throughout the weeks after the hurricane, and a wide array of VHF and UHF repeaters were

available and used as needed. The Salvation Team Emergency Radio Network (SATERN) was operated at HF and the Military Auxiliary Radio Service (MARS) used one of the 5.3 MHz interoperability channels available for this specific purpose. As Hurricane Harvey proceeded northeast toward Louisiana, ARES volunteers were activated, informed by amateur Weather Spotting networks and the NWS SKYWARN program. Despite this extensive outpouring of volunteer support, Hurricane Harvey resulted in relatively minimal impact on the region's communications infrastructure, considering the strength of the storm and the magnitude of the flooding. There were no unusual requests made to the Commission for any regulatory accommodations to ARRL's knowledge, nor did any appear necessary. According to ARRL's South Texas Public Information Officer, the "hardening" of the telecommunications infrastructure in south Texas to make it more immune to storm damage somewhat diminished the need for Amateur Radio communication support. He noted, however, that the Amateur Radio telecommunications infrastructure for emergency purposes in South Texas includes analog facilities, as "the lowest common denominator" of technology -- VHF/UHF FM, and HF – because it provides the highest capacity for interoperability.

19. The Hurricane Watch Net (HWN) conducted HF operations for Hurricane Harvey, providing 51.5 continuous hours of activation. The VoIP Hurricane Net, and WX4NHC, the Amateur Radio station at the NHC in Miami, also activated as Harvey approached landfall in Texas as a Category 4 hurricane. In terms of internet-linked Amateur Radio stations in Houston, EchoLink 7203, IRLP 9219, and AllStar *33007203 were deployed to handle requests from the affected area at the request of Humanity Road.

IV. Hurricane Maria and the Amateur Radio Response.

20. Hurricane Harvey brought widespread flooding to the Houston area, but it did not result in the high wind damage that typically leads to the type of communications emergency more recently experienced in Puerto Rico and the Virgin Islands following Hurricane Maria. Typically, there are dual roles filled by Amateur Radio operators in these events. In the early stages of a communications emergency, radio Amateurs provide communications for first responders and medical facilities. After public safety facilities are restored, Amateur Radio is used to facilitate the work of disaster relief agencies and to provide health and welfare messaging. In Houston, the restorative communications function was largely unnecessary, because there were few public safety communications disruptions, although there is value in planning for the same, which was an ongoing effort in south Texas. In Puerto Rico and the Virgin Islands, it was a completely different story.

21. Because of the utter devastation that occurred in Puerto Rico, the approximately 500 local Amateur Radio operators who are actively and regularly available there for emergency communications purposes[6] were not all available to provide restorative and other emergency communications because the operators themselves were concerned at the outset with basic survival of themselves and their families. ARRL estimates that there were approximately 75 Amateur Radio stations throughout the Island providing communications during the entire process -- from before the Hurricane hit until very late in the recovery effort. However, it was obvious that additional resources were going to be needed. And Amateur Radio volunteers responded immediately, without hesitation. Fifty of the nation's most accomplished Amateur Radio operators responded within 24 hours to the call of the American Red Cross, relayed by ARRL, to deploy to Puerto Rico and provide emergency communications. At the behest of Red

[6] There are 4,238 licensed radio Amateurs in Puerto Rico and more than 200 licensees in the U.S. Virgin Islands.

Cross, ARRL called upon the United States' Amateur Radio community to provide up to 25 two-person teams of highly qualified hams. The group's principal mission was to move health-and-welfare information from the island back to the US mainland, where that data was used by the Red Cross. The group remained on the island for 3 weeks.

22. ARRL equipped each two-person team with a modern digital HF transceiver, special software, a wire antenna, a power supply and all the connecting cables, fitted in a rugged waterproof container such as is shown below. In addition, ARRL sent a number of small, 2,000-Watt portable generators as well as solar-powered battery chargers of the variety the US military uses on extended deployments. ARRL's Ham Aid program adapted and provided nearly $75,000 in Amateur Radio equipment to the volunteers that deployed to Puerto Rico and to the ARRL Puerto Rico Section staff. Some of this equipment is still being used in Puerto Rico for the recovery effort.

