

**CCAR Infrastructure and Capabilities  
in Support of Chester County  
Department of Emergency Services**

## Organization

Chester County ARES/RACES (CCAR) is a volunteer organization of amateur radio operators, licensed by the Federal Communications Commission (FCC), capable of providing emergency communications capabilities and services independent from established infrastructure such as the switched telephone network, cellular phone network, and the Internet.

CCAR's served agency is the Chester County Department of Emergency Services (CCDES) and in that role operates under direction and in coordination with the Chester County Director of Emergency Services.

CCAR is affiliated with two authorizing agencies

- Amateur Radio Emergency Service (ARES)
- Radio Amateur Communication Emergency Service (RACES)

## Amateur Radio Emergency Service (ARES)

ARES is a service of the American Radio Relay League (ARRL) which is the national organization representing amateur radio (HAM radio) in the United States. ARES is a top-down hierarchical structure managed by the ARRL with established relationships with organizations such as the Red Cross and Salvation Army as well as a mutual support agreements between individual ARES groups. There are ARES groups in Berks, Bucks, Delaware, and Montgomery counties and a developing group in Philadelphia county.

CCAR self-deploys under ARES authority to support local community events such as the Marshalton Triathlon and Chester County Hospital Ride for the Cure, and the Northbrook Canoe event for Cerebral Palsey. In this role CCAR acts independently of CCDES and is not acting under or asserting CCDES authority.

ARES operations provide several benefits to the group

- Reputation within the community
- Training
- Equipment and infrastructure testing

CCAR ARES deployments are typically confined to Chester County however the ARRL may request support for other events such as the city to shore ride etc.

## Radio Amateur Communication Emergency Service (RACES)

RACES is a Federal Government sponsored program to leverage amateur radio operators for emergency communications during a declared emergency or disaster. RACES is currently under the Department of Homeland Security (DHS) control.

Amateur radio operators/groups can only deploy under RACES authority when requested by a served agency which, for CCAR, is the CCDES. Deploying as RACES offers amateur operators additional flexibility from FCC rules at the discretion of the DHS. When CCAR deploys as RACES we display Chester County ID badges and take direction from Chester County DES. Note that ALL non-tactical communications pass though the Chester County EOC.

The primary focus during a RACES deployment is intra-county communications however CCAR can establish contact with other counties, PEMA, FEMA, etc. as required through other RACES groups.

CCAR RACES deployment has priority over ARRL ARES deployment requests.

## **CCAR Services**

CCAR operators utilize personal amateur radio equipment, PCs/laptops, and emergency power to provide county-wide voice and data communications capabilities via Radio Frequencies independent from established infrastructure. CCDES has funded additional amateur radio equipment to provide enhanced functionality with limited dependencies on other infrastructure.

CCAR's basic mission is to provide an alternate communication path between the Chester County EOC and affected locations within the county during emergency or disaster situations in the event that:

1. Normal communications are disrupted or
2. There is no established communications capability

## **Baseline Technical Capabilities**

CCAR operators are able to pass message traffic over simplex/point-to-point radio frequency paths (VHF, UHF) as well as relay traffic between multiple operators/locations if terrain is an issue. Message traffic to/from affected locations and the Chester County EOC is managed by CCAR operators at the GSC in room 026. Basic capabilities include:

1. County-wide voice communications
2. County-wide low speed data (text or predefined forms such as ICS-213)
3. Wide-area voice communications (e.g PEMA Harrisburg via RACES relay)
4. Wide-area low speed data (text or predefined forms)
5. County-wide asset position tracking using GPS
6. County-wide ground truth weather reporting

## **Enhanced Technical Capabilities**

CCAR also operates two county funded expanded capabilities:

- County-wide UHF voice repeater system providing direct communications for voice and low speed data from the GSC/026 to all points in the county without the need for relays
- An independent microwave backbone selectively serving townships within the Limerick EPZ, as well as the West Chester area and some points South with a high speed data capability

The expanded capability adds email-based messaging functionality to served townships in the EPZ providing increased bandwidth and the ability to send documents and pictures, etc.

Note: CCAR also supports the Peach bottom EPZ with voice and low speed data capabilities.

# CCAR communication capabilities

## Voice Communications

Voice communications support all locations within the county and is preferred for:

- CCAR tactical purposes to deploy and manage operators in the field
- Pass coordination traffic from the Chester County EOC to affected locations
- Pass short, non-ambiguous messages between the Chester County EOC and affected locations
- Last chance communications if all other paths are inoperable

## Low speed data

Low speed data communications support all locations within the county and can reasonably pass messages up to 30KB. It is preferred for emergency traffic that contains specific requests such as names, numbers, sizes, medications/drugs, times, etc., as there is less opportunity for voice transcription errors. There is also a small obscurity advantage as messages are not decipherable without the right equipment however decoding equipment/software is readily available so low speed data traffic should not be considered secure.

