

July 2019



Newsletter of the County of Orange Radio Amateur Civil Emergency Service

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Captain's Corner

by RACES Captain Ken Bourne, W6HK, Chief Radio Officer

Electromagnetic Pulse Dangers

In the December 2005 issue of *NetControl*, I wrote about potential threats to our power and communications infrastructure and to electronic equipment by an electromagnetic-pulse (EMP), caused by a nuclear blast. I wrote about it again in the June 2009 and October 2014 issues. David Corsiglia, WA6TWF, gave a presentation on the subject at the March 1, 2010, OC-RACES meeting. Concern about an EMP attack continues to increase, and on March 26, 2019, a Presidential Executive Order mandated a "Whole of Government" and "Whole of Community" commitment to demonstration and testing programs and prioritized protection for critical infrastructures. The executive order, *Coordinating National Resilience to Electromagnetic Pulses*, identifies designated government responsibilities and encourages industry-government partnerships to strengthen our national resilience.

On April 30, 2019, the Electric Power Research Institute (EPRI) released a report, "High Altitude Electromagnetic Pulse and the Bulk-Power System." This report is one of a series of electric utility assessments on the vulnerability of the bulk electric system in natural occurring solar storms and man-made EMP hazards. Tests of digital relays indicate that a substantial portion of relays are at risk of failure during a man-made EMP event, with risk of cascading grid blackouts and challenges to restore electric power.

Previous reports from the Congressionally-mandated Commission to Assess the

Threat to the United States from Electromagnetic Pulse (EMP) Attack ("EMP Commission") anticipate enhanced EMP effects weapons of interest to Russia, China, North Korea, and Iran, and possible other U.S. adversaries.

The April EPRI report indicates lesser electromagnetic threat levels than the EMP Commission did. EPRI predicts that most of the main transformers will survive an EMP attack. The report did not address vulnerabilities for power generators.

In its July 2017 report, the EMP Commission said, "The critical national infrastructure in the United States faces a present and continuing existential threat from combined-arms warfare, including cyber and manmade EMP attack, as well as from natural EMP from a solar superstorm. Within the last decade, newly armed adversaries, including North Korea, have been developing the ability and threatening to carry out an EMP attack against the United States. Such an attack would give countries that have only a small number of nuclear weapons the ability to cause widespread long-lasting damage to critical national infrastructures, to the United States itself as a viable country, and to the survival of a majority of its population."

The report further states, "Protecting and defending the national electric grid and other critical infrastructures from cyber and EMP could be accomplished at reasonable cost and minimal disruption to the present systems that comprise U.S. critical infrastructure. This is commensurate with

Continued on page 2

Next OCRACES Meeting

Monday,
July 1 2019,
at 1930 Hours

840 N. Eckhoff
Street, Suite 104,
Orange

APRS Programs by
Mark Warrick,
KM6ZPO



Orange County Sheriff's Department
Communications & Technology Division

Captain's Corner *Continued from page 1*

Trump Administration plans to repair and improve U.S. infrastructure, increase their reliability, and strengthen homeland defense and military capability. Continued failure to address the U.S. vulnerability to EMP generated by a high-altitude nuclear weapon invites such an attack.

Another July 2017 EMP Commission report by George H. Baker said the nuclear EMP results from a detonation high above the tropopause. Three main phenomena come into play, each with distinct associated system effects:

- The first, a “prompt” EMP field, also referred to as E1, is created by gamma ray interaction with stratospheric air molecules. It peaks at tens of kilovolts per meter in a few nanoseconds, and lasts for a few hundred nanoseconds. E1’s broadband power spectrum (frequency content in the 10s to 100s of megahertz) enables it to couple to electrical and electronic systems in general, regardless of the length of their penetrating cables and antenna lines. Induced currents range into the 1000s of amperes. Exposed systems may be upset or permanently damaged.
- The second phenomenon, late-time EMP, also referred to as magnetohydrodynamic (MHD) EMP or E3, is caused by the distortion of the earth’s magnetic field lines due to the expanding nuclear fireball and rising of heated and ionized layers of the ionosphere. The change of the magnetic field at the earth’s surface induces currents of 100s to 1000s of amperes in long conducting lines (a few kilometers or greater) that damage components of the electric power grid itself as well as connected systems. Long-line communication systems are also affected including copper as well as fiber-optic lines with repeaters. Transoceanic cables are a prime example of the latter.
- The third phenomenon, referred to as the “atmospheric effect,” is caused by ionization of the upper atmosphere, leading to interference with normal radio wave propagation and reflection behavior. The interference lasts for tens of hours and is most pronounced in the HF, VHF, UHF, and GPS transmission bands.