TOM GALLAGHER/ AMERICAN RADIO RELAY LEAGUE

The Amateurs and their equipment were sent to Red Cross shelters extending from San Juan to the western end of the island. Donations from the Amateur Radio community in support of this effort totaled more than $75,000. This was the first time in the nearly 75-year relationship between ARRL and the American Red Cross that such a request for assistance had been made. Because Hurricane Maria devastated the island's communications infrastructure, without electricity and telephone service, and with most of the cell sites inoperative, millions of Americans were cut off from communicating. Shelters were unable to reach local emergency services. Nor could people check on the welfare of their loved ones. The situation was dire and the Amateur Radio response was timely in order to address the crisis. Referred to as the "Force of 50," the Amateur Radio volunteers were deployed as Red Cross volunteers, but they provided communications for local law enforcement and utility managers; island-to-mainland health-and-welfare traffic, and outgoing communications from the more remote areas of Puerto Rico in the mountains to San Juan and other municipios. Fire officials in Puerto Rico facilitated safe passage, food, shelter, and water for the volunteers at fire stations on the island, as needed. The volunteers initially gathered at the convention center in San Juan, which served as the Puerto Rico Emergency Management Agency (PREMA) headquarters. The Force of 50 and local radio Amateurs, led by ARRL Section Manager Oscar Resto, KP4RF, staffed VHF and HF nets at the American Red Cross temporary headquarters, despite severe damage to their own homes. The nets covered nearly two-thirds of the island. In addition to the health and welfare traffic and Red Cross information transfer, the volunteers handled traffic to and from the power company, Autoridad de Energía Eléctrica (AEE), and state and local authorities relative to power restoration efforts. Twelve team members were assigned to provide communication for engineers tasked with repair to the island's power distribution centers.

23. The Red Cross Headquarters net, staffed by radio Amateurs, provided 24-hour operation in preparation for an anticipated emergency involving the Guajataca hydroelectric dam. Amateurs provided notices to residents in the districts of Quebradillas, Isabela, and San Sebastián of the danger. An Amateur volunteer was stationed in Quebradillas to provide emergency communication if needed and to maintain contact between AEE and its Monacillo control center. An Amateur Radio station was installed and an operator embedded at the Puerto Rico Emergency Operations Center (PREOC). Local radio Amateurs established VHF communication capabilities at 51 hospitals throughout the island, so they could have direct contact with the PREOC. The Amateur embedded at the PREOC served as liaison between the PREOC and the FEMA Emergency Support Function (ESF-2) task force, relaying information among the Red Cross, ARRL, FEMA, and the ESF-2 task force.

24. Two team members deployed in the westernmost end of the Island. "Team Oeste (Mayagüez)" were stationed at a Red Cross shelter in Mayagüez, providing the only emergency communication link from that city to San Juan initially. That team relayed needs and conditions of those living in and around Mayagüez and coordinated water delivery and other urgent necessities, such as non-perishable food items, extended-life dry milk, blankets, baby formula, and dust masks. They provided communications for the medical staff set up at the Palacio de Recreacion y Deportes, a sports facility in Mayagüez converted to a medical facility. Lists of medical needs were relayed to the Red Cross as well as to FEMA and Puerto Rico's Emergency Management Agency. An HF station with *WinLink* (HF data) capability and a VHF/UHF station were set up in the FEMA disaster field office, and volunteers reported in by radio from around the island to post situation reports. Amateur operators were also posted at four power-generation facilities, at the request of the power company. Superacueducto, the water utility, asked for

several Amateur Radio Operators to help in re-establishing water flow from Arecibo to San Juan. Four Amateur Radio volunteers were positioned to accompany and provide VHF communication at Red Cross distribution centers on a daily basis. Two volunteers also were sent to Culebra Island to establish VHF and HF communication there. Those volunteers provided the first communications from Culebra following the storm.

