SECTION 3: ARES IN CONTEXT

This section provides a discussion of the changing role of ARES.

Once you complete this section, you will be able to:

- Explain the difference between a disaster and an emergency
- Outline potential served agencies
- Identify other amateur emergency communications organizations
- Discuss emerging technologies
- Discuss the relevance of ARES today.

WHAT IS A COMMUNICATIONS EMERGENCY?

A communications emergency is a situation in which normal communications infrastructure and processes are unable to meet the communications demands associated with an unusual event, potentially putting people, property or public safety at risk.

THE NATURE OF DISASTER COMMUNICATIONS

Disasters and emergencies

Emergency services train for emergencies and respond to them every day. On the other hand, a disaster is something that emergency services rarely train for, since disasters occur very rarely. Disasters can overwhelm the capabilities of communities and emergency responders, and often cause great suffering, and even the loss of property or life.

A *state of emergency* is a government declaration made in response to a disaster situation. The declaration of a state of emergency leads to mobilization of a wide range of support services and agencies. The specific response to a state of emergency depends on the scope and type of disaster and the size of the region affected. Examples of localized disasters include tornadoes, chemical spills, explosions, and flooding. Regional disasters might include wildfires, pandemics, or a loss of infrastructure such as power or telecommunications.

Communications during disasters

During a disaster, one of the first essential services to be compromised is often communications. Communications can fail in a number of ways: equipment, batteries, power grids and generators can fail. Frequencies may be incompatible or overloaded. Collaboration between agencies that do not normally work together may be hampered by an inability to share communications channels. Personnel not trained or accustomed to two-way communications may not be able to pass information reliably or efficiently. Key individuals, locations or organizations may become unreachable.

Failures of communications can make the effects of a disaster much worse. Such failures can also lead to ineffective disaster response, with the worst-affected regions receiving little or no aid because they are unable to ask for it. Miscommunications caused by poor practices or system failures can also lead to misunderstandings about what is needed, and where. Information about community conditions, evacuees, casualties, the need for supplies, and resources is critically important during a disaster. That information has to be delivered to decision-makers quickly and accurately.

Disasters can last for a very long time. While some localized disasters can end quickly, larger, destructive disasters can require a disaster response lasting for weeks or even months. The need for communications support can extend from the first alert to the end of the disaster response and the beginning of disaster recovery.

Disaster response

Organizations and personnel

The response to a disaster will vary depending on the nature and scope of the disaster. The response will usually involve a range of agencies and organizations in cooperation, working under a local or regional government authority. However, some disaster responses may involve multiple jurisdictions working in parallel, or agencies with overlapping responsibilities (such as the Salvation Army and the Canadian Red Cross). During a significant disaster, a large number of organizations may become involved, including police and fire departments, search and rescue teams, hospitals and municipal governments, the SPCA, church and social welfare organizations, and of course ARES. In addition, disasters often lead to an uncoordinated response by individuals in the affected region. In fact, an excess of volunteers (particularly untrained, undisciplined volunteers) can create serious problems during a disaster response.

There will also be a presence of organizations and individuals not involved in the disaster response itself. A large or sustained disaster may lead to the arrival of members of the general public from outside the affected area, looking for affected family members or friends. The media is also likely to become actively involved during any disaster situation.

Equipment and supplies

Typically, a disaster response will suffer from either too little in the way of supplies and equipment, or too much.

Equipment must be available in advance of a disaster and transported to its place of use despite the limitations imposed by the disaster. In addition, personnel have to be trained to use the equipment properly.

The proper allocation of supplies will be an ongoing challenge throughout almost any disaster response.

Communications and information

Effective communications is essential. Without reliable, up-to-date information decision-makers are unable to manage the disaster response. Responding agencies and organizations may not share information effectively. In the absence of reliable information, rumours and misinformation can lead to serious harm.

Infrastructure and logistics

Logistics and transportation are always major issues during any disaster. In many cases, a failure of logistics is what defines the disaster.

Failures of infrastructure also characterize disasters. These failures can also degrade the ability of responders to function in a disaster area. Responders may be forced to innovate and work outside their plans. Past examples of responders 'thinking outside the box' include:

- Using dumpsters used to transport essential supplies
- Using train locomotives to provide electricity to evacuation centres
- Using municipal trucks to transport flood victims
- Using airport terminals as hospitals
- Using breweries to supply water for thousands of people
- Using roads as landing pads and jails.

Command

The Incident Command System (ICS) is used to organize most disaster responses. ICS deals directly with many of the critical management, safety and logistical issues that arise during a disaster. Unfortunately, different agencies use different versions of ICS. In general, agencies use only the parts of ICS that they like, disregarding the rest. New positions and titles are added to keep people happy or to reflect the normal organizational structure.

Nature of amateur radio

Amateur radio can be extremely useful during disasters. However, most disaster response managers do not know what amateur radio is, or how it can be used. Only when communications systems fail completely is amateur radio considered as an alternative.

Amateur radio offers a number of advantages:

- Amateur radio operators do not need to stage from a common marshalling area. In fact, they do not need to physically converge at all.
- Amateur radio communications infrastructure is dispersed, which helps during damage assessment. Amateur radio can be used to define the exact boundaries or scope of a disaster.
- Amateur radio stations are less likely to be forced off the air, since they benefit from equipment redundancy, alternate power supplies and operators with the willingness and skills needed to solve technical problems.
- Amateur radio is not tied to specific locations, agencies, or types of disaster, and can be used in many different scenarios.

Amateur radio also suffers from some disadvantages:

- Amateur radio is a scarce resource. Although there are thousands of amateur radio operators, many are too old or physically unfit to respond, and many have never participated in any emergency training.
- Amateur radio is not user friendly for served agencies. For example, it often is not clear what destinations can be reached using amateur radio, and served agency personnel may find themselves forced to use NTS forms.
- Messages sent by amateur radio are much less likely to produce a response.

