

September 2014



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

### FM Capture Effect

The FM capture effect is a phenomenon that can effect RACES communications. In FM reception, only the stronger of two signals on the same frequency will be demodulated. It's as if the weaker signal didn't even exist when two stations are "doubling." For that reason, OCRACES net control, when standing by for applicants or visitors, should acknowledge check-ins by call sign, rather than just saying "Roger." Otherwise, the checking-in station does not know if he/she is being acknowledged by net control, or if net control is acknowledging a station that doubled with a stronger signal.

In a capture-effect condition, the weaker signal is completely suppressed at the FM receiver's limiter or demodulation stage. The weaker signal, then, is attenuated rather than amplified. If both signals are at or near equal in strength, they will interfere with each other and be unreadable. If then one and/or the other begins to fade, the receiver will probably switch from one signal to the other.

Receivers will vary in the signal-strength difference required to cause the capture effect. Commonly, a 3-dB or higher difference will cause the stronger signal to completely suppress the weaker signal. A receiver's *capture ratio* is the measure of how much that receiver rejects a weaker second signal on the same frequency. It is the lowest ratio of the power of the two signals that causes complete suppression of the weaker signal.

Capture effect does not exist in AM or single-sideband receivers. Two AM signals near the same frequency will produce a beat note ("heterodyne") of an audio frequency equal to the frequency difference of the two AM carriers. For example, an AM signal on 50.400 MHz and another on 50.401 MHz will produce an audible beat note of 1 kHz. The weaker signal will not be suppressed, and both signals will interfere with each other. If one signal is *much* weaker, interference to the stronger signal will be minimal. If all AM signals on a frequency are not extremely different in strength, it will be quite obvious at the receiver that more than one signal is present. For that reason, the aviation industry has chosen to remain with the AM mode rather than FM. Air Traffic Control needs to know that more than one aircraft needs to communicate, which would not be obvious in the FM mode if one signal completely suppresses all weaker signals in the receiver.

Unless detection of multiple signals is needed (as in the aviation industry), the capture effect of FM is normally advantageous over the lack of such effect on AM, to suppress interference from weaker stations. Furthermore, an AM receiver detects short-term amplitude changes, and is susceptible to pulse noises (such as power-line and ignition noise) and lightning crashes. An FM receiver typically has an AM limiter stage to eliminate detection of short-term amplitude changes, and ignition noise or power-line noise is not as severe a problem. However, severe pulse noise will affect overall effective sensitivity.

The Next  
OCRACES  
Meeting Is

September 8, 2014  
1930 Hours

840 N. Eckhoff Street,  
Suite 104, Orange

Delia Kraft on  
800 MHz Operating  
Procedures



Orange County Sheriff's Department  
Communications & Technology Division

## Ken Bourne Receives OCSD Gold Star Award

*by RACES Sergeant Bob McFadden, KK6CUS, Assistant Radio Officer*

Meet Ken Bourne, W6HK: Ken is an ambassador for amateur radio and was first licensed in 1956. He enjoys experimenting with new technology and is continually fascinated by the technology that he has worked with practically his entire life. Ken stays in touch with many amateurs in the area through frequent meetings, telephone conversations, e-mail, radio QSOs, swap meets, and luncheons while always being available to share his time and knowledge with everyone.

Being a 6-meter aficionado, Ken demonstrates a real fondness for the “magic band.” He is always searching for the right band opening in hopes of someday making contact with Zimbabwe while operating portable with his new 6-meter beam antenna. Ken has rejuvenated the art of transmitter hunting in the local area by promoting monthly cooperative T-hunts as an exercise in locating interference.

Ken volunteers countless hours to the Orange County Sheriff’s Department in many ways. Being the Chief Radio Officer for OCRACES, Ken demonstrates excellent leadership skills and mentors numerous people every day. This job takes hard work, dedication, and long hours with a laundry list of never-ending tasks, yet Ken finds a way to deliver. As if that weren’t enough, Ken is also part of the OCSD Reserve Bureau’s Professional Services Responder (PSR) program and a member of the High-Tech Services Reserve Unit. He also assists with the Orange County Sheriff’s Museum, including maintaining the Web site.

I am proud to know Ken and call him a friend. I am also proud to know that he is the recipient of the OCSD Gold Star Award. The Gold Star Award is given to individuals who exemplify the mission of the Department and go above and beyond in the line of duty, which Ken certainly has done. Congratulations Ken!



Sheriff Sandra Hutchens presents the OCSD Gold Star Award to OCRACES Chief Radio Officer Ken Bourne, W6HK, on Tuesday, August 26, 2014, at the Brad Gates Building in Santa Ana.