25. Critical to the value of the Amateur Radio response to Hurricane Maria were the partnerships that had been established long before the event. As discussed above, ARRL has national partnerships with, *inter alia,* the American Red Cross, the Federal Emergency Management Agency, and The Salvation Army. ARRL worked closely with the Red Cross in Puerto Rico and, due to the work of local volunteers in the ARRL field organization in Puerto Rico, a network of relationships across the island has been in place for many years. Amateur Radio emergency and disaster preparedness through building partnerships allows our volunteers to be integrated into response in an effective way on exceptionally short notice. The radio Amateurs in Puerto Rico are extremely well-organized, and, given the severity of the damage and personal deprivations suffered by everyone, including the vast majority of local Amateur Radio licensees, they responded in large, and sufficient, numbers. They are deserving of a great deal of credit for their performance in the face of tremendous personal loss and sacrifice.

26. In addition to non-Amateur Radio partners and the local Amateur Radio communities in both Puerto Rico and the Virgin Islands, there are also relationships that have been built between different Amateur Radio groups that focus on emergency and disaster communications. ARRL worked with parts such as US Army MARS, WX4NHC Amateur Radio at the National Hurricane Center, and the Salvation Army Team Emergency Radio Network (SATERN) so the

broader Amateur Radio response was coordinated and made effective use of each group's strengths and assets.

27. There were several other lessons learned from this extensive test of Amateur Radio's emergency capabilities. Throughout Puerto Rico, normal communications were disrupted isolating communities and hampering emergency response. Amateur Radio operators extensively utilized conventional, analog VHF systems and HF radio email systems to successfully pass lifesaving messages between government and non-government entities. Through our volunteers deployed from the mainland to Puerto Rico and the resident ARRL Puerto Rico Section, radio Amateurs effectively integrated into the Joint Field Office (JFO) in ESF-2 (Communications). This allowed for an effective flow of information between Amateur Radio volunteers throughout the island and Federal responders responsible for communications restoration. Amateur Radio operators supported many NGOs responding to Puerto Rico as well. Amateur Radio volunteers supporting Team Rubicon and Southern Baptist Disaster Relief worked alongside radio amateurs supporting Red Cross and JFO ESF-2. The Department of Homeland Security SHARES program also played a key role in providing Amateur Radio support to JFO ESF-2 when the volunteers there were at the end of their tour.

28. Radio amateurs provided support to military responders when clear channel HF communications were needed for military missions.[7] The expertise radio amateurs have with HF communications is tremendously valuable when frequency selection, interference and propagation hinder response and where, as in Hurricane Maria, there is a large volume of message traffic between the U.S. Mainland and geographically separated Caribbean islands. In

[7] Among other things, Amateur Radio operators provided HF communications for the military when helicopters were out of line-of-sight range and needed to communicate with base stations obscured by the extremely mountainous terrain in Puerto Rico.

this case perhaps the most urgent lesson learned is that *the value of an active and engaged group of local Amateur Radio operators with pre-existing effective outdoor antennas cannot be overstated. Local radio amateurs understand their communities, the threats faced, and the response culture better than do volunteers from the outside.* The "Force of 50" would not have been successful but for the exceptional spirit of volunteerism by Puerto Rico radio Amateurs and their relatively unfettered ability to erect effective outdoor antennas, and the fact that those local Amateur stations were in place and ready to provide communications long before the 2017 hurricane season. It was local radio Amateurs, using stations at their residences and portable stations who initiated restorative communications operations before the Force of 50 arrived, and they continued those efforts many weeks after the Hurricane. It was also notable that Amateur Radio repeaters that were damaged by hurricanes Irma and Maria were quickly put back on the air to assist with response communications. Radio amateurs, along with great flexibility in response, possess expertise and equipment that can reestablish their networks when damaged and get them back on the air quickly.

29. In other respects, the Amateur Radio deployment followed standard operating procedures and that pre-planning worked exceptionally well. Any time a hurricane, particularly a major one such as Harvey, Irma or Maria is developing, ARRL takes specific actions. First, it reaches out to its Field Organization for information. They provide communications support during a storm response. It also works with national partners: the National Hurricane Center (NHC), the Red Cross, The Salvation Army, FEMA, SHARES, and National Voluntary Organizations Active in Disaster (VOAD) members, to help match potential needs they have with Amateur Radio resources in the field. ARRL also coordinates closely with available

Amateur Radio resources, such as SATERN, the Hurricane Watch Net (HWN), the VoIP Hurricane Net, and WX4NHC, the Amateur Radio station at the NHC in Miami.