SERVED AGENCIES - OUR CLIENTS AND PARTNERS

Our served agencies may include:

- Canadian Red Cross
- Emergency management organizations
- Municipalities
- Law enforcement agencies
- Salvation Army
- Other disaster relief organizations.

OTHER AMATEUR RADIO EMERGENCY COMMUNICATIONS ORGANIZATIONS

ARES may also interoperate with other amateur radio emergency communications organizations, including:

- SATERN, the Salvation Army's disaster communications group
- VECTOR, Vancouver's communications group

- PERCS, British Columbia's communications group
- EMCG, New Brunswick's EMO communications group
- RACES, a communications group in the United States.

EMERGING TECHNOLOGIES

A number of emerging technologies are likely to affect amateur radio and ARES in the near future.

GPS and APRS

The integration of GPS, APRS and packet capabilities into mobile and even handheld radios is imminent. This will turn position reporting into a 'turnkey' application that almost every operator can use, without the complexity of current packet or APRS installations.

Bluetooth

Device-to-device networking using Bluetooth is already commonplace between laptops, printers and other computer peripherals. It's also used to connect wireless headsets to computers and cellphones. Expect to see amateur transceivers (even handheld ones) equipped with Bluetooth modems that will allow connection to wireless headsets or handheld computers, making voice and packet operation and programming much easier.

Spread spectrum

Spread-spectrum technologies are in common use now in digital cellphones, trunked radio systems, and military communications. Spread spectrum works by transmitting a signal that is smeared out over a wide range of frequencies, rather than being focused on a single, coherent frequency (like a CW, AM or FM signal). Ironically, this smearing makes the signal more readable at lower power levels, and more resistant to interference from other spectrum users. In fact, with spread spectrum, the 'user capacity' of a given piece of spectrum can be multiplied many-fold. Spread spectrum effectively removes the need for frequency coordination.

Spread spectrum will have two impacts on amateur operations: amateur equipment that incorporates spread-spectrum capabilities will become commercially available, and the use of spread spectrum by both amateurs and 'competing' frequency users will allow amateurs to share frequencies with other users, without losing spectrum or access privileges.

Smart antennas

Microchip-based 'smart' antennas using phased-array technology will allow order-of-magnitude increases in the efficiency of small, broadband antennas used in mobile and handheld radios.

Multitask transceivers

Software-based radio technologies will allow amateurs to re-use next-generation business band, aviation, or marine radios, or even cellular phones, as all-band amateur transceivers, making it much more likely that amateurs will have amateur-capable transceivers available when and where they're needed. Once software-based radio technology matures, you may even be able to transmit and receive on your laptop or handheld computer.

Fuel cell batteries

Fuel-cell battery technology developed for laptops and other portable devices will make their way into portable and handheld amateur transceivers. This will allow higher transmit power levels and extended operations, with 'recharging' required after weeks, not hours. Fuel cells will also remove the need for noisy, dirty, unreliable gasoline-powered generators at portable stations and emergency sites.

Miniaturized transceivers

Transceivers are getting smaller and smaller to the point where they will soon become 'wearable' technology. (Even now, you can purchase wrist-watch UHF transceivers for the FRS band.) Expect transceivers to shrink to coin-sized units, as better batteries, antennas and voice-control systems become available.

Robust ad-hoc wireless networks

A problem with current digital communications systems is their fixed hierarchical structure. A mobile node (a transceiver, cellphone or mobile computer) must be able to directly see a 'tower' or cellsite in order to work. In the amateur realm, you need to be able to reach the receiver or repeater directly from your transceiver. In the case of packet, you need to manually redefine your path if you can't 'see' the next node.

However, a new form of ad-hoc network called a MANET will allow nodes to intelligently carry traffic between sender and receiver, adapting to changing 'topology' and making it far more likely that your message will get through. In a MANET, if your handheld can't reach the repeater, but it can reach another transceiver in the parking lot that can in turn reach the repeater, the transceiver in the parking lot will automatically relay the traffic (without any intervention by the operator). Packet traffic will get to its destination without any manual routing on the part of the operator (much like the current Internet). MANETs are critically important in emergency situations, where infrastructure is damaged or users are operating in areas that are signal-hostile.

Convergence of radio, wireless and Internet communications technologies

As wireless devices such as handheld computers and cellphones become more able to access Internet services, and as those services grow to include a variety of communications applications, the line between radio communications and Internet communications will blur. Internet applications already exist that mimic (or obsolete) packet services, dispatch radio, long-haul radio, voice networks, SSTV, and voice repeaters. When everyone with a pocket PC has access to this range of communications

services, both for business and personal use, the privileges of amateur operation become less meaningful. Looking at this shift from an ARES perspective, our technologies and infrastructure becomes less important, and the value of ARES will lie in our operating practices and our communications discipline.

WHAT TO DO TODAY

Despite the changing technologies and the evolving role of ARES and amateur radio in emergency communications, we still need to train and prepare for the emergencies of today and tomorrow. Things that we can focus on in order to add value and invest in our abilities include the following:

- Practice our voice operating skills for both tactical and formal messaging handling
- Learn packet and use it in exercises
- Think about robustness and survivability when building your station and designing systems
- Keep up to date with digital and wireless communications technologies, even those that do not seem to relate directly to amateur radio (for example, wireless digital telephony, wireless computer networking, and Internet-based communications)
- Be aware of the lessons learned elsewhere in the world by emergency communications agencies, including other ARES groups
- Be professional in all our interactions with community stakeholders, emergency officials, government representatives, and the media
- Be ready to serve.