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On the Cover: Greg Dean, N9NWO, at the former W9REG club station in Lafayette, Indiana. Details on page 92.

The Staten Island Ferry in busy New York Harbor. (Photo credit: S. Alfassa)

At a public service event, the New York City Amateur Radio Emergency Communications Service (NYC-ARECS) used an APRS/AIS network to track the status of the world famous Staten Island Ferry to help manage the flow of heavy pedestrian movement.

Integrating Internet Technology with Amateur Radio for Public Service Events

BY SHELOMO ALFASSA,* KI4GGU

When not serving during a disaster, it is typical of amateur radio emergency teams throughout the United States to provide communication support at events such as marathons, bike races and other "public service events" such as walk-a-thons. Deployment of communication team members to an event with tens of thousands of participants provides an ideal training opportunity for radio operators to not only practice their communication and technical

abilities, but to also observe and/or perform as part of the incident management system utilized by most municipalities.

In May of 2012, nearly a dozen radio operators from the New York City Amateur Radio Emergency Communications Service (NYC-ARECS) were stationed around the city in support of the Five Boro Bike Tour, America's largest cycling event. Over 30,000 bicyclists rode a 40-mile (64-km) path through closed New York City streets and highways over ten hours. The event finale included the 30,000 bicyclists riding over the Verrazano Narrows Bridge from Brooklyn into Ft. Wadsworth on Staten Island, then returning to Manhattan via the Staten Island Ferry.

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Amateur radio Net Control (Charles Hargrove, N2NOV) was positioned in the Emergency Operations Center (EOC) located at Coast Guard Sector New York headquarters at Fort Wadsworth. Assignments for hams included key spots along the route, the entrance to Central Park, family reunion tents at the various rest stops and the staging area a few blocks before the ferry entrance ramp on Staten Island. Route spots were for traffic flow and safety, while the family reunion tents were primarily for any lost children. We were able to notify the entire route and even locate one missing child before the event organizers could get the word out on their rented trunked radios.

Combining Amateur Radio and the Internet

But the most innovative part of our operation was the use of amateur radio infrastructure, via the internet, to monitor and integrate into the overall communication picture the locations of each of the Staten Island Ferry boats. The large numbers of bicyclists and their bicycles created a need to monitor ferry traffic for decision-making in regard to moving large groups of people from the fort, where they were initially gathered, to a staging area near the ferry terminal, before boarding the vessels. Utilizing data plotted on an Internet-based digital map, from both the APRS (Automatic Packet Reporting System) and AIS (Automatic Identification System), the NYC-ARECS net control operator established a method to track the arrivals and departures of the Staten Island Ferry in the EOC.

APRS is a non-voice digital communication system developed in the 1980s by Bob Bruninga, (WB4APR), currently a senior research engineer at the United States Naval Academy. The technology has since expanded to embrace both GPS (1992) and later, the Internet. APRS can be used to transmit real-time data, short text messages, information and reports of the exact location of a person or object via a data signal sent over amateur radio frequencies. It can also be used to provide weather station location, data and dates, and to track objects, as well as other map-related amateur radio volunteer activities including search-and-rescue and signal direction-finding.

AIS is a vessel and shore-based transponder system that was developed by the U.S. Department of Transportation and made operational in 2002. It was originally designed for oceangoing vessels that would be in compliance with the international SOLAS Convention (Safety of Life at Sea), administered by the International Maritime Organization and enforced in the United States by the U.S. Coast Guard. AIS provides continuous real-time information including a ship's identity, type, length, position, course, speed, navigational status and other safety-related information. The system then takes this data and automatically makes it available to shore stations, other ships and aircraft. AIS information supplements marine radar, which continues to be the primary method of collision avoidance for water transport. AIS integrates a VHF-FM transceiver with

Charles Hargrove, N2NOV, the NYC-ARECS City-Wide Radio Officer and Net Control Station for the Five-Boro Bike Tour, visually monitoring the Staten Island Ferry and coordinating communications for the event in the EOC which was established in the US Coast Guard Building on Staten Island for all city emergency services. (Photo credit: S. Alfassa)