V. The Commission's Hurricane Response and Urgent Regulatory Needs of the Amateur Radio Service

30. Given the foregoing, ARRL can respond to the Commission's two specific questions asked in this proceeding quite easily. First, Hurricane response and recovery efforts are facilitated by Amateur Radio operators to the extent that a given disaster is a communications emergency. Amateur Radio provides a measured, contextual, "as needed" response to each emergency. Amateur Radio involvement can be relatively nominal in a local emergency, or in a larger, non-communications emergency, or it can be very extensive, as was the case in the Virgin Islands and Puerto Rico following Hurricane Maria. As former FEMA Administrator Craig Fugate noted, you don't always need Amateur Radio operators, "but when you need them, you really need them."

31. As to the second question asked in the *Notice*, whether efforts should be made to increase the use of Amateur Radio services in connection with the planning, testing and provision of emergency response and recovery communications, ARRL would suggest that it is apparent from the foregoing that Amateur Radio is *already* included to a very large degree in emergency response and recovery planning at Federal, State and local levels, and with numerous served agencies, including several major NGOs. FEMA has in the past instructed local governments to make use of Amateur Radio in their disaster planning. Most do. That said, ARRL remains ready, willing and able to discuss with the Commission's Public Safety and Homeland Security Bureau opportunities for expansion of this effort, and increased incorporation of Amateur Radio in emergency alerting, restorative communications and facilities restoration efforts, and in the provision of health and welfare communications where needed. In a service of

750,000 licensees, there is clearly expanded capacity for emergency communications involvement, and ARRL data show that a principal interest of young people who become involved in Amateur Radio is in public service and emergency communications initiatives.

32. There are relatively few regulatory needs that the Amateur Service has in order to even better fulfill its 47 C.F.R. §97.1(a) obligation to provide emergency and disaster relief communications. There are, however, three very noteworthy and urgent needs that do call for some regulatory involvement of the Commission, right now. The first relates to an outdated regulation that limits data rates in HF Amateur communications, precluding certain digital emissions that have recently proven extremely important in Amateur Radio hurricane relief efforts. On November 14, 2013, ARRL filed a Petition for Rule Making, RM-11708, which proposed to modify the Commission's Amateur Radio Service rules to eliminate the symbol rate limit in those rules relative to data emissions in the Amateur allocations below 29.7 MHz; and to establish a 2.8 kilohertz maximum occupied bandwidth for data emissions in those bands. This deregulatory action was necessary in order to allow the use of PACTOR 4, a data emission in the HF bands that has great utility. The Petition was placed on Public Notice by the Wireless Bureau on November 21, 2013. However, no further action was taken on the Petition until July 28, 2016 when the Commission released a *Notice of Proposed Rule Making* in WT Docket 16-239. The ARRL Petition asked two things: (1) to delete from the Part 97 rules the symbol rate limitation for data emissions in the band segments where RTTY and data emissions are now permitted; and (2) to establish a maximum occupied bandwidth of 2.8 kHz for data emissions in the medium-frequency (MF) and high-frequency (HF) bands where data emissions are permitted now. These actions would permit use of various high-data-rate digital emissions in the HF bands which are

very useful in disaster relief communications, and at the same time ensure that no one signal usurped more of the very limited bandwidth in the small, shared HF Amateur allocations.

33. The Notice of Proposed Rule Making in that proceeding proposed, however, only to "remove limitations on the symbol rate…applicable to data emissions in certain amateur bands." That Notice said that the Commission "believe(s) that this rule change will allow amateur service licensees to use modern digital emissions, thereby better fulfilling the purposes of the amateur service and enhancing its usefulness." However, no action has been taken to date, and the ARRL proposal is now well more than four years old.

