



**Meeting location!** East of Hwy. 41 on Shaw Av. 7 P.M. on the second Friday of the month at the University of California Center at 550 E. Shaw.



**FARC General Meetings**  
are held the 2nd Friday of each month, 7 p.m. at the University of California Center on Shaw Ave. unless otherwise noted. Stay tuned in for new announcements.

**2019 FARC BOARD MEETING DATES**  
1st Tuesday of each month at 2 P.M., this month at WB6VRJ's QTH

**FARC Nets**  
Morning Drive Time Net:  
Weekday mornings-7:30—8:00 a.m.

W6TO/R 146.940  
**FARC Net:**  
Sundays @ 7:00 pm  
W6TO/R 146.940  
**Web page:**  
W6to.com



Pat, W6YEP, our speaker for the May meeting, has an interesting insight to the history of not only the FARC, but also ham radio manufacturing in the USA in the 1950's and 60's. This is one of the fascinating USA radios, both ahead of it's time and just about to be eclipsed by the future that Pat will bring to the meeting.

## Fresno Amateur Radio Club

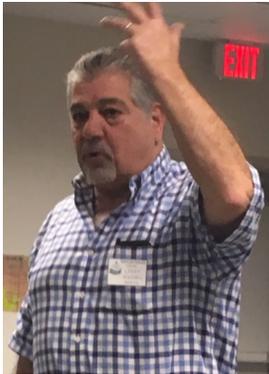
January: Ken, WA6OIB, led a good presentation on the stations at W1AW, ARRL headquarters.

The February meeting had a presentation by Jim, W6NIF, who has found a way to take old computer power supplies, and make them useful for 12v 15 amp power supplies

The March program was a very interesting video on the beginnings of USA ham licensing.

April brought us a program on oil and oil changes by our member with great insight on this, Larry, W6OWL.

The May meeting program will be presented by Pat, W6YEP, on the origins of the FARC and the universe.



The June meeting is traditionally a FD meeting. FD chairman Dennis, KI6NVG, will preside.

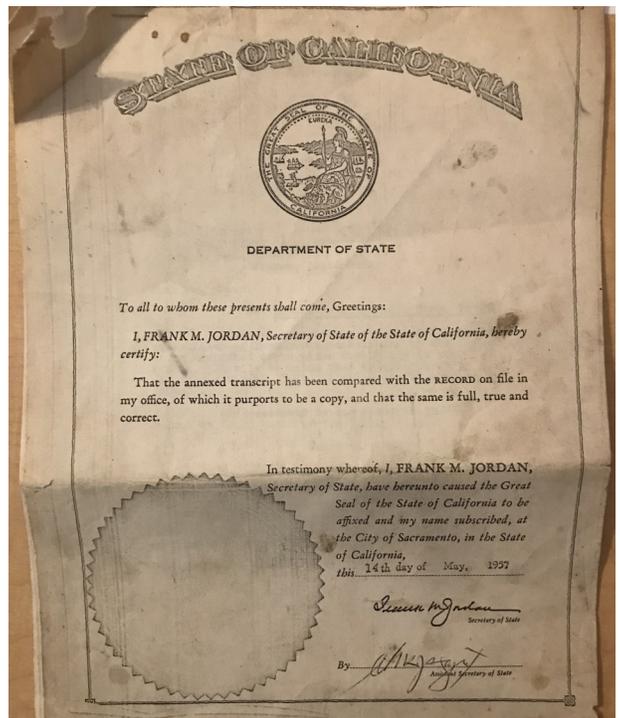
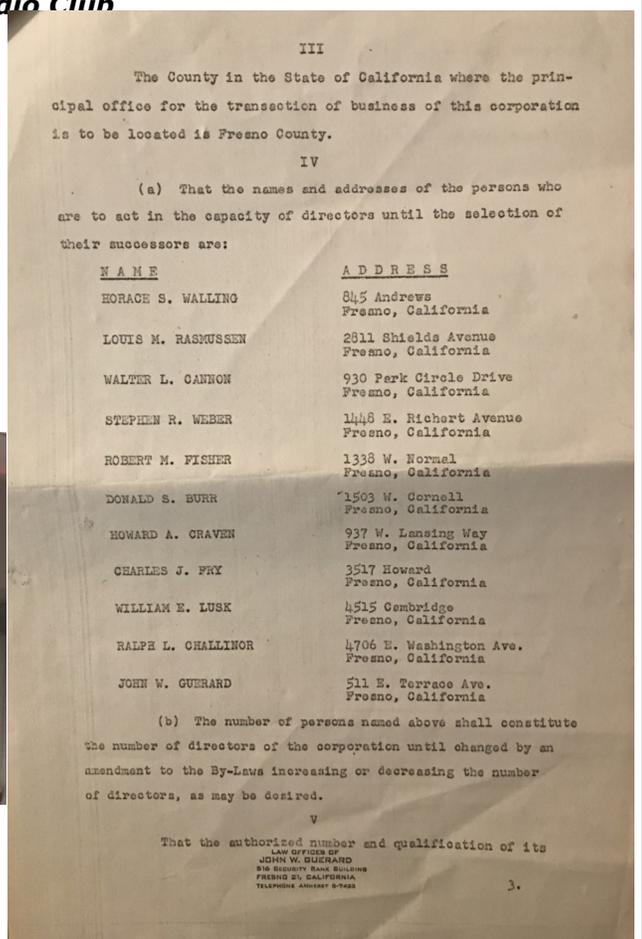
July is quite often "Old Radio and Ice Cream" night. Stay tuned to see what happens this year.