The Coast Guard building at Ft. Wadsworth on Staten Island where all the various emergency agencies monitored the progress of the cross-city bike tour. (Photo credit: S. Alfassa)
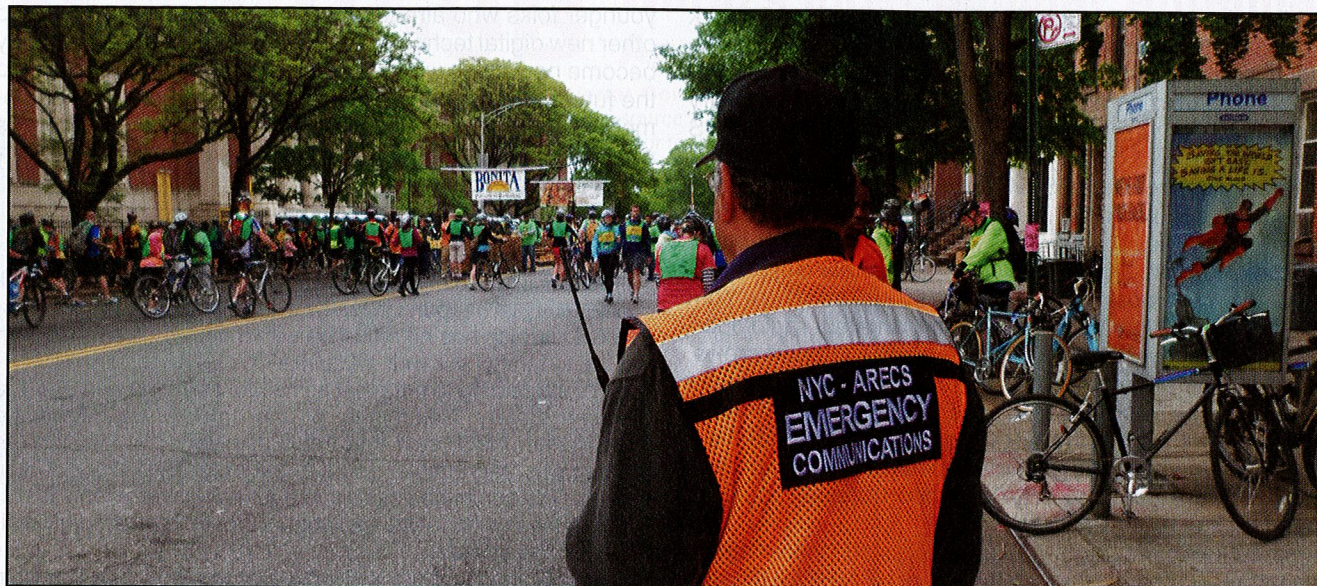
Jose Rivera, N2LRB, stationed in East Harlem, far from Staten Island but reporting back to the EOC on the status of the bikers. (Photo credit: S. Alfassa)

other electronic navigation sensors, such as GPS, gyro-compass or rate-of-turn indicator. AIS runs at 9600 bit/s (GMSK) on two marine VHF frequencies (channel 87B (161.975 MHz) or 88B (162.025 MHz), transmitting ship position reports once every 2 to 10 seconds, over an unencrypted system.

Enter APRS.fi

The gateway which NYC-ARECS used to maintain coordination of the ferries via both APRS and AIS data was the popular <www.APRS.fi> website, one of the most sophisticated aggregators of RF-derived mappable digital location information on the Internet.[1] APRS.fi collects data from both APRS and AIS, then displays that data in a (Google-sourced) real-time map. The APRS data comes through APRS-IS (Automatic Packet Reporting System-Internet Service), the common name given to the Internet-based network which interconnects various APRS radio networks across the earth and in space. APRS-IS is maintained and operated by volunteer amateur radio operators to provide worldwide capabilities to the amateur radio APRS RF networks and to promote the Amateur Radio Service as a whole. While there are several websites which offer AIS tracking, APRS.fi remains ham-friendly, because it also tracks and plots APRS transmissions. The site is run out of Helsinki, Finland by a self-described single IT professional as a hobby, but (as he has listed on his site) "in a rather professional manner."