34. Equipment dispatched with the "Force of 50" to Puerto Rico included data transmission equipment capable of PACTOR 4 operation, but it could not be legally used in the Hurricane Maria disaster relief effort. ARRL filed a request for a temporary waiver to permit amateur data transmissions at a higher symbol rate than currently is permitted by Section 97.307(f) of the Commission's rules, in order to facilitate hurricane relief communications between the continental United States and Puerto Rico.[8] The Mobility Division of the Wireless Bureau quickly granted[9] this waiver which greatly facilitated the disaster relief communications in Puerto Rico provided by Amateur Radio operators. However, it should not have been necessary to wait more than four years for the underlying rulemaking proceeding to have been resolved and it should not have been necessary to ask for a temporary waiver of a hopelessly outdated rule that limits data speeds for no useful reason, in order for Amateur Radio operators to quickly deploy equipment that was absolutely necessary to perform the functions that were needed at the time. ARRL would urge the Wireless Bureau to please ensure that the rather simple

[8] E-mail from Christopher D. Imlay, General Counsel, ARRL to Donald K. Stockdale, Jr., Roger Noel, and Scot Stone, FCC (Sept. 29, 2017 16:06 EDT) (Waiver Request).
[9] See the Order, *American Radio Relay League, Emergency Request for a Temporary Waiver of Section 97.307(f) of the Commission's Rules,* DA 17-974, Released October 4, 2017.

but long-delayed Docket 16-239 rulemaking proceeding is resolved before the commencement of the next hurricane season.

35. The second urgent regulatory need of the Amateur Service, in order to ensure the continuation of emergency communications readiness, is relative to the ubiquitous presence and exponential increase in unreasonable and unnecessary private land use regulations in the United States that preclude the ability of licensed radio amateurs to erect and maintain any effective outdoor antenna at all. This is without any doubt at all the largest threat to the Amateur Radio community's ability to respond to disasters, severe weather, and other threats to lives and property in the United States. Perhaps the most important element of the ability of local radio Amateurs throughout Puerto Rico to be immediately ready to provide the restorative communications that they did provide very effectively is that they had the ability, long before the Hurricane arrived, to install and maintain effective outdoor antennas for the HF and VHF and UHF bands at their residences. There is not yet in Puerto Rico the prevalence of preclusive private land use regulations[10] that now exists in the rest of the United States, but the situation is dire in most other suburban, urban and exurban areas. It is important in analyzing this issue to view the Amateur Service as a decentralized network of individual stations working together in emergency situations and in preparing for the same. The essentially uniform distribution of Amateur Radio stations in residential areas makes those individual stations very important in a given weather disaster in the area where those stations are located when commercial communications systems are disabled or overloaded, or in other areas for purposes of relay of message traffic. Amateur stations are often called on to report severe weather and the geographic

[10] This is changing, however. There is with virtually all new housing starts in the United States the accompanying obligation (imposed by lenders) on land developers to subject all residences in the subdivision to declarations of covenants and homeowners' association rules, which almost universally preclude outdoor antennas. This trend is just as true in Puerto Rico as in other parts of the country.

distribution of stations in residential areas is critical for this function as well, per the discussion above. Furthermore, while modern Amateur stations are portable, and transportable to remote disaster locations, it is critical to have stations located at one's residence in order to regularly participate in disaster preparedness training exercises and drills. It is impossible to look toward enhancements in the use of Amateur Radio communications when the ability to self-train and self-educate by means of an effective, reliable Amateur Radio station at one's residence is precluded by the inability to install a functional outdoor antenna. There is no substitute for the ready availability of a residential Amateur Radio station in daily operation from a licensee's residence. The licensee cannot be expected to have the ability to communicate into or from a disaster site unless he or she has a station with an effective outdoor antenna capable of operation on multiple frequency bands at once, which is ready to be pressed into service from the licensee's residence at a moment's notice. The major value of Amateur Radio emergency communications is during the first hours, days or weeks of a disaster when commercial and public safety communications facilities are not functional or are overloaded. Stations must be ready to operate when needed and emergency communications are most often conducted from a licensee's residence. For some disabled persons, home stations represent their only opportunity to participate in emergency communications. Private land use regulations which exclude Amateur Radio stations from entire communities preclude emergency communications readiness.