At the August 26th Gold Star ceremony were (standing, left to right) Scott Byington, KC6MMF, Fran Needham, KJ6UJS, Chuck Dolan, KG6UJC, Tom Wright, KJ6SPE, Bob McFadden, KK6CUS, Gene Thorpe, KB6CMO, Don Bourne, KB6TVK, Cheryl Thorpe, KE6TZU, Ken Bourne, W6HK, Carol Bourne, N6YL, Sue Mickelson, KJ6LCJ, Bob Bourne, K6RBI, Ray Grimes, N8RG, OCSD Communications & Technology Division Director Robert Stoffel, KD6DAQ, and (kneeling) Sarah, Allie, Sam, and Emmy Bourne (Don’s wife and kids). Photos by OCSD Emergency Communications Manager Delia Kraft, KF6UYW.

## Next OCRACES Meeting: September 8th

The next County of Orange RACES meeting is on Monday, September 8, 2014, at 7:30 PM, at 840 N. Eckhoff Street, Suite 104, in Orange. OCSO Emergency Communications Manager Delia Kraft, KF6UYW, will discuss operating procedures when using the County's 800 MHz portable radios and the Motorola Centracom console on the County-wide Coordinated Communications System (CCCS) and other public-safety frequencies.

## Next City/County Meeting: September 15th

The next City/County RACES & MOU Meeting is on Monday, September 15, 2014, at 7:15 PM, at 840 N. Eckhoff Street, Suite 104, in Orange. At this meeting we will discuss the scenario for the October 4th City/County RACES & MOU Drill. Those attending will give a brief report of their agency's latest activities.

## Next City/County Drill: October 4th

The next City/County RACES & MOU Drill is on Saturday, October 4, 2014, from 9:00 AM until 11:00 AM. Drill plans and the scenario for this drill will be discussed at the September 15th City/County RACES & MOU Meeting. Unless we change the plan, we will once again conduct three exercises during the drill—a general message blitz, simplex contacts, and Winlink. (The County's Winlink system is currently fully operational, with the three RMS sites connecting to the CMS sites via the Internet. Stations may communicate via the W6ACS-10, -11, and -12 UHF RMS sites or via telnet.) Additional drill details will be provided in the next two issues of *NetControl* and via e-mail to the ocsd-races Yahoo! Group.

## General Election Ballot Comms: November 4th

City and County RACES and MOU units will provide communications for ballot transportation from the Collection Centers to the Vote Tally Center on Tuesday, November 4, 2014, at the close of the General Election. Training for this activity will occur at the November 3rd OCRACES meeting at 7:30 PM at 840 N. Eckhoff Street, Suite 104, in Orange.

## MARRITE: November 18th

OCRACES plans to participate on November 18, 2014, in what was previously known as "Radio Rodeo." The event will now be called the Multi-Agency Regional Radio Interoperability Training Exercise (MARRITE). The Orange County location has not yet been determined, but OCRACES members are urged to save the date. Besides our RACES vehicle, OCSO Communications & Technology Division Director Robert Stoffel, KD6DAQ, anticipates participation from Samantha II and the Division's Support Trailer.

## Appreciation Certificates Awarded for B2V

Sheriff Sandra Hutchens presented certificates of appreciation to OCSO Emergency Communications Manager Delia Kraft, KF6UYW, and the following OCRACES members for providing communications for the Baker to Las Vegas Challenge Cup Relay on the weekend of March 22nd and 23rd, 2014: Sgt. Jack Barth, AB6VC, John Bedford, KF6PRN, Randy Benicky, N6PRL, Martin La Rocque, N6NTH, Sgt. Bob McFadden, KK6CUS, Sue Mickelson, KJ6LCJ, Tom Riley, K6TPR, and Lt. Ralph Sbragia, W6CSP. The certificates read: "Certificate of Appreciation for participating as a member of the Orange County Sheriff-Coroner Department Running Team at the Baker to Vegas Challenge Cup Relay Race 2014."

## WA6TWF Hides in Fullerton

OCSD Senior Communications Technician David Corsiglia, WA6TWF, was the fox on the cooperative T-hunt on Monday, August 11, 2014. Hiding with David was OCSD Telecommunications Engineer III Brad Russo, KB6GPM, and John Luthy, N7JL. They were in a parking lot just southwest of Laguna Lake in Fullerton, and hid their fox box behind a dumpster on a trail near the parking lot. All hunters had portable direction-finding equipment, and found the fox box quickly after a short walk. A hill to the northeast of the fox's den effectively blocked the signal to arriving hunters. The signal became strong only after maneuvering over to Lakeview Drive. It was an excellent location—not too tricky for beginning hunters, but enough of a challenge to make it interesting and fun for everyone. Hunters compared bearings on the 449.100 MHz repeater, enabling all hunters to reach



Ron Allerdice, WA6CYY (left), talks to the fox, David Corsiglia, WA6TWF.

the general area within a few minutes after the hunt began.