Low speed data supports sending text files and predefined forms (e.g. ICS-213) and is able to process messages received as files or emails provided the size is within limits.

## High speed data

High speed data links are available to many townships within the Limerick EPZ and support email capability between CCAR operators deployed to townships and CCAR operators at the GSC room 026. Note that messages travel over Amateur radio frequencies so CCAR operators (FCC licensed) must handle the traffic. Currently, traffic passes between the Chester County EOC and CCAR/026 via county email to CCAR email.

Note: High speed data is not available for the Peach Bottom EPZ.

## Asset tracking / GPS

CCAR leverages the Amateur Radio Position Reporting System (APRS), which uses GPS and a VHF radio interface to report the position of CCAR operators and other assets requiring tracking/position reporting. The current location of all tracked assets is collected in real time and is displayable using APRS software. CCAR operators assigned to affected locations or mobile assets can provide position tracking data.

## Weather reporting

National Weather Service (NWS) weather radar does not provide ground level weather data for Chester county so CCAR has two weather reporting capabilities to compensate.

- Voice based weather data reporting facilitated by CCAR “Net Control” operators. Data is relayed to the NWS for integrating into their reporting via one of several channels. The NWS supports local RF weather nets through their SKYWARN outreach program.
- Davis weather stations (CCDES funded) located at CCAR operator homes throughout the county. Weather data is received at the GSC/026, maintained in a SQL database, and forwarded to the APRS system (see asset tracking) for wider reporting.

## **CCAR deployment scenarios**

- Back-up communications to township EOCs for Limerick, Peach pottom, and other disaster scenarios. Note that experience based on multiple Limerick exercises has shown township EOC personnel are not generally proficient with emergency communications (not their job) and CCAR has often been the main communications path and is not dependent on the Internet or telephone networks.
- Primary communications for emergency shelters and warming centers etc.
- Primary communications for ad-hoc locations (e.g. nursing home) during power failures, ice storms, etc.
- Backup communications located at fire stations during 911 outages
- Primary/backup communications for PODs and other events
- Primary communications for exercises such as homeless counts
- APRS asset tracking
- Backup communications during County radio system major maintenance
- Other ad-hoc communications needs as identified by CCDES

## **CCAR Infrastructure and staffing locations**

### **GSC / 026**

- CCAR backbone
- Event / disaster management, CCDES coordination
- Comcast Internet connection
- CCAR Mail and Web server
- Weather and APRS position tracking (gateway)
- Wide-area Communications (outside the county)
- Winlink-based wide-area email

### **Pocopson**

- CCAR backbone
- Comcast Internet connection

- CCAR network access points (Infrastructure, ad-hoc)
- DSTAR voice and digital data
- APRS and weather digital repeating node

## **Charlestown**

- CCAR Backbone
- Digital Voice / DMR
- APRS and weather digital repeating node

## **Bucktown**

- CCAR Backbone
- Comcast Internet connection
- CCAR network access points (Limerick, ad-hoc)
- Voice repeaters (2)
- APRS and weather (VHF digital repeating node, UHF gateway)
- Low speed data server
- DSTAR digital data (Warwick)

## **Uwchlan**

- CCAR Backbone
- CCAR network access points (Limerick, ad-hoc)
- Digital Voice / DMR
- Backup voice repeater

## **Octoraro**

- Voice repeater

## **Backup EOC**

- Work in progress

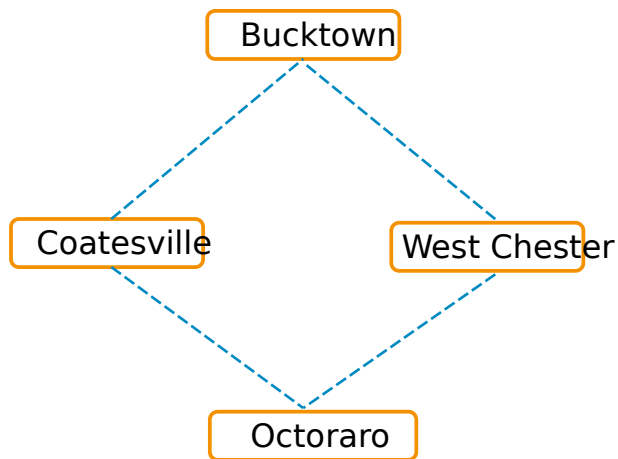
# CCAR Infrastructure

The following sections provide an overview of the infrastructure operated by CCAR on behalf of Chester County DES

## CCAR UHF Linked Repeater System

The UHF linked repeater system provides voice and low speed data links across Chester county without the need for relay stations. In addition, Bucktown has a dedicated standalone low speed data system that covers a wide area of the Chester county and surrounding counties. This system operates in conjunction with the UHF repeater system to allow simultaneous transmission of voice and low speed data traffic.