36. Given the prevalence and increasing numbers [11] of private land use regulated communities in the United States, residential Amateur Radio antennas cannot be installed or maintained in most of them. An Amateur Radio licensee who must live in a deed restricted

[11] According to the Community Associations Institute, 90 percent of new housing starts in the United States are subject to private land use regulations. This is because, now, essentially all lenders for land developers in the United States require, as a condition for funding a new housing development, all require a declaration of covenants be filed with the subdivision plat.

community currently will almost inevitably be subject to either (1) a complete prohibition of his or her Amateur Radio operation, or (2) the unlimited jurisdiction of a community association or architectural control committee or board which makes decisions concerning Amateur Radio antennas without any standards or limits whatsoever. Those private land use regulations (or the application of them) which prohibit outdoor Amateur Radio antennas or transmissions, and thus preclude Amateur Radio entirely; those which fail to permit the installation of effective outdoor Amateur Radio antennas; and those which do not constitute the minimum practicable regulation to accomplish the (aesthetic) goals are unreasonable and unnecessary.

37. There is now pending in Congress the Amateur Radio Parity Act of 2017.[12] H.R. 555 passed the House unanimously in January of 2017. An identical predecessor House Bill, H.R. 1301 passed the House in the 114th Congress. The current Senate Bill, S. 1534 was introduced in July of 2017. This is a balanced, completely bipartisan bill that would protect both the entitlement of Amateur Radio volunteers to be able to utilize their FCC-issued licenses to provide emergency, disaster relief and public service communications, while at the same time protecting the aesthetic concerns and the jurisdiction of homeowners' associations. The Bill is unopposed: it has the support of both ARRL and the Community Associations Institute (CAI) which is the national association of homeowners' associations. ARRL and CAI have cooperatively and carefully negotiated the current language of the Bill, and both organizations have stated their support for the present, amended version which contains the following provisions. The Bill calls on the Commission to enact rules that prohibit the application to Amateur Radio stations of deed restrictions which preclude Amateur Radio communications. Also prohibited are those deed restrictions which do not permit an Amateur Radio operator living in a deed-restricted community to install and maintain an effective outdoor antenna on property

[12] See, H.R. 555 and S. 1534.

under the exclusive use or control of the licensee; and those restrictions which do not impose the minimum practicable restriction on Amateur communications to accomplish the lawful purposes of a Homeowner's Association (HOA) seeking to enforce the restriction. Amateurs who wish to install an antenna in a deed restricted community where there is an HOA may be required to notify and obtain prior approval of the HOA. HOAs can preclude Amateur antennas in common areas (property not under the exclusive use of the licensee). HOAs can enact reasonable written rules governing height, location, size and aesthetic impact of, and installation requirements for, outdoor antennas and support structures for amateur communications but the effective outdoor antenna requirement is paramount. The Bill is currently before the Senate Commerce Committee. If, however, Congress is unable, as has been rumored, to pass any telecommunications legislation this term, it will be incumbent on the Commission to take the action on its own initiative that would be called for by this legislation. The future of Amateur Radio emergency communications is dependent on it.

38. The final regulatory action urgently necessary to improve Amateur Radio emergency communications would be to take the action requested in ARRL's Petition for Rule Making, RM-11785, filed January 12, 2017. The Petition proposes to amend Section 2.106, the Table of Allocations, and several sections of the Part 97 Service Rules, so as to implement domestically that portion of the Final Acts of the 2015 World Radiocommunication Conference ("WRC-15")[13] that provided for the international allocation of the band 5351.5 - 5366.5 kHz to the Amateur Radio Service on a secondary basis. A contiguous band in the vicinity of 5 MHz will assist in conducting emergency and disaster relief communications in the United States; with the Caribbean basin; with Alaska and with other parts of North, Central and South America. Since

[13] WRC-15 Final Acts, (Geneva, 2015).