The first hunter to find the fox was Ron Allerdice, WA6CYY, from Costa Mesa. Bob McFadden, KK6CUS, from OCRACES, was next, followed by Joe Moell, KØOV, from the Hospital Group. Next was the MESAC team, consisting of Patrick Williams, KJ6PFW, Tom Pastore, N6HAM, Terri Fuqua, KJ6QOC, and Bill Rose, KA6HMS (HBRACES). Shortly after that, Ken Bourne, W6HK, from OCRACES, arrived, with his friend and neighbor Roger Kepner, W6SQQ, who brought along his own portable DF equipment that he had used several years ago on challenging Saturday night hunts.



Patrick Williams, KJ6PFW (left), and Bill Rose, KA6HMS.

We encourage participation in the Southern California Saturday night hunts for those who want greater challenges over wider areas. Those hunts are based on mileage from a specific starting point (lowest mileage wins). For more information, see <http://www.thunter.org>. Another interesting hunt is held by SOARA on the second Sunday of each month (except December) at 1:00 PM. There is no starting point, and the winner is the first hunter to arrive. See <http://www.soara.org/activities/transmitter-hunting/>. The Saturday night and SOARA hunts are on 146.565 MHz, the standard Southern California T-hunt frequency. Our second-Monday cooperative T-hunts are on the input (146.295 MHz) of the OCRACES repeater. This allows hunters who cannot hear the fox at the beginning of the hunt because they are out of range to know that the fox is transmitting, by listening to the output (146.895 MHz) of the repeater. After changing location, they will then, hopefully, hear the fox on the input and take a bearing. Tones from the fox box, going through the repeater, will trigger the curiosity of those who have never participated in a T-hunt, and will cause some to want to join in on the fun next time. We have no specified starting point. By comparing bearings on the 449.100 MHz repeater and beaconing their locations via APRS, hunters gain valuable practice in working together to quickly locate interference, not only to RACES repeaters but also to other public-safety frequencies.

Because of Labor Day and the next OCRACES meeting being held on the second (rather than first) Monday of September, there will be no cooperative T-hunt in September. The next hunt will be on Monday, October 13, 2014, immediately following the OCRACES 2-meter net, at about 7:20 PM. The fox and location (city or county quadrant) will be announced in the October issue of *NetControl* and elsewhere.



Ken Bourne, W6HK (left), uses a loop to locate the fox box, while Roger Kepner, W6SQQ, uses his "tape measure" yagi.

# An Arduino Doppler RDF

by OCRACES Member Ken Tucker, WF6F

*This is an excerpt of an article that Ken Tucker sent to QST/QEX. Space does not permit including all text, photographs, schematics, and software programs in this issue. To review his entire paper, please contact Ken directly at [tucker180@cox.net](mailto:tucker180@cox.net).—Editor.*

About a year or so ago, I became familiar with what's called an Arduino. It all started with a gift card burning in my hand one day at the local Radio Shack. Now we all know there's a lot you can do with a gift card there, but what really caught my eye was this thing that was a programmable microcomputer with lots of I/O ports. Knowing that whatever code I was eventually going to write would be terribly inefficient, it was an easy decision to opt for the bigger memory version called the Arduino Mega 2560.

Arduino describes the Mega 2560 as "... 54 digital input/output pins (of which 14 can be used as PWM outputs), 16 analog inputs, four UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started."

When I got home, opened the package, and read the brochure, the first of many pleasant surprises hit me. Despite the fact that there was no manual—just a reference to the Arduino Web page <http://www.arduino.cc/>—there turned out to be an amazing downloadable C-compiler including many, many excellent coding examples and extremely well-done Reference and Help pages. Very impressive indeed.

