September 2025

Newsletter of the County of Orange Radio Amateur Civil Emergency Service

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Next OCRACES Meeting

Monday, September 8, 2025, 7:30 p.m.

EOC, Loma Ridge

OCRACES Members Only: Training

Orange County Sheriff's Department
Emergency Management Division

CRO's Nest

by Ken Bourne, W6HK, Chief Radio Officer Emeritus

Product Detectors

My first receiver back in the 1950s, when most hams operated on HF AM and CW with separate transmitters and receivers, was a Hallicrafters S-53A. It used a diode detector following the intermediate frequency (IF) stage to recover the audio. Received signals first went into the RF front end, then mixed with a signal from the local oscillator and was superheterodyne-converted to produce the IF. The audio was extracted from the IF output by the diode detector and was audio-amplified to drive the speaker or headphones. A beat-frequency oscillator (BFO) mixed with the IF output to produce an audio tone for copying CW.

Single-sideband (SSB) operations were starting to become popular on HF. Rather than a carrier with two sidebands of audio, the carrier and one of the sidebands were removed to reduce bandwidth. In the S-53A and similar receivers with diode detectors, the BFO was needed to inject a carrier into the received signal for the diode detector to extract audio. SSB did not sound as good as AM, but a great improvement was made when product detectors were developed to replace the diode. Today's receiver modules in our HF (and all-mode VHF/UHF) transceivers still use product detectors for SSB, as well as for AM, CW, and digital formats. It's fascinating to learn how they work.

Rather than simple diode envelope detection, the product detector employs synchronous demodulation—mixing the received signal with a local oscillator or reestablished carrier. Rather than responding to the envelope of the signal (as does a diode detector), it multiplies (or mixes) the incoming signal with a locally generated carrier at the original signal's carrier frequency. Consequently, the detector is sometimes called a "multiplier mixer" or "synchronous detector."

This technique is fundamentally different from simple diode detectors. While a diode detector rectifies the signal to follow the envelope, the product detector effectively performs a heterodyne operation—generating sum and difference frequencies and extracting the desired information by filtering out the unwanted components. The operation is similar to the action of a mixer in a superheterodyne receiver but instead the local oscillator is set to the precise carrier frequency for demodulation. Product detectors are far better than envelope detection for recovering intelligent audio from SSB signals, to reduce distortion or noise.

For SSB or when the local oscillator is not exactly in phase or frequency with the incoming carrier, the output becomes sensitive to phase and frequency errors—the signal may be attenuated or shifted, and noise performance degrades. This emphasizes the need for carrier synchronization, such as with a phase-locked loop.

Analog product detectors use simple diode ring mixers or sophisticated circuits such as Gilbert cell multipliers and specialized integrated circuits. The diode ring

CRO's Nest Continued from page 1

mixer uses the non-linear current-voltage characteristic of diodes to multiply the RF/IF input with the LO. Despite their simplicity and ruggedness, diode mixers require precise balancing and appropriate signal levels to minimize unwanted harmonics and noise. Active mixers based on bipolar junction transistors (BJTs) or FETs (Field Effect Transistors) offer gain and typically better performance at lower signal levels. The Gilbert cell is popular in commercial mixer ICs. For example, the NE602 integrates both a double-balanced mixer and a local oscillator, simplifying receiver design and offering reasonable dynamic range. For both IF and direct-conversion product detectors, the signal chain is: RF or IF signal input → mixer (multiplies with LO) → low-pass filter (removes sum frequency and DC) → audio amplifier → speaker or recording device.

IF Product Detector in Superheterodyne Receivers

In the superheterodyne receiver, the received RF signal is converted to a fixed intermediate frequency using an RF mixer and local oscillator. At the IF stage, a product detector (often called the second detector) can demodulate the signal effectively. The signal chain is: antenna → RF amplifier → mixer (with LO) → IF amplifier → IF product detector → audio/bandpass filtering → output. The fixed frequency in the IF allows highly selective and stable filtering and demodulation.