2003, pursuant to a *Report and Order* in ET Docket No. 02-98,[14] United States radio Amateurs have utilized five, 2.8 kilohertz bandwidth channels within the band 5250-5450 kHz on a secondary basis [See, 47 C.F.R. §97.203(c)]. The power limit on those discrete channels is now 100 watts ERP pursuant to the *Report and Order*, FCC 11-171, released November 18, 2011.[15] That Report and Order replaced one of the five channels (5368 kHz) with a less encumbered frequency (5358.5 kHz); increased the maximum authorized power amateur stations may transmit from 50 watts ERP to 100 watts ERP; and authorized amateur stations to transmit three additional emission designators (150HA1A, 60H0J2B, and 2K80J2D) so as to permit use of Morse telegraphy and different forms of narrowband data in addition to SSB telephony. The 100 watt limit is critical because the purpose of the 60-meter channels in the first place was to be able to facilitate a propagation gap between 80 and 40 meters (i.e. between 3.5 MHz and 7 MHz) for the purpose of providing disaster relief communications between the continental U.S. and the Caribbean basin. The band is in use during the hurricane seasons when static crashes and high noise levels prevail on those paths. The power level is critical to a successful domestic implementation of the contiguous allocation. The power level authorized internationally at WRC-15, however, is far, far lower, insufficient for the disaster relief communications provided in the frequency range. While the contiguous band allocated in all three ITU regions for Amateur use is but 15 kilohertz wide, it will, if implemented functionally, and in addition to, rather than in lieu of the channels now in use; and if the Part 97 service rules for this contiguous band are thoughtfully enacted, *radically* improve the current, very limited capacity of the Amateur Service in the United States to address emergencies and disaster relief during times when the 5 MHz band carries a great deal of traffic between the U.S. mainland and the Caribbean basin. This is

[14] FCC 03-105, 18 FCC Rcd. 10258 (2003)
[15] *Amendment of Parts 2 and 97 of the Commission's Rules to Facilitate Use by the Amateur Radio Service of the Allocation at 5 MHz,* FCC 11-171, ET Docket 10-98, 26 FCC Rcd. 16551, 77 Fed. Reg. 5406 (2011).

most notably an issue in the Caribbean basin, but the same effect will be realized elsewhere as well, at all times of the day and night, and at all times of the sunspot cycle. As more countries adopt the WRC-15 result, including several Caribbean countries that rely on the low HF bands for communication among each other and with the United States during weather-related emergencies, the United States should be the leader in enhancing and encouraging this volunteer resource and the interoperability it provides. In fact, however, Canadian regulatory authorities are in regular communication with Radio Amateurs of Canada, ARRL's counterpart in Canada, about implementing the 5351.5 - 5366.5 kHz allocation. The Commission should move forward with this enabling authorization as well.

39. ARRL looks forward to further dialog with the Public Safety and Homeland Security Bureau about these three urgent regulatory topics and would welcome the chance to participate in a workshop to discuss improvements and extensions of the role of Amateur Radio volunteers in emergency and disaster relief communications.

Therefore, the foregoing considered, ARRL respectfully requests that the Commission

proceed with the actions recommended herein, to improve the capabilities and to facilitate the provision of emergency and disaster relief communications via Amateur Radio.

Respectfully submitted,

ARRL, THE NATIONAL ASSOCIATION FOR AMATEUR RADIO

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ARRL Irma/Maria Response Roster

The following individuals have been identified as playing key roles in the Amateur Radio response to hurricanes Irma and Maria. They represent volunteers from the mainland who responded, ARRL field organization leadership, corporate donors, ARRL HQ staff, and American Red Cross personnel. No doubt many others have played a role, and continue to do so through the recovery process. The efforts of all who responded show Amateur Radio's commitment to serving communities during times of crisis.

In addition to those listed below, ARRL also extends great thanks to the members and leadership of the Salvation Army Team Emergency Radio Network (SATERN), VOIP WX Net, WX4NHC, and Hurricane Watch Net for their work during this hurricane season. The coordinated and collaborative work between these organizations is a credit to the Amateur Radio Service.

On behalf of ARRL, thank you!