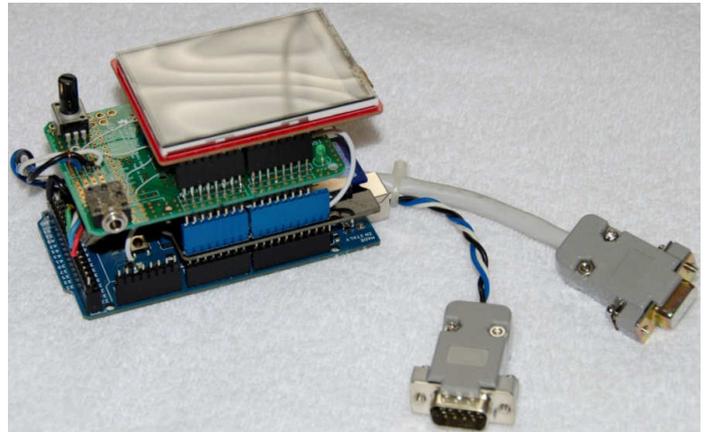
Well, now fast-forward to a few thousand lines of code and a dozen projects later to the Arduino Doppler radio direction finder (RDF). One of the lessons that I learned early in writing my C-code for the Arduino was to make it as modular as possible. So everything became either a subroutine or a function making it extremely easy to incorporate small blocks of code that could be independently written and tested. This made the coding straightforward by keeping each subroutine relatively short, and easy to write in a limited amount of time. All of the coding is done with the special free Arduino-supplied C compiler on my home PC and downloaded to the Mega 2560 via the USB port. Once the code is in the Arduino and disconnected from the PC, it stays there with each power on/off cycle, automatically restarting itself each time. This was the portability I was looking for.

Arduino has what are called shields that physically stack on top of one another and are all controlled by the Mega 2560. Each shield serves a specific function. So, my RDF has a TFT touch shield for displaying a radar-like display; a shield for writing log data to an SD memory card; and another shield for reading NMEA data from a GPS as well as processing the audio output of my 2-meter VHF radio.

The Mega 2560 has digital I/O pins that control the on/off switching of the Doppler antenna and analog pins to read pot voltages that control the radar display and audio sampling.

All of this was very impressive for a small, relatively inexpensive microcomputer, but the truly amazing aspect of the Arduino has been its ability to digitally process the switched antenna signals. It has been so easy to implement digital filtering, both positive and negative slope zero-crossing algorithms, and have Doppler processing as well as TDOA analysis. In reality, this project could have been completed a lot sooner if it weren't for all of the fun and interesting experimental tangents I had with the Arduino. At one point, there was the entire C math library including Fourier transforms (FFT) running on this little microcomputer *and* controlling the antenna. Amazing.

The Doppler antenna that I built is based on designs from Clinton Turner, KA7OEI. His "Base"-mounted design is made up from four half-wave dipoles instead of the usual quarter-wave whips. Each brass dipole element is mounted at a corner of an 18 inch square. Construction was all PVC and brass rods. The rods were inserted into a drilled and tapped 1/2 inch pipe plug which was screwed into the PVC fittings.



The completed prototype Arduino Doppler RDF with touchscreen display, SD memory card, GPS input, antenna switching control, and VHF radio audio input. The RDF radar display shows current signal position in red and recent positions in yellow. The display also shows relative bearing, signal strength, current time, and position. Touching the "Reset" button clears the screen of recent data.

# RACES/MOU News from Around the County

**"RACES/MOU News" provides an opportunity to share information from all City & County RACES/ACS units and MOU organizations in Orange County.**

**Please send your news to NetControl Editor Ken Bourne, W6HK, at: [w6hk@ocraces.org](mailto:w6hk@ocraces.org)**

## Mission Viejo RACES

The guest speaker at the Mission Viejo RACES-ARES meeting on Tuesday, September 30, 2014, from 7:00 PM to 9:00 PM, will be Carl Gardenas, WU6D, ARRL Orange Section Manager (Inyo, Orange, Riverside, and San Bernardino Counties). Those planning to attend should RSVP Radio Officer Charley Speelman, WA6RUZ, at [wa6ruz@gmail.com](mailto:wa6ruz@gmail.com).

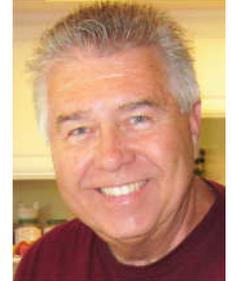
## Orange County RACES

We are happy to extend a "Welcome back" to Kenan Reilly, KR6J. He became an OCRACES member in May 2010. About a year and a half ago, Kenan moved to San Diego to accept a position with the San Diego County Sheriff's Department as a Telecommunications Technician Trainee. Recently, Kenan became a Communications Technician II with the Orange County Sheriff's Department, Communications & Technology Division, Mobile Systems Unit—Service, and has moved to Foothill Ranch with his wife Poay and son Gavin. His membership in OCRACES is reestablished, and he is happy to be serving with us once again. Kenan is an excellent contest operator and plans to add contesting excitement to our Field Day efforts next year. Kenan holds a BS in Criminal Justice from Cal State Long Beach and an AS in Electronics Engineering Technology from Orange Coast College.