RF Product Detector in Direct-Conversion Receivers

Direct-conversion receivers (also called zero-IF or homodyne receivers) use a product detector directly at the RF stage, mixing the incoming RF with an LO at the same frequency to extract baseband information without the need for an intermediate frequency. The signal chain is: antenna → RF amplifier → product detector (mixing with LO at carrier frequency) → audio/baseband filter → audio amplifier. These product detectors are used in software-defined radios (SDRs), simple CW/SSB receivers, and quadrature detectors for digital communications. They have simpler architecture and no IF substation but greater susceptibility to DC offsets, LO leakage, and 1/f noise at baseband. They are used in compact SDR transceivers leveraging Tayloe I-Q product detectors for CW, SSB, and AM demodulation.

Synchronous Detection Using Phase-Locked Loop (PLL)

A key limitation of the product detector is its reliance on a local oscillator exactly matching the carrier in both frequency and phase. Any LO offset introduces demodulation errors and audio distortion—critical in AM, and fatal in SSB or suppressed-carrier modes. A Phase-Locked Loop (PLL) enables the receiver to generate or recover a local oscillator synchronized in frequency and phase to the incoming carrier (sometimes reconstructing a "phantom" carrier in suppressed carrier systems). The PLL compares the phase of the received signal and locally generated oscillator, adjusting the oscillator frequency in a feedback loop to maintain lock. It is applied in synchronous AM demodulators and digital communication demodulation to improve fidelity and noise immunity. Modern PLL ICs integrate phase-frequency detectors, charge pumps, VCOs (voltage-controlled oscillators), and digital frequency dividers for robust carrier recovery in a range of frequencies. They provide substantial improvement in signal-to-noise ratio (SNR) due to noise rejection in the in-phase (I) channel. They enable detection in severe fading and multipath conditions common in shortwave and HF radio.

DSP-Based Product Detectors

With the proliferation of high-speed digital signal processing (DSP), many product-detector functions are now performed numerically. With a digital product detector, the incoming signal is sampled and multiplied numerically with a synthesized LO, often generated in-phase and quadrature (for I-Q demodulation). Band-limiting/filtering is achieved with digital FIR/IIR filters. Carrier recovery and synchronization are implemented algorithmically, including Costas loops, PLLs, and advanced decision-directed carrier tracking. DSP-based product detectors provide flexibility for any modulation format (AM, SSB, FM, and digital modulations such as QAM, FSK, PSK, etc.). They are robust against component drift, temperature changes, and implementation errors. They are seamlessly integrated into SDR receivers/transceivers (e.g., those using FPGA or ARM cores for digital downconversion and demodulation).

I-Q (Quadrature) Product Detectors

The I-Q product detector is the cornerstone of modern radio. It is a special class of product detector that generates two baseband outputs—one in-phase (I) and one quadrature (Q)—by splitting the received signal and the LO into two channels with a 90-degree phase shift between them. Each branch multiplies the signal with its respective LO: The signal chain is: RF Input → mixer (LO in phase) → I output → mixer (LO 90° out of phase) → Q output. These outputs can be combined to reconstruct both amplitude and phase information of the received signal via vector processing, enabling demodulation of all AM, SSB, and many digital modulations, sideband selection (USB/LSB), frequency discrimination, and frequency-agile operation in SDRs. ✸

Next OCRACES Meeting: Sept. 8th at 7:30 p.m.

The next County of Orange RACES meeting will be for members only, on Monday, September 8, 2025, at 7:30 p.m., at the Orange County EOC at Loma Ridge. This will be a training meeting for OCRACES members on operating the radios in the Control 7 vehicle. Training will also include using file sharing and other features of the new members-only section on the OCRACES website.

While the September 8th meeting will be in-person for members only, the following meeting on Monday, October 6th, will be on Zoom and will be open to all county and city RACES, EmComm members, and any radio amateur interested in emergency communications. ✸

ARRL Book: *Stealth Antennas for Ham Radio*

ARRL's new book, *Stealth Antennas for Ham Radio*, includes designs for discreet amateur radio operating. It describes 28 unobtrusive stealth antennas to get you on the air no matter where you live. Even radio amateurs who live with antenna restrictions or covenant limitations will find solutions in this book. Learn how to install a multiband vertical that looks like a flagpole, or how to run an end-fed random wire along your roof, so the neighbors never notice. If you are looking for an invisible repeater connection, try the Ham Walking Stick. If you want five bands but cannot put wires in trees or have anything even remotely antenna-like, try the Compact Stealth Inverted L.