APRS.fi overlays and combines data from both APRS and AIS to geographically plot ships under way, as well as track them throughout their voyages and even gather specific information about their movement.[2] This movement was tracked by the NYC-ARECS Net Control operator at the Emergency Operations Center after he used the various tools on the APRS.fi website to manually select all the boats in the New York City Department of Transportation's (DOT) ferry fleet. Then, unique filters were employed so that only the *active* ferries would be tracked—as not all of them are usually in service at any given time.

Sailing between the boroughs of Manhattan and Staten Island, the Staten Island Ferry is the nation's single busiest ferry route by passenger volume. There are eight boats in the DOT fleet which travel the 5.2-mile (8.4-km) single direction run in 25 minutes. The three classes of these boats have the capacity to carry a range of passengers, some 1300, 3500 or even 6000 passengers per trip.

It is interesting to note that the use of the APRS/AIS real-time monitoring of the boats demonstrated, in hindsight, that a radio operator with the primary mission of reporting the location of the ferry in proximity to the Manhattan-side of the harbor was now no longer necessary. The observation and reporting of the geographic location of the vessels could be conducted in the EOC, but it could also be monitored and its progress reported, remotely by an offsite 'trusted agent' who is a pre-screened member of an organization's Virtual Operations Support Team (VOST).[3] While the idea of the "VOST" is still nascent in the emergency management world, one certainly can see how the concept has potential.

Conclusion

The APRS.fi site, combined with the APRS/AIS data, allowed a New York City amateur radio emergency communications team on the other side of the world to maintain a constant watch on their harbor boat traffic and the ferries themselves, then pass along that information to the coordinating representatives of the event, the authorities in the EOC, and to their own radio operators stationed on both sides of the harbor. Combining resources such as these with traditional ham radio communications support can only increase the value of amateur radio operators to event sponsors and emergency managers.

Postscript

While on that specific day NYC-ARECS did not use amateur radio operators on the boats themselves, it did utilize technology invented by amateur radio operators for amateur radio operators. The APRS-IS (Automatic Packet Reporting System-Internet Service) was started in the 1990s by Steve Dimse, K4HG, as a way to show APRS activity occurring on amateur radio frequencies to people using the World Wide Web. APRS-IS has grown into an ad-hoc network (500 servers and over 20,000 users), with a central server core

that all packets pass through. People can access the network via amateur radio through any of several free software applications, and even via their iPad® or smart phone (even without a radio!), utilizing a callsign and password to gain entry into the network which then uses the cellular phone's GPS technology.

This cellular phone APRS/GPS technology was combined with amateur radio APRS technology in June 2012 when NYC-ARECS assisted with the American Diabetes Association's annual *Tour de Cure*, an interstate bicycle tour fundraiser which runs over 100 miles (160 km) from New York City into upstate New York. On that day, amateur radio operators were deployed in vehicles with bicycle support crews. Among the operators, some utilized APRS via radio and some via smart phone applications with GPS technology. All of the operators were tracked by Net Control utilizing APRS.fi so, at any given moment, the geographic location of the amateur radio operators (and the bicycle support crews) could be located on the 100-mile course.

Amateur radio operators who are interested in maintaining their hobby and service through the use of HF/VHF/UHF radio communications should also be open to embracing new technology which can only expand the breadth and depth of the hobby. This, of course, may also potentially spark interest in younger folks who already have embraced the Internet and other new digital technologies. These younger folks who may become new hams will be those who continue the hobby into the future and will be those who volunteer their time, equipment and skills to participate in civic-minded opportunities such as volunteering for public service events and in emergency communications.

Notes

1. APRS.fi is one of several websites which allow you to track positions. It just happens to be the one selected for use by NYC-ARECS – which has no affiliation with the website – other than just being fans of the well-made site.

2. It's interesting to note that as helpful as AIS is, in 2004, the Maritime Safety Committee of the International Maritime Organization (IMO) said that freely available AIS data on the Internet was "regrettable" and a threat to safety and security of vessels. The committee's position is to urge governments to discourage those who make available AIS data to others for publication on the Internet.

3. Monitoring the day's activities over the VHF repeater from outside of New York City was Dennis Graiani, KC2UEW, a Certified Broadcast Technologist, who has since become an active and welcome member of NYC-ARECS.

The historic Whitehall Terminal for the Staten Island Ferry at the southern tip of Manhattan. (Photo credit: David Jones)