August is club picnic month, hosted in past years by WA6OIB and WA6VZM.

November meeting is a Sat. Swapmeet in place of the regular meeting.

December brings us to the banquet.

***The original incorporation papers for the Fresno Amateur Radio Club will be presented at the May meeting with a talk by Pat, W6YEP, who holds the papers and knows the people who signed them. Who was W6TO? All will be revealed.***



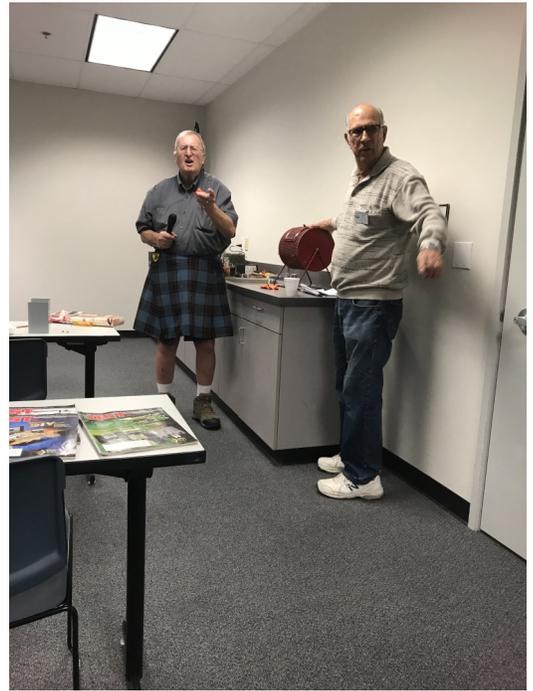
PREZ SEZ:

I found an old binder that had a bunch of pages I had taken out of CQ magazine-dating back to 1999 through 2004! How things have changed! From the 6AQ5 tube through the 2N3904 transistor to the CHIP! From soldering all those wires to mounting a chip in a board and soldering those leads! Wow! Hee heee-going from the 100 Watt soldering gun to some low-wattage thingy-how things have changed for this old timer!

But one thing has NOT changed—the camaraderie of speaking with other hams, whether in CW or voice [even that mode has changed] has NOT changed. Hams are the friendliest people on earth, so far as I know. I am sure that all of you hams out there have experienced that as well—whether it is a ham in another state, or in another country or some DXpedition, hams are always friendly and a good QSO is sure to come about.

I see it here in our own club—so many different pursuits, but all aimed at the same thing—being friendly to others, even as we pursue our technical knowledge—always ready to help the newcomer, or one wanting to switch to a different method—ELMER is always there.

To all of you, without reservation or hesitation, I say THANK YOU. You folks are simply great. **W. Stuart Home WB6VRJ**



From Ted, W6TLM:

Spent yesterday morning at a memorial service for Miles (K6KDM) Humpheys' wife, and yesterday afternoon at one for Bob Allen, WA6ITN.

Bob passed away on March 20. He was a club member in years past and was on the board.