Stealth Antennas for Ham Radio will also help hams who want to stay unnoticed by neighbors. There are ideas for small lots, covenant-restricted properties, and many other living situations. Steve Ford, WB8IMY, kicks off the collection with safe, effective, and ethical stealth operation. "Stealth operating can be highly rewarding if you understand your limitations and work to alleviate them as much as possible," Ford says.

Stealth Antennas for Ham Radio is now shipping. Order from the ARRL online store or find an ARRL publication dealer; ARRL Item No. 2288, ISBN: 978-1-62595-228-8, $22.95 retail, member price $19.95. For additional questions or ordering, call 1-888-277-5289 toll-free, Monday through Thursday, 5 a.m. to 4 p.m., and Friday 5 a.m. to 2 p.m., PT. ✸

Use the Correct Call Sign When Identifying

It's common practice for an OCRACES member to use his own call sign when checking into an OCRACES net with his handheld transceiver, while at the Orange County EOC. The RACES station at the EOC is licensed to OCSD Emergency Management Division (as the Orange County Communicators Club), with W6ACS as the call sign. When using the equipment in that station, it's best to identify with W6ACS or with your call sign plus "at W6ACS." When using your handheld, you should use your own call sign, which is legal according to common interpretations of § 97.119 of the FCC Amateur Radio Service rules. Likewise, when operating at the station of another radio amateur, you should identify with his call sign, although something like "KX6XYZ at WB6ZYX" would be acceptable. When using your handheld radio at any location, use your own call sign.

One reason for using the call sign of the station you are at is so the FCC knows the source of a possibly poor signal that might emit spurious radiation. Likewise, if your handheld radio is emitting spurious signals, using your call sign would identify the equipment ownership.

If you are the control operator at a club or friend's station, you may identify with your own call sign (although the station's call sign is preferred). The FCC may need to know who is violating one of its rules while operating.

When operating as net control during a net or activation, or when communicating in a test with another RACES station (such as with San Diego County ACS), use the station call sign (W6ACS at Loma Ridge) if you are using the station's equipment. If appropriate, you may identify as "W6ACS with KX6XYZ, Bob, at the mic," for example, which is the protocol used during Cal OES nets. ✸

ASRU Members Train to Be Part of UAV Unit

by Eric Bowen, W6RTR

Back in February of 2022, I wrote an article about the Aero Squadron Reserve Unit (ASRU). A lot has changed within the unit since that time. There has been a change in leadership. The membership numbers have doubled. The frequency of missions has increased. The types of missions have also increased. The unit is still part of the Mutual Aid Bureau, administratively, but is now also under the Air Support Bureau, operationally.

With that operational change, it has also allowed members of the ASRU to be trained to be a part of the Unmanned Aerial Vehicle (UAV) unit. For those Reserve Deputies and PSRs with their FAA Part 107 certification, they can now be trained to fly UAVs, aka drones, for the Sheriff's Department. This new program is the first of its kind for the Reserve Program.

Back in January of 2025, seven UAV pilots in the ASRU completed the first part of their training to be certified to fly UAVs for the Sheriff's Department. This group of seven pilots consisted of four Professional Services Responders (PSRs) and three Reserve Deputies. This training consisted of classroom training and flight training.

The classroom training covered OCSD policies and procedures, as well as a review of FAA regulations and how they apply to OCSD policies. The Sheriff's Department adheres to the Part 107 federal rules and regulations, which are the same ones that all Part 107 UAV pilots adhere to. There was also extensive training on flight operations for daytime and nighttime flights and other topics.

The flight training was done on a day where there was some unusual weather patterns and it made for some challenging scenarios. The daytime flights consisted of testing the pilots' capabilities in maneuvering, flying patterns, spatial orientation, and pattern / grid searching. There was also a challenging indoor obstacle course. The nighttime

Two drones used in recent training by ASRU members.

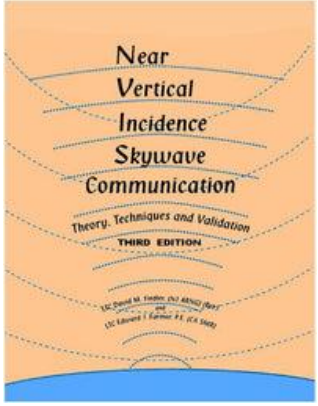
flights moved on to some more difficult scenarios that were based on what might be seen during patrol operations. This included locating a "stolen" vehicle and checking to see if it was occupied, locating a "lost" UAV and flying it back home, more spatial awareness testing, which is very difficult at night, familiarization with the UAVs' thermal imaging capabilities, and another, more complicated, indoor obstacle course. All seven pilots successfully completed the classroom training, flight training, and a difficult, written exam at the end.