OCRACES is pleased to welcome Tom Wright, KJ6SPE, as a new member. He said being prepared to survive natural or civil emergencies was imbedded in him as a young man raised in a small town in Oregon, where he learned basic survival skills, hunted and fished, and was a Cub Scout and Boy Scout Webelos. In 2009 he completed CERT training to be better prepared to help his family and neighbors in the event of an emergency. Effective communications is important in any emergency, so it seemed

only fitting to Tom that he learn as much as he could about options. As an "off-roader," Tom said CB and GMRS radios have been very useful, but are "line of sight" communications systems. In his boat a marine VHF radio provides weather alerts and emergency communications, but it too has limitations. Recognizing the limitations of these radios,



and to honor his grandfather, Elwyn Nutt, WIADR, who was a well known ham in New Hampshire, Tom earned his amateur radio Technician license in 2011, and his General license in 2013. He uses a Yaesu FT-60R/E dual-band portable radio, and plans to add mobile and base units. Tom resides in Yorba Linda.

## Orange County Fire Watch

Thanks to Kevin McArthur, KK6JSG, Fire Watch Coordinator, Irvine Ranch Conservancy, for providing the annual OCRACES Severe Fire Weather Patrol training at the OCRACES meeting on Monday, August 4, 2014. Assisting Kevin was Jennifer Bower, Assistant Fire Marshal, Orange County Fire Authority. Kevin covered such subjects as the stages of a Red Flag Alert and Warning, wildland fire behavior, Fire Watch activation, what to bring on a fire patrol, what to do and not do during a fire patrol, how to report a fire or suspects, etc.



Irvine Ranch Conservancy Fire Watch Coordinator Kevin McArthur, KK6JSG, at August 4th OCRACES meeting.

# September 2014

Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1 <i>Labor Day</i>	2	3	4	5	6
7	8 <i>OCRACES Meeting &amp; Weekly ACS Net</i>	9	10	11	12	13
14	15 <i>City/County Meeting &amp; Weekly ACS Net</i>	16	17	18	19	20
21	22 <i>Weekly ACS Nets &amp; SWACS Freq Test</i>	23	24	25	26	27
28	29 <i>Weekly ACS net</i>	30				

## Upcoming Events:

- **September 1:** Labor Day, no meeting, no net
- **September 8:** OCRACES meeting (presentation on 800 MHz CCCS operations), 1930, 840 N. Eckhoff Street, Suite 104, Orange; no cooperative T-hunt this month
- **September 15:** City/County RACES & MOU Meeting, 1915, 840 N. Eckhoff Street, Suite 104, Orange
- **September 22:** 2-m/70-cm/6-m/1¼-m ACS nets and SWACS frequency/radio test
- **October 4:** City/County RACES & MOU Drill, 0900-1100
- **November 4:** Communications for General Election ballot transportation, 2000
- **November 18:** Multi-Agency Regional Radio Interoperability Training Exercise (MARRITE)



[www.ocraces.org](http://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

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: 147.480 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: 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)  
 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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 Ralph Sbragia, W6CSP

[Assistant Radio Officers \(Sergeants\)](#)  
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 Ernest Fierheller, KG6LXT  
 Bob McFadden, KK6CUS  
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## County of Orange RACES

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**“W6ACS ...  
Serving  
Orange County”**

## Meet your County of Orange RACES Members!



Ken Bourne  
W6HK



Scott Byington  
KC6MMF



Harvey Packard  
KM6BV



Ralph Sbragia  
W6CSP



Delia Kraft  
KF6UYW



Marten Miller  
KF6ZLQ



Robert Stoffel  
KD6DAQ



Jack Barth  
AB6VC



Jim Dorris  
KC6RFC



Ernest Fierheller  
KG6LXT



Bob McFadden  
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Tom Tracey  
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John Bedford  
KF6PRN



Randy Benicky  
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Bill Borg  
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Chuck Dolan  
KG6UJC



Nancee Graff  
N6ZRB



Ray Grimes  
N8RG



Walter Kroy  
KC6HAM



Martin La Rocque  
N6NTH



Sue Mickelson  
KJ6LCJ



Fran Needham  
KJ6UJS



Kenan Reilly  
KR6J



Tom Riley  
K6TPR



John Roberts  
W6JOR



Joe Selikov  
KB6EID



Ken Tucker  
WF6F



Brian Turner  
KI6WZS



Tom Wright  
KJ6SPE