At our last Club meeting, we had a visitor from Australia, Armen, KF6RCW aka VK2EN. He lives in Sydney. Armen comes to town every so often to visit relatives and friends. Was nice seeing him again at our Club meeting.

In the same photo is Karen, KI6OS, one of our newest member and loves CW. Right

now she is hoping to put up an HF antenna to get her fist pounding away, making those wonderful contacts. Maybe she will join us during our upcoming Field Day. Welcome to the FARC Karen.



### FARC

Send your dues check to FARC, PO Box 5912, Fresno 93755-5912

Board meeting on the first Tuesday at Stu's place.

**Fresno Amateur Radio Club**

**AMATEUR RADIO EXAMS  
IN FRESNO**

Exams given for **TECHNICIAN, GENERAL, and AMATEUR EXTRA**

Sponsored By the **FRESNO VE TEAM**

And The **FRESNO AMATEUR RADIO CLUB, INC.**

**2019**

Exams for all Amateur license classes will be conducted on the following dates in Fresno California. All exams are given on Saturday and begin at 9:30 AM.

**May 18 August 17 November 16**

LOCATION: ....St. James Episcopal Cathedral, 4147 E. Dakota, Fresno CA 93726

DIRECTIONS: This is at the northwest corner of Cedar and Dakota in Fresno. Enter the campus from Dakota. There is a large parking lot. Exams are given in Room 2.

Theory exams are multiple choice. First Class mail is used to send paperwork to ARRL, who sends data to FCC via electronic mail, thus assuring the fastest possible service on new licenses, which typically are posted to the FCC database by the end of the second week following the exam.

**BRING.** Two ID's, one with photo. Taxpayer ID Number (Social Security Number), or FCC Registration Number (**preferred**). Fee **\$15.00** per test session. Bring exact change. **Original and copy of Amateur License.** Talk in on 146.94 repeater.

Walk in's only, no pre-registration. More Info?? Contact Charles, (559) 431-2038

## **Honda Portable Generators Recalled Due to Potential Fire Hazard**

*04/15/2019*

American Honda has announced that it's voluntarily recalling some 200,000 of its portable generators sold in the US due to a potential fire and burn hazard.

The recall includes only the EU2200i, EU2200i Companion, and EB2200i generators.

The US Consumer Product Safety Commission (CPSC) says the affected portable generators can leak gasoline from the fuel valve. Users should stop operating the recalled generator and contact an authorized Honda dealer for a free repair. Honda is also contacting users directly. For more information, **visit the CPSC website**. A similar recall has been issued in Canada.



## **Fresno Amateur Radio Club**

The April Saturday for the combined second running of the N6MTS estate sale and the CARP swap meet was cold and grey, with light rain. The crowds didn't turn out, but the faithful were there, taking care of buying and selling, visiting, and a bit of just giving things away.

Much of what was left of the MTS estate went up to the Turlock auction several weeks later.

The next swap in our area would be the second week in November.





## **Fresno Amateur Radio Club**

I made a CW QSO today with KE4TS on a little QRX 5Watt QRP rig that I made from a kit. I actually ordered this kit in January before I started on studying for my license, but it only came in the mail two weeks ago.

I was operating at the park on battery, had 1.7 watt output and was mostly just listening. I answered someone calling CQ, but didn't expect to get a response since I was using so little power and his signal was weak.

He responded with my call sign and a signal report of 449! I looked up his call sign on QRZ and see he is in NC. I never thought it was possible to communicate over such a long distance with so little power. I hope he confirms my contact!!! This is such a cool hobby.

My daughter's name is Celestina Moore, age 9.

73, Brian KM6ZYC (new club member, with his daughter pictured below). (She can send and receive code at 10 WPM)



## **Fresno Amateur Radio Club**

ARLX004 Amateur Radio in Space Pioneer Astronaut Owen Garriott, W5LFL (SK)

The US astronaut who pioneered the use of Amateur Radio to make contacts from space - Owen K. Garriott, W5LFL - died April 15 at his home in Huntsville, Alabama. He was 88. Garriott's ham radio activity ushered in the formal establishment of Amateur Radio in space, first as SAREX - the Shuttle Amateur Radio Experiment, and later as ARISS - Amateur Radio on the International Space Station.

"Owen Garriott was a good friend and an incredible astronaut," fellow astronaut Buzz Aldrin tweeted. "I have a great sadness as I learn of his passing today. Godspeed Owen."