Baker’s report continues by saying that solar storm GMD effects are the result of large excursions in the flux levels of charged particles from the sun and their interactions with the earth’s magnetic field and upper atmosphere. Two effects are present:

- Perturbation of the earth’s magnetic field, similar to MHD EMP, that generates overvoltages in

long-line systems over large regions of the earth’s surface, affecting electric power and communication transmission networks.

- Ionization of the upper atmosphere, similar to MHD EMP, leading to interference with HF, VHF, UHF, and GPS signals. For typical solar storms, these effects last for around 30 hours.

Baker says that wide-area electromagnetic system effects are challenging due to their near-simultaneous initial effects and cascading effects on a wide array of infrastructures. Infrastructure systems comprised of long-line conductor networks are the most vulnerable to both effects. Susceptible networks include the electric power grid, land-line communications, and interstate pipelines. Effects on these networks will cascade to most other infrastructures. Smaller, self-contained, self-powered infrastructure systems (e.g., hand-held radios and vehicles) are also vulnerable, but only to EMP and to a lesser degree than long-line networks.

Baker’s EMP Commission report says that initiating a U.S. protection program involves wrestling with the question of where to begin, given the long list of critical infrastructure sectors, which include Agriculture and Food, Water, Public Health, Energy, Transportation, Banking and Finance, Chemical Industry, Emergency Services, Information and Communication, Postal and Shipping, Government Services, the Defense Industrial Base, and Critical Manufacturing.

So what can we do to protect our amateur radio equipment from an EMP? Faraday cages might be effective, but commercial ones run thousands of dollars. An effective Faraday cage might be a 10-gallon galvanized steel garbage can with a locking lid, sealed with aluminum HVAC tape around the lid. Some hams think that a microwave oven would be effective. Yes, it’s effective at microwave frequencies, but not at other parts of the electromagnetic spectrum, which would also be covered by an EMP. Use cardboard boxes or plastic storage bins to insulate your equipment from the inside of the can. Do not ground the can, because the ground wire can act as an antenna, picking up the EMP energy. Your equipment should include a charge controller and perhaps an inverter. You can test your cage by enclosing a battery-operated AM/FM radio. If the signal disappears when the cage is closed, you know the cage works (but only at the frequency the radio is tuned to).

Configure your equipment so that it can be quickly broken down and stored in a Faraday cage. If world events deteriorate or an unusually intense solar storm is forecast, you can store your equipment in the cage until the danger passes.

Next OCRACES Meeting: Monday, July 1st

The next County of Orange RACES meeting will be on Monday, July 1, 2019, at 7:30 PM, at OCSO Communications & Technology Division, 840 N. Eckhoff Street, Suite 104, in Orange. Our featured speaker, Mark Warrick, KM6ZPO, will give a fascinating demonstration of PinPoint APRS and SARTrack.

PinPoint is free software that allows you to visually track and communicate via amateur radio. During an emergency, it can be used as a location-aware tactical communications tool. It is mostly used as a tool for tracking hams and assets on a map, although it is capable of so much more. During, for instance, a weather spotting event, an incident commander could visually track where spotters are deployed in the field, and direct them away from approaching weather using an area map on a computer screen. PinPoint has built-in mapping and supports quite a few different map providers, including Google maps, Bing maps, Yahoo maps, OpenStreetMaps, including satellite and hybrid imagery. PinPoint caches all map tiles that are requested from a map provider to ensure tile servers are not overburdened and allowing for offline use. Once maps are cached, PinPoint can be taken offline, so it's perfect for use in rural areas where Internet access is unavailable. At the same time, PinPoint supports (RX only) iGate and APRS-IS operation while connected to the Internet.

SARTrack is a very advanced amateur radio APRS program and software suite with a Windows-based client and database server and an Android app. It's also free! When installed in "SAR" mode, it will run as an advanced Operational Management and Tracking system for Search and Rescue and Emergency Management. Mark believes that SARTrack is designed more for the serious user who needs a lot of information and communications, versus the casual user who would probably prefer the simpler interface and setup of PinPoint APRS. Mark notes that SARTrack has a built-in messaging feature that lets you exchange messages via APRS stations through a handy interface that resembles simple e-mail. Although SARTrack is intended for Search and Rescue, Mark says you could also use it for other applications such as exchanging bearings on a cooperative T-hunt, messaging when the Internet goes down, etc. "So long as the digipeaters have power (and most of them will even after a major power outage), it would be very easy to keep in contact with other ham stations via APRS."