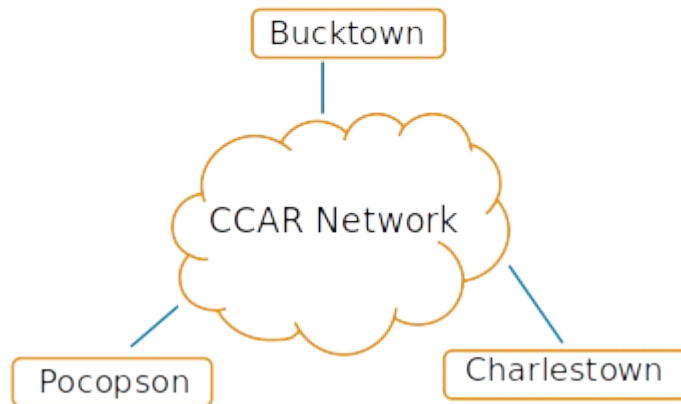
### CCAR UHF Linked Repeater System



## CCAR Digital Voice Repeater System

The Digital voice repeater system is a backup for the UHF linked system and provides two digital voice channels. Currently digital voice is utilized for tactical/coordination of resources as the system is built out and tested. The digital voice equipment is self funded by CCAR.

### CCAR UHF Linked Digital Voice Repeater System

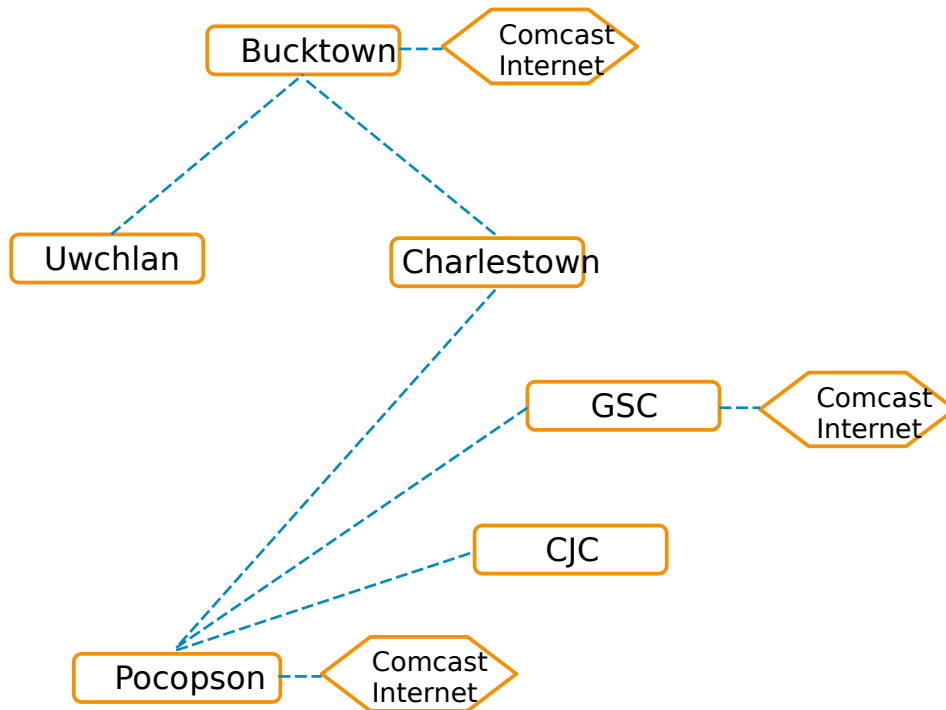




## CCAR 5.8GHz Network Backbone

The CCAR network backbone connects the central and northern parts of the county over a 5.8GHz microwave backbone. It is primarily for support of the Limerick Nuclear Generating Station and townships in the Limerick EPZ. The key nodes are Bucktown, Pocopson, and Uwchlan that each have WiFi access points serving surrounding townships and infrastructure locations. In addition, there are three [redundant] Internet access points at Bucktown, Pocopson, and West Chester/GSC. The Internet connections are not required for emergency communication support but offer substantial operator deployment flexibility if available.

## CCAR 5.8GHz Network Backbone





# CCAR capabilities

To be updated...