An Oklahoma native, Garriott - an electrical engineer - spent 2 months aboard the Skylab space station in 1973 and 10 days aboard Spacelab-1 during a 1983 Space Shuttle Columbia mission. It was during the latter mission that Garriott thrilled radio amateurs around the world by making the first contacts from space. Thousands of hams listened on 2-meter FM, hoping to hear him or to make a contact. Garriott ended up working stations around the globe, among them such notables as the late King Hussein, JY1, of Jordan, and the late US Senator Barry Goldwater, K7UGA. He also made the first CW contact from space. Garriott called hamming from space "a pleasant pastime."

"I managed to do it in my off-duty hours, and it was a pleasure to get involved in it and to talk with people who are as interested in space as the 100,000 hams on the ground seemed to be," he said in an interview published in the February 1984 edition of QST. "So, it was just a pleasant experience, the hamming in particular, all the way around."

Although Garriott had planned to operate on ham radio during his 10 days in space, no special provisions were made on board the spacecraft in terms of equipment - unlike the situation today on the International Space Station. Garriott simply used a hand-held transceiver with its antenna in the window of Spacelab-1. His first pass was down the US West Coast.

"[A]s I approached the US, I began to hear stations that were trying to reach me," he told QST. "On my very first CQ, there were plenty of stations responding." His first contact was with Lance Collister, WA1JXN, in Montana.

ARISS ARRL Representative Rosalie White, K1STO, met Garriott when he attended Hamvention, "both times, sitting next to him at Hamvention dinner banquets," she recounted. "Once when he was a Special Achievement Award winner, and once with him and [his son] Richard when Richard won the 2009 Special Achievement Award. Owen was unassuming, very smart, kind, and up to date on the latest technology." Garriott shared a Hamvention Special Achievement Award in 2002 with fellow Amateur Radio astronaut Tony England, W0ORE.

Richard Garriott, W5KWQ, was a private space traveler to the ISS, flown there by the Russian Federal Space Agency, and he also carried ham radio into space.  
NNNN



Meeting up at the Visallia DX Convention were Bob, KK6LT, John, K6MI, Craig, N6ED, Eric, NI6G, and Larry, K7LJ.

## Local Amateur Radio Repeaters

<i>Organization</i>	<i>Call Sign</i>	<i>Frequency</i>	<i>Offset</i>	<i>PL</i>
CARP	K6ARP	147.675	-	141.3
CARP	N6JXL	224.380	-	141.3
CARP	K6ARP	444.725	+	141.3
CARP	NI6M	440.350	+	141.3
CONDOR	WB6BRU	224.900	-	156.7
FARC	W6TO	146.940	-	141.3
FARC	W6TO	223.940	-	141.3
FARC	W6TO	444.200	+	141.3
BRA	W6FSC	145.230	-	141.3
BRA	W6FSC	443.450	+	141.3
KINGS ARC	N6CVC	145.110/444.95	-	100.0
NC9RS	NC9RS	927.6625/902.0125	-	146.2
MADERA ARC	W6WGZ	147.180	+	146.2
MADERA ARC	W6WGZ	441.175	+	146.2
QCWA	WQ6CWA	146.850	-	141.3
QCWA	WQ6CWA	443.250	+	107.2
RACES	N6HEW	147.150	+	141.3
SJVAR	KE6JZ	146.820	-	141.3
TURLOCK ARC	W6BXN	147.030	+	100.0
CVRC	K6WGJ Fresno Low	145.43	+	141.3
CVRC	N6VRC Meadow	147.165	+	141.3
CVRC	N6VRC Meadow	440.025	+	141.3
CVRC	N6VRC Santa Rita	147.285	+	141.3
CVRC	N6VRC Santa Rita	442.275	+	141.3
CVRC	N6VRC Visalia	442.525	+	141.3
CRVC	N6VRC Porterville	443.825	+	141.3
CVRC	K6WGJ Fresno Low	444.975	+	141.3
CVRC	N6VRC Bear Mt.	443.950	+	141.3
CVRC	N6VRC Mt. Bullion	442.350	+	141.3
CVRC	Bear	927.05	+	141.3
Meadow Lakes	WA6OIB	146.61	-	141.3
WA6IPZ	WA6IPZ	52.84	-	82.5

Remember to keep you dues current for both the attendance prize and the birthday and anniversary listings.