If you have never used APRS, Mark's presentation will give you a strong incentive to get started. If you already have some APRS experience, Mark will reveal some exciting and important enhancements with PinPoint and SARTrack.

Elecraft Announces K4 SDR Transceiver

OCRACES has been very pleased with the quality of its Elecraft K3 HF/6-meter transceiver, which has been operational for a few years in the EOC RACES Room. It has a reputation, backed up by Sherwood Engineering tests, as one of the most excellent transceivers available for radio amateurs. Now Elecraft has announced a new top-of-the-line transceiver, the K4 direct-sampling SDR. It has a 7-inch touch display, combining a panadapter with three multifunction controls.



Elecraft K4 SDR 160-6 meter transceiver.

There are three K4 models to choose from: the basic K4; the K4D, which adds diversity receive capability; and the K4HD, which adds a dual superheterodyne module to the direct-sampling SDR, for ultimate blocking and close-in dynamic range. A basic K4 can be easily upgraded to a K4D by adding the KDIV4 option. Similarly, the K4D can be upgraded to a K4HD by adding the KHDR4. The K4 and K4D, like other "pure" direct-sampling radios, do not require crystal roofing filters. Digital signal processing is used to provide advanced demodulation, filtering, and signal display. The K4HD can operate either in direct-sampling or superhet mode. Typically the latter is only needed in the presence of extreme signals.

The K4 can be fully remote controlled, via Ethernet, from a second K4 as well as a PC, notebook, or tablet. Panadapter data is included on all remote displays.

An expansion slot is reserved for an all-mode VHF/UHF module (future option), with output of approximately 15 watts.

Joe Moell, KØOV, Retires as ARDF Coordinator

ARRL Amateur Radio Direction Finding (ARDF) Coordinator Joe Moell, KØOV, is stepping down after more than 20 years on the job. Since he became ARRL ARDF Coordinator in February 1998, Joe said the sport of on-foot transmitter hunting under international rules has grown steadily in participation and popularity. Since 2001, beginners and experts alike have gathered each year for the USA Championships of ARDF.

ARRL President Rick Roderick, K5UR, has appointed Jerry Boyd, WB8WFK, of Albuquerque, New Mexico, as the new ARRL ARDF Coordinator, effective on July 1. Boyd has been involved in ARDF for many years and has been a frequent medal winner at USA's championships. He headed the team of organizers for the 2002, 2005, and 2011 USA and IARU Region 2 ARDF Championships, held in his hometown. He was on Team USA for the 2004, 2006, and 2010 ARDF World Championships. Boyd also holds an appointment as ARRL Official Observer Coordinator for the New Mexico Section.

The ARRL ARDF Coordinator is responsible for overseeing the selection of Team USA members for the World ARDF Championships in even-numbered years, selecting the location and organizers of the annual USA ARDF Championships, and working with coordinators and working groups of other nations and IARU regions to schedule activities and develop rule updates, among other activities.

As Boyd prepares to take the reins, President Roderick has expressed gratitude for all Joe has done for the advancement of ARDF. Since the US began participating in the biennial ARDF World Championships in 1998, the team has been better prepared every time. The US won its first World Championships medal in 2006 and has medaled every competition since. Last year, the US team garnered 10 medals, with more than half of the team members standing on the medal podium at least once.

While Joe is retiring from the ARDF Coordinator position, he will continue posting radio-orienteeing event news and photos on his Homing In website and participating with other southern California ARDF enthusiasts. He expressed his appreciation for the efforts of all who have worked to make ARDF practices and competitions available to aspiring champions. "ARDF has moved from a novelty into the mainstream of amateur radio," he said. "It is recognized as an ideal way to interest young people in our hobby and to get them started. Please keep up the good work."

Joe is a good friend of OCRACES, as is his wife April, WA6OPS, who retired recently as the Coordinator of the Hospital Disaster Support Communications System (HDSCS). Joe has participated in many OCRACES cooperative T-hunts and has given very informative presentations on direction finding at OCRACES meetings.