Name	Call Sign	Role
Robb Landon	KE8AMC	Force of 22
Jeremy Dougherty	NSØS	Force of 22
Matthew Hackman	KB1FUP	Force of 22
Mike Miciukiewicz	K1MJM	Force of 22
Michael Smith	N5TGL	Force of 22
Guillermo Narvaez	NØGUI	Force of 22
Andy Anderson	KEØAYJ	Force of 22
Bobby Price	KB4ROR	Force of 22
Craig McVeay	NØCSM	Force of 22
Valerie Hotzfeld	NV9L	Force of 22
Jeff Sumner	KC4FOX	Force of 22
Rafael Ortiz	W4RAO	Force of 22
Ryan Barenklau	W5RKB	Force of 22
Jim Hughes	KI7CTF	Force of 22
Joe Bassett	W1WCN	Force of 22
Gene Roll	KM4FUD	Force of 22
Joe Pistritto	N3CKF	Force of 22

Tim Moloney	N9RRM	Force of 22
Gary Sessums	KC5QCN	Force of 22
Bill Kollenbaum	K4XS	Force of 22
Wey Walker	K8EAB	Force of 22
Matt Gonter	AC4MG	Force of 22
Oscar Resto	KP4RF	Puerto Rico Section Manager
Juan Sepulveda	KP3CR	Puerto Rico Section Emergency Coordinator
Angel Santana	WP3GW	Puerto Rico Section Public Information Coordinator
Fred Kleber	K9VV	US Virgin Islands Section Manager
Lisa Kleber	W4LIS	US Virgin Islands Section
Wesley Tester	K2AHU	US Virgin Islands Section
Daryl Jaschen	NP2QD	US Virgin Islands Section
Michael Shuman	NP2PZ	US Virgin Islands Section
Gilly Grimes	NP2OW	US Virgin Islands Section
Bob Wakefield	WP2E	US Virgin Islands Section
George Riedel	N1EZZ	US Virgin Islands Section
Sean Cullinan	WP2SC	US Virgin Islands Section
Lubos Sudek	KP2AD	US Virgin Islands Section
Jeff Hugabonne	N1KBY	US Virgin Islands Section
David Benoist	AG4ZR	Georgia Section Manager
Darrell Davis	KT4WX	West Central Florida Section Manager
Jeff Beals	WA4AW	South Florida Section Manager
ABR Industries		Corporate Donor
Heil Sound		Corporate Donor
Quicksilver		Corporate Donor
DX Engineering		Corporate Donor
Joe Carcia	NJ1Q	ARRL HQ – W1AW
Michelle Patnode		ARRL HQ – Media and Public Relations Assistant
Ken Bailey	K1FUG	ARRL HQ – Emergency Preparedness/Ham Aid
Eric Casey		ARRL HQ – Ham Aid Support Team
Jon Faasen	KC1ECT	ARRL HQ – Ham Aid Support Team
Amanda Grimaldi	N1NHL	ARRL HQ – Ham Aid Support Team
Ed Hare	W1RFI	ARRL HQ – Lab/Ham Aid Support Team
Lori Kosior	N1SMK	ARRL HQ – Ham Aid Support Team
Greg Kwasowski	W1GJK	ARRL HQ – Ham Aid Support Team
Gary McManus	NQ1G	ARRL HQ – Ham Aid Support Team
Jodi Morin	KA1JPA	ARRL HQ – Ham Aid Support Team
Regina Galuppi	W3DGI	ARRL HQ – Development Office
Dan Henderson	N1ND	ARRL HQ – Regulatory

Steve Ewald	WV1X	ARRL HQ – Field Services
Tom Gallagher	NY2RF	ARRL HQ – Chief Operating Officer
Barry Shelley	N1VXY	ARRL HQ – Chief Financial Officer
Dave Isgur		ARRL HQ – Communication Manager
Mike Corey	KI1U	ARRL HQ – Emergency Preparedness Manager
Jacqueline Yannacci		American Red Cross
Mary DeWitt-Dia		American Red Cross
April Wood		American Red Cross
Kate Martotana		American Red Cross
Greg Suddeth		American Red Cross
Margot Hillman		American Red Cross
Julie Schoening		American Red Cross
Jason Shapiro		American Red Cross