**Birthdays**  
  
**05/17 AE6SX Dan**

**Anniversaries**  
  
**05/05 Mary & David KA6VTA**  
**05/12 Craig W6CMR**

Ten meter net, CW and Phone, every Wednesday  
7 P.M. for CW at 28.140  
8 P.M. for SSB at 28.445  
This is a local net, the cw part run by KF6ZXO, and the SSB with various net control ops.. Have fun checking in on one or both modes.

**The monthly attendance prize!**

The attendance prize was won by WA6IMA , who was not present. Must be present to win. Next drawing will be \$40, at the May meeting.



## THE DX CORNER

**By Charles McConnell W6DPD**

May 2019

"DX is the one you want but you don't have. That is the way it has always been, that is the way it will always be."

Of the most recent DXpeditions, "If you worked it, it was the best DXpedition ever. If you missed it, it was probably not so good." "And so it goes."

All things are relative, some more than others. Thanks Hugh Cassidy, WA6AUD SK.

If you want help with DX, you can contact the local members of the Central California DX Club for some assistance. Charles W6DPD 431-2038, or Perry K6XJ 299-2802, can give you advice. The big thing about finding DX is to tune the bands.

The DX Breakfast is every Saturday at Jeb's Blueberry Hill Café, 3851 N. Blackstone Ave in Fresno. This group gathers about 06:30 AM. All are welcome.

Check out [www.spaceweather.com](http://www.spaceweather.com) and [www.solarham.net](http://www.solarham.net) for information on the solar cycle. The higher the solar flux and the lower the A and K Indices, the better the band conditions. As the solar cycle heads toward the minimum by the end of the decade, working DX becomes more of a challenge. The high bands become less useful until the solar cycle heads toward the maximum, some years from now. There were over 100 sunspot free days in 2017

The address of the Sixth District QSL Bureau is P. O. Box 970, Fairfax CA 94978-0970. You can send up to 10 address labels and \$0.80 for each envelope to the address above. They will put 1 unit of First Class postage on the envelope. You can contribute \$10 or \$20 online using Paypal. If you work DX, you should have envelopes at the bureau so you can get your cards. You may be able to check your status at the bureau at <http://www.qslbureau.org/>

The ARRL Outgoing QSL Service has **rolled back the rates** to those of 2011. The rate is \$2 for up to 10 cards, \$3 for 11 to 20 cards in one envelope, and \$0.75 per ounce for 21 or more cards. There is no longer a transaction fee. These changes began May 15, 2019.

Overseas postage is still \$1.15 per ounce. Domestic postage is \$0.55 for 1 ounce. Additional ounce for domestic mail will go from \$0.21 to \$0.15. Postcards stay \$0.35. Postage for flat rate boxes and envelopes will increase.

If you don't get a DX Bulletin and you belong to ARRL, you should register on the members only web page and check the box for the ARRL DX Bulletin. This one is emailed each Thursday. Or you can go to the ARRL web page in the News/ Bulletin section and view the bulletins there.

You can also read the OPDX Bulletin or the 425 DX Bulletin on the web. Search OPDX Bulletin or 425 DX Bulletin to get the URL. You can subscribe to the Daily DX, or Weekly DX. These bulletins will keep you informed of DX operations and QSL information.

## Fresno Amateur Radio Club

Continued from the last page

The following operations are scheduled:

Sudan **ST2NH** is learning FT8 and is active  
Bouvet **3Y0I** Postponed  
Djibouti **J28PJ** for 3 to 5 years  
Ascension Island **ZD8AC** now for 2 years  
Senegal **6W1SU** now for 2 to 3 years  
Rwanda **9X0TA** August 5, 2017 for 3 years  
Rwanda **9X9PJ** now for 2 years  
Antarctica **VK0HZ** Davis Station for 1 year  
Antarctica **ZL5A** Scott Base for 1 year  
The Gambia **C5DL** April 1 to April 15, 2019  
Madagascar **5R8PX** August 3 to August 17, 2019  
Panama **H31A** now through August 15, 2019  
Chad **TT8RR** March 2019 **POSPONED DUE TO SECURITY ISSUES**  
Sao Tome and Principe **S9A** June 6 to June 18, 2019  
Luxembourg **LX50MOON** July all month Special Event  
St. Paul Island **CY9C** August 2019  
Liberia **A82X** and **A82Z** September 28 to October 11, 2019  
Tristan da Cunha and Gough **ZD9EI?** September/October 2019  
St. Pierre and Miquelon Island **FP/KV1J** September 24 to October 8, 2019  
Uganda **5X0T** September/October 2019  
North Cook Islands **E51GC** October 10 to October 28, 2019  
Pitcairn Island **VP6R** October 18 to November 1, 2019  
Tokelau **ZK3** September 25 to October 16, 2019  
Lakwadshadweep Islands **VU7RI** October 19 to November 23, 2019  
Western Kirabati **T30GC** October 30 to November 15, 2019  
Marquesas Island **F00/M?** November 6 to November 19, 2019  
Cocos Keeling Island **VK9CZ** November 17 to November 27, 2019  
Vietnam **XV9D** November 17 to November 30, 2-19  
Sable Island **CY0C** postponed to Fall 2020  
South Orkney Isl **VP8?** February 20 to March 5, 2020



Charles, W6DPD

Watch the DX Bulletins for up to date information. As the time for the operation is at hand, watch the DX Summit ([www.newdxsummit.fi](http://www.newdxsummit.fi)) for listings.

There are a number of state QSO parties each year. Check the contest corral in QST or the ARRL web page. State QSO parties are a good place to collect states for your Worked All States award. Good luck, tune the dial, and listen.

New sunspot group 2739 appeared on April 17, and the daily sunspot number rose to 24. The new sunspot has a polarity indicating it is still part of old Solar Cycle 24, the current sunspot cycle. This reporting week (April 11-17) the average daily sunspot number rose from 6.9 to 14, while average daily solar flux increased from 75.4 to 76.4.

Sunspots have been visible on every day since April 7, so as of April 18 that is 12 continuous days.

New version of FT-8 coming soon! FT-4!

[http://physics.princeton.edu/pulsar/k1jt/FT4\\_Protocol.pdf](http://physics.princeton.edu/pulsar/k1jt/FT4_Protocol.pdf)

## Fresno Amateur Radio Club



# EC Report for April 2019

Hello,

The schedule for the month of April, 2019, was 1 Monthly F.C. EmComm Meeting, 4 Monday Night Nets, 2 Message Handling Practices, 1 EmComm & Coffee, and 2 Public Service Events.

## Silent Key

Last month we lost our good friend and colleague, Hal Clover (AD9HC). Hal was the DEC for the Southern portion of the SJV Section. His celebration of life was held Saturday April 27, 2019 at the Grace Bible Fellowship Hall.

## ARES Traffic Practice

Fresno ARES/RACES is conducting an on-the-air Traffic Handling practice twice a month after our regular Monday night EmComm Nets. Brian has been sending a message using the ARRL Message Form. After the practice the copied message was emailed to Brian to check accuracy and log your time on ARES Connect.

The practice will continue after the nets so join us and have some fun.

## Getting to know the Fresno County ARES Officers

Good evening everyone,

I had a thought and wanted to take a few minutes of your time (or less if you delete this) to introduce myself. I realize that I just started showing up to meetings in October of 2017 and checking into the net and seem to be rapidly taking over. I assure you, that's not the case. I'm a stay-at-home father to a set of two and four year old boys that keep me plenty busy. Many of the regulars to the training meetings know me, but that's about it. I would like to try and change that with this e-mail to all of the members, new and existing.

I'll start with a bit of my background. I'm a 20 year retired USAF veteran who was in Bosnia, Iraq (v2.0), and U.A.E. (keeping Iran in check). I did IT for 18 years, everything from running cabling, working T1 help desk, managing servers, network security, infrastructure (CCNA at 23), IT project management, training, standards and evaluation, and even three-star general direct support. The last few years were more managing of multiple offices, I ran T1 to T3 support, I ran the base post office, and then I worked with emergency managers developing plans for the base and running exercises. Several exercises were large-scale evacuations of personnel in Asia. I enlisted in Alaska, traveled the world through 10 duty stations, and then ended up retiring in Alaska.

I became a ham because of the emergency communications aspect. I currently hold a general but will test for extra this year. There are times it may seem as if I have no idea what I'm doing. And that's because I truly have no idea what I'm doing. I am currently only an active member of ARES, my boys and wife's