Joe Moell, KØOV.

RACES Workshop at Citizen Corps Exercise

The 2019 Citizen Preparedness Exercise was held on June 8th at Saddleback College in Mission Viejo. The morning exercises and skills activities included Incident Command System (ICS) Tabletop Exercise (TTX), Damage Assessment Activity, Patient-Carry Obstacle Course, and Triage Activity. Afternoon workshops and training activities included Splinting and Bandaging, RACES/Ham Radio, Stop the Bleed, American Red Cross/OneOC Overview, and Map Your Neighborhood/Fire Watch.

The RACES/Ham Radio workshop began with an overview by OCRACES Chief Radio Officer Ken Bourne, W6HK, followed by a presentation by Phil Burtis, KF6NFA, on how well CERT and RACES are working together in Huntington Beach as an example for other cities to follow. Ken then gave a presentation on Winlink, followed by a presentation on direction-finding (including how interference to radio systems can be located quickly) by Joe Moell, KØOV, who then conducted an on-foot T-hunt in the college's quad. All of these sessions were to be repeated in a second workshop that afternoon, but, unfortunately, the exercise officials unexpectedly concluded the event quite early and the Winlink and direction-finding sessions could not be repeated.

OCRACES Radio Officer Scott Byington, KC6MMF, spent at least a couple of hours setting up an elaborate portable amateur radio station in the quad outside the classroom building, to demonstrate ham radio to the exercise participants. Some of his equipment included an Icom IC-7300 SDR HF transceiver, an Elecraft KX3 portable HF transceiver, and a three-element beam with coils available for various HF bands. He also had a Hamstick dipole on a tripod and a variety of batteries that could keep the station operational for many hours. Unfortunately, virtually no exercise participants visited Scott's excellent station. OCRACES Member Don Mikami, N6ELD, kept Scott company during the hours that the station was in operation.

KC6TWF and K6PB Hide in Laguna Niguel

Peter Gonzalez, KC6TWS, and IDEC Radio Officer Pete Bergstrom, K6PB, were the fox on the monthly cooperative T-hunt on Monday, July 17, 2019. They hid the fox box in the southern end of the Kohl's Laguna Niguel parking lot. It was a fairly high location and caused several challenging signal reflections down below. The first hunter to find the fox was Ron Allerdice, WA6CYY. Next was Richard Saunders, K6RBS. Coming in third were OCRACES Chief Radio Officer Ken Bourne, W6HK, with OCRACES Member Don Mikami, N6ELD, getting excellent bearings with their loop antenna.



At the fox's den are (left to right) Pete Bergstrom, K6PB, Richard Saunders, K6RBS, Peter Gonzalez, KC6TWS, Ron Allerdice, WA6CYY, and Don Mikami, N6ELD.

The next hunt will be on Monday, July 15, 2019, immediately following the OCRACES 2-meter net (approximately 7:20 PM). The fox will hide on paved, publicly accessible property in a city or sector of Orange County to be announced a few days before the hunt. He will transmit tones on the input (146.295 MHz) of the 146.895 MHz repeater. Hunters will compare bearings via the 448.320 MHz repeater and are encouraged to beacon their positions via APRS while hunting. We are looking for a volunteer to be the fox.

The cooperative T-hunts are usually held on the third Monday of each month (except in October). The hunts are not official RACES events, so DSW (Disaster Service Worker) coverage does not apply. Please drive carefully!

To keep our cooperative T-hunts active, we need to have more participants. RACES members are urged to equip themselves with direction-finding equipment and be ready to find sources of interference to RACES repeaters and to VHF public-safety communications. These hunts provide excellent practice in working together to find such interference—plus they are great fun! We hope to gain more participants soon, not only by RACES members getting equipped, but also because of a tape-measure beam building project to occur at the August 16th meeting of the Orange County Amateur Radio Club. We will promote our cooperative T-hunts at that meeting.

Fox-hunt loops and beams are available from Arrow Antenna and HRO, including the Arrow Model FHL-VHF fox-hunt loop (covers 1 MHz to 600 MHz) and the Arrow Model 146-3 three-element portable hand-held yagi. The Arrow OFHA 4-MHz offset attenuator can be useful when close to the fox, to prevent receiver overload. For on-foot hunting, the BC-146.565 three-element, hand-held, foldup, yagi antenna is available from Bob Miller Enterprises (<http://www.rdfantennas.com>), along with the VK3YNG MK4 sniffer. An all-mode transceiver is quite useful, allowing hunters to switch to the SSB or CW mode for detecting extremely weak signals, or to switch in a built-in attenuator, reduce RF gain, or tune slightly off frequency when dealing with extremely strong signals. Some hunters use the DF2020T radio direction finder kit, which is a Doppler system available from Global TSCM Group, Inc. (<http://www.kn2c.us>). A very similar system is the MFJ-5005 Doppler direction finder. Useful apps are available for iPhones and Android phones. For some excellent information on T-hunting, see <http://www.homingin.com>.

Xiegu Introduces G90 20-W SDR Transceiver

MFJ Enterprises and Connect Systems are now selling the compact Xiegu G90 20-watt SDR HF transceiver. It features a built-in automatic antenna tuner. The 1.8-inch OLED display allows clear viewing in sunlight, providing ± 24 kHz bandwidth spectrum and waterfall. The head is detachable for remote mounting. Output can be adjusted from 0.5 to 20 watts, in 0.5-watt increments. Modes include SSB, AM, and CW. Coverage is 160-10 meters transmit and 500 kHz to 30 MHz receive.

This software defined radio allows features to be added by updating the firmware. A narrowband filter can be selected on CW down to 300 Hz. Most features can be accessed from the included microphone.

Interfacing is diversified. The baseband I/Q output allows interfacing with sound-card based devices or PC-based applications such as XDT1.



Xiegu G90 20-watt SDR HF transceiver.

RACES/MOU News from Around the County

Westminster RACES

By Barbara Eames, KJ6EBA

From Friday, May 17, through Sunday, May 19, 2019, Westminster RACES served the community by participating in the Blessed Sacrament School Festival. The annual event is a fundraiser for the school and Westminster RACES has participated in it for many, many years by having its members serve as moving eyes and ears, looking for ways to assist visitors and communicating their needs to the appropriate authorities.

This year Westminster RACES members were given mutual aid by members of Buena Park RACES, Fountain Valley RACES, and Laguna Niguel ACS, plus supporters of Westminster RACES. During the 3-day event, 13 radio operators worked 151 man-hours in spite of the sometimes brisk winds, steady sprinkles, and the occasional downpour. Net control duties were rotated over the course of the event, giving everyone the opportunity to expand their skills and stretch their legs.

Radio operators answered questions by festival visitors about attractions, directed

event volunteers to their check-in station, offered visitors directions to festival sites, advised many about the event hours, and gave assistance as needed to festival organizers. Thankfully, RACES members were able to quickly resolve issues brought to them. The friendly operators in their hi-vis vests made them approachable and marked them as helpful visitor resources. A panicked child approached one operator pleading for help in finding his missing mom. She was tracked down and reunited in short order by the observant radio operator—even before the mom realized that she was a “missing.” Another member was flagged down and given a found wallet—which the radio operator immediately turned over to the event organizers. Another was approached by a visitor asking for medical aid that gratefully was minor and taken care of by the on-site EMT.

Besides walking and working, the entire team had a good time at the festival assisting visitors and staff—and enjoying the various food and drinks offered by vendors. To the entire team’s credit, the festival’s chairperson was delighted with the volunteer efforts of the RACES team.

“RACES/MOU News” provides an opportunity to share information from all City & County RACES/ACS units and MOU organizations and supportive amateur radio clubs in Orange County.

Please send your news to NetControl Editor Ken Bourne, W6HK, at:

kbourne.ocsd@earthlink.net



Westminster RACES members working the Saturday night shift at the Blessed Sacrament School Festival included (left to right) Barbara Eames, KJ6EBA; Huy Nguyen; Assistant Radio Officer Adam Valek, N6HVC (in back); WRACES supporters Ken Nguyen, KE6UNN, and wife Cathy Nguyen, KE6UNO; Hermie Asido, KM6UKE (Buena Park RACES); Chu Nguyen, KE6YSS; WRACES supporter Thu Chu, KE6SFF, and wife of Radio Officer Chi Nguyen, KE6MVS; and David Gorin, KB6BXD, (Laguna Niguel RACES).

July 2019

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 Weekly 2 m ACS Net & OCRACES Meeting	2	3	4 Independence Day	5	6 Weekly 60 m ACS Net
7	8 Weekly 2 m ACS Net	9	10	11	12	13 Cal OES SWACS Leadership Meeting
14	15 Weekly 2 m ACS Net & Cooperative T-Hunt	16	17	18	19 Orange County Amateur Radio Club Meeting	20 Weekly 60 m ACS Net
21	22 ACS Net on Five Bands & Cal OES Nets	23	24	25	26	27 Weekly 60 m ACS Net
28	29 Weekly 2 m ACS Net	30	31			

Upcoming Events:

- **July 1:** OCRACES Meeting, 1930-2130 hours, OCSD Communications & Technology Division, 840 N. Eckhoff Street, Suite 104, Orange
- **July 4:** Independence Day
- **July 13:** Cal OES Southern Region ACS Leadership Meeting, 1000 hours, San Bernardino
- **July 15:** Cooperative T-Hunt, 1920 hours
- **July 19:** Orange County Amateur Radio Club Meeting, 1900 hours, American Red Cross (George M. Chitty Building), 600 Parkcenter Drive, Santa Ana (program: "APRS plus Satellites" by Robert MacHale, KE6BLR)



www.ocraces.org



Mission Statement

County of Orange RACES has made a commitment to provide all Public Safety departments in Orange County with the most efficient response possible to supplement emergency/disaster and routine Public Safety communications events and activities. We will provide the highest level of service using Amateur and Public Safety radio resources coupled with technology, teamwork, safety, and excellence. We will do so in an efficient, professional, and courteous manner, accepting accountability for all actions. We dedicate ourselves to working in partnership with the Public Safety community to professionally excel in the ability to provide emergency communications resources and services.

County of Orange RACES Frequencies

- 60 m: 5346.5 kHz USB (dial) (Channel 2) (OC ACS Net—Saturdays, 1000 hours)
 - 40 m: 7250 kHz LSB
 - 10 m: 29.640 MHz output, 29.540 MHz input, 107.2 Hz PL
 - 6 m: 52.620 MHz output, 52.120 MHz input, 103.5 Hz PL
 - 2 m: 146.895 MHz output, 146.295 MHz input, 136.5 Hz PL*
 - 2 m: 146.595 MHz simplex
 - 1.25 m: 223.760 MHz output, 222.160 MHz input, 110.9 Hz PL
 - 70 cm: 446.000 MHz simplex
 - 70 cm: 448.320 MHz output, 443.320 MHz input, 141.3 Hz PL (private)
 - 70 cm: 449.100 MHz output, 444.100 MHz input, 110.9 Hz PL (private)
 - 70 cm: 449.180 MHz output, 444.180 MHz input, 107.2 Hz PL (private)
 - 70 cm: 449.680 MHz output, 444.680 MHz input, 131.8 Hz PL (private)
 - 23 cm: 1287.650 MHz, 1287.675 MHz, 1287.700 MHz, 1287.725 MHz, 1287.750 MHz, and 1287.775 MHz outputs, -12 MHz inputs, 88.5 Hz PL
- *Primary Net—Mondays, 1900 hours

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It's Where It's @!

Questions or Comments?
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**“W6ACS ...
Serving
Orange County”**

Meet Your County of Orange RACES Members!

Officers →



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Scott Byington
KC6MMF

Jack Barth
AB6VC

Ernest Fierheller
KG6LXT

Bob McFadden
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Tom Tracey
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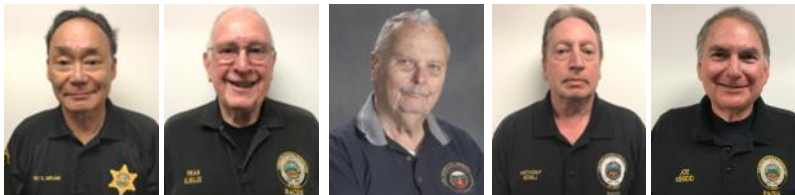
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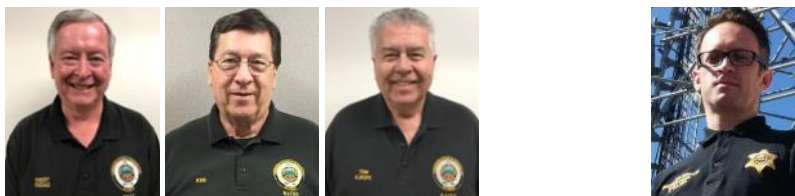
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