UAVs are increasingly being used throughout the Department by patrol, HDS, SWAT, MART, MFF/SRT, and others. Since the initial training back in January, three UAV pilots have done training with the Sheriff's Response Team (SRT) and another participated in a training search with the Search and Rescue Reserve Unit (SRRU).

If you are an experienced UAV pilot, PSR, or Reserve Deputy, and are interested in finding out more about this program, you can contact me or attend the next ASRU monthly meeting. ✸

Book Covers NVIS Communication

The third edition of *Near Vertical Incidence Skywave Communication* by LTC David M. Fiedler and LTC Edward J. Farmer is a comprehensive guide to NVIS (Near Vertical Incidence Skywave) propagation, a technique for short-range HF communications, which is used during the Saturday morning (10:00 a.m.) OCRACES ACS net on 5371.5 kHz upper sideband. This edition, published by Jokalym Press in 2023, spans 164 pages and is particularly valuable for amateur radio operators and emergency communicators. Price: $20 at DX Engineering, Amazon, Walmart, etc.



NVIS is a propagation method that utilizes high-angle ionospheric reflection to enable reliable communication over distances typically ranging from 0 to 400 miles. This technique is especially useful when VHF/UHF frequencies are ineffective due to terrain or other obstacles. The authors draw from extensive military experience to provide insights into NVIS theory, practical applications, and validation methods. ✸

GMRS Is a Component of ACS

Included in the OCRACES members-only field drill on July 26, 2025, was a test of GMRS (General Mobile Radio Service) communications. Some radio amateurs unfortunately refer to GMRS as "G M aRen't uS," since it is not part of the Amateur Radio Service. Because OCRACES is an auxiliary communications service (ACS) of the Orange County Sheriff's Department, we need to be prepared to use many forms of communications during an emergency, including amateur radio, OCSD 800-MHz pack sets, other OCSD VHF/UHF frequencies (such as "Blue Channel" that is used by the Search & Rescue Reserve Unit), GMRS, FRS, MURS, and even CB.

Amateur radio is a hobby for those who like to experiment and to discover the many exciting aspects of radio communications. But it is also a service, with the capability of offering auxiliary or backup emergency communications. GMRS is not a hobby, but is also a communications service. When RACES members are looking for information from an affected area, such as canyon areas during a wildland fire, GMRS can be a valuable communications tool. Many residents in canyon areas rely on GMRS, and we need to be able to communicate with them. ✸

Icom Introduces IC-7300MK2 HF/50 MHz Radio

Icom has introduced the new IC-7300MK2 100-watt transceiver that covers HF and 50 MHz (6 meters) at the JARL at the Ham Fair in Japan on August 23-24, 2025. (A European version also covers 70 MHz.) Initial shipments are planned by the end of 2025.

The IC-7300MK2 is the next-generation of the popular, compact IC-7300 HF/50-MHz transceiver, which has sold 100,000 units globally.

The IC-7300MK2's RMDR is improved to about 105 dB typical (at 2 kHz separation) and transmit phase-noise characteristics are improved by about 12 dB (at 1 kHz frequency separation) compared to the previous model. The superior phase-noise characteristics reduce noise components in both receive and transmit signals.

Optimized DC power design results in receive standby current consumption reduced by about 23% (from 0.9 A to 0.7 A, typical), lowering heat generation.

Firsts for Icom HF radios include an HDMI port for connecting to a large external display. Operating information, such as frequency, scope, waterfall, and menus, can be shown on a large monitor, and audio can also be output through HDMI to the display's speakers.

Icom enhanced IC-7300MK2 HF/50 MHz transceiver, with typical external display.

The IC-7300MK2 has separate receive antenna IN/OUT SMA connectors for receive antennas, filters, and preamps.

A built-in LAN (Ethernet) port allows easy remote operation with optional RS-BA1; no server PC is required. The RS-BA1 (Version 2) software allows operation from a remote location within your home QTH, or from a remote location anywhere in the world. The radio can be turned ON or OFF through the internet.

A built-in CW decoder decodes Morse code without a PC or other external equipment. The decode filter automatically follows the target signal, and keying speed is automatically adjusted.

The IC-7300MK2 provides a USB Type-C port with dual virtual COM ports and audio input/output for two simultaneous applications such as FT8 and logging and contest operation, with just one USB cable.

The IC-7300MK2 has not been formally released by Icom for sale in the United States. This is pre-release information only. This unit has not yet been approved by the FCC for sale in the U.S.

✸

Countywide RACES/EmComm News

"RACES/ EmComm News" provides an opportunity to share information from all City & County RACES/ACS units and EmComm organizations and supportive amateur radio clubs in and near Orange County, as well as from Cal OES and federal agencies.

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

kbourne.ocsd@earthlink.net

Winlink P2P Exercise

by OCRACES Chief Radio Officer Scott MacGillivray, KM6RTE

Based on the successful previous exercises, the next countywide Winlink Peer-to-Peer (P2P) practice exercise is planned for Saturday morning, September 13, 2025. This exercise is an opportunity to gain experience using the Winlink P2P Operating Mode.

The exercise will again focus on sending a Winlink P2P message with an attached form to "Drill Ops" located at Loma Ridge in central Orange County. Details are fully described in the instructions currently being finalized and will be distributed prior to the exercise.

This is an informal practice exercise (organized by me) and not associated with any organization. Your participation is solely for your own personal benefit, and the exercise is not to conflict with any official city or county government activities.

Importance of Winlink P2P: For those not familiar with Winlink P2P, it is one of the four operating modes that Winlink supports and does not rely on intermediate Radio Message Server (RMS) or "gateway" for connection to the internet. It is valuable to understand how to operate this mode since it is expected to be a critical Winlink mode used after a major disaster when phone, text, and internet services are not available in our area. I highly recommend that you take advantage of this exercise to gain experience with P2P. However, make sure your Winlink equipment can operate using Conventional Mode (i.e., using local a "gateway") before participating in this drill. The main purpose of this drill is not to verify that your Winlink equipment works but instead focuses on becoming familiar with how to operate P2P mode.

You are encouraged to contact other individuals and organizations that you feel might be interested in taking advantage of this practice exercise. This includes any operators that can reach Loma Ridge (Central Orange County) directly or through a Winlink gateway operating as a relay.

For more information on Winlink Global Radio Email: https://www.winlink.org/.

Orange County Mesh

Bill Kreutinger, KM6SLF, Chief Radio Officer & Technical Director, Tri-Cities RACES, said that OC Mesh needs to put together a team of power-users, network administrators, application and web developers, and EmComm group leaders so that OC Mesh can collaborate, test, troubleshoot, document, and help push things forward. Email km6slf@gmail.com if you are interested in working with OC Mesh and have application development skills.

Orange County Amateur Radio Club (OCARC)

The next meeting of the Orange County Amateur Radio Club will feature a presentation by members Ron Mudry, W6WG, Dave Ginsberg, N3BKV, and Nicholas Harban, AF6CF. They will be talking about their remote ham station in the wilds of the high desert. With it they can operate from their airconditioned homes and transmit and receive from a low-noise and more ideal location. The meeting will be on Friday, September 19, 2025, at 7:00 p.m., at the American Red Cross (George M. Chitty Building), 600 Parkcenter Drive, Santa Ana). Members will be able to check in on Zoom from home for this meeting. Online visitors can receive Zoom sign-on information on the day of the meeting by an email link that will be provided at OCARC's web site (https://w6ze.org/) after 9:00 a.m. PDT.

San Bernardino Microwave Society (SBMS)

The next meeting of the San Bernardino Microwave Society will be on Thursday, September 4, 2025, at 7:00 p.m. PDT, at the American Legion Hall, 1024 S. Main Street, in Corona. To watch the SBMS meeting live, go to the American Television Network Live on YouTube and click on the "Live Now" window. To participate in meetings via Zoom (when available), use this ID and Passcode: Meeting ID: 886 9217 9521; Passcode: 10368310, or this link: https://us02web.zoom.us/j/88692179521?

September 2025

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 Labor Day	2	3	4 San Bernardino Microwave Society Mtg	5	6 Weekly 60 m ACS Net
7	8 Weekly 2 m ACS Net & OCRACES Meeting	9	10	11	12	13 Weekly 60 m ACS Net
14	15 Weekly 2 m ACS Net	16	17	18	19 Orange County Amateur Radio Club Meeting	20 Weekly 60 m ACS Net & P2P Winlink Drill
21	22 Weekly 2 m ACS Net	23 OC AuxComm Advisory Group	24	25	26	27 Weekly 60 m ACS Net
28	29 Weekly 2 m ACS Net	30				

Upcoming Events:

- **September 1:** Labor Day
- **September 4, 1900 hours:** San Bernardino Microwave Society Meeting, American Legion Post #216, 1024 S. Main Street, Suite B, in Corona
- **September 8, 1930-2130 hours:** OCRACES Meeting on Zoom (members only)
- **September 19, 1900 hours:** Orange County Amateur Radio Club meeting, American Red Cross (George M. Chitty Building), 600 Parkcenter Drive, Santa Ana
- **September 20:** P2P Winlink Exercise
- **September 23, 1900-2100 hours:** OC AuxComm Advisory Group

Mission Statement

■ **To provide emergency communication services for the County of Orange under the guidance of the Orange County Emergency Manager and Emergency Management Division Personnel**

■ **These services include, but are not limited to:**

- **Support to the County of Orange Emergency Management Division with auxiliary communications capabilities from County Emergency Operations Center radio room and field locations to and from:**
  - **The general population,**
  - **Orange County city RACES, EmComm, and Public Service organizations,**
  - **Adjacent counties, and**
  - **State and Federal Government organizations**
- **Provide voice and digital communication services in the event of the loss of existing communications infrastructure including public service radio services, cellphone service, internet service, conventional power, and any combination of these services**

County of Orange RACES Frequencies

60 m: 5371.5 kHz USB (dial) (Channel 4) (OC ACS Net—Saturdays, 1000 hours)
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) (down)
*Primary Net—Mondays, 1900 hours

OCSD RACES Coordinator
Lee Kaser, KK6VIV, (714) 628-7081

Chief Radio Officer
Scott MacGillivray, KM6RTE, (714) 392-9095

Assistant Chief Radio Officer
Joe Selikov, KB6EID

Radio Officer
Scott Byington, KC6MMF

Assistant Radio Officer
Randy Benicky, N6PRL

Chief Radio Officer Emeritus
Ken Bourne, W6HK

County of Orange RACES

Orange County Sheriff's Department, Emergency Management Division
2644 Santiago Canyon Road, Silverado, CA 92676-9791
Telephone: (714) 628-7081 • Fax: (714) 628-7154
Email: LKaser@OCSheriff.gov

County of Orange RACES

OCSD Emergency Management Division
2644 Santiago Canyon Road
Silverado, CA 92676

Telephone: (714) 628-7081
Fax: (714) 628-7154
E-mail: LKaser@OCSheriff.gov

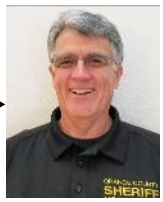
Visit Our Web Site
https://ocraces.org
It's Where It's @!

Questions or Comments?
Contact *NetControl* Editor Ken Bourne, W6HK
kbourne.ocsd@earthlink.net

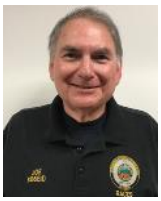
"W6ACS ... Serving Orange County"

Meet Your County of Orange RACES Members!

Officers →



Scott MacGillivray
KM6RTE



Joe Selikov
KB6EID

Scott Byington
KC6MMF

Randy Benicky
N6PRL

OCSD RACES Coordinator →

Lee Kaser
KK6VIV

Heide Aguire
K3TOG

Joel Bishop
AJ6ZP

Ken Bourne
W6HK

Eric Bowen
W6RTR

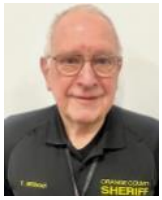
Bill Ehart
KM6ZHO

Bill Griffin
KO6JHY

Ted Lavino
KG6LZP

Steve Livingston
NJ6R

Ron Mosher
K0PGE



Fran Needham
KJ6UJS

Chi Nguyen
KE6MVS

Dick Palm
KN6RVU

Lance Rzepiejewski
KO6CXL

Robert Stoffel
KD6DAQ

Chuck Streitz
KK6HFS

Ken Tucker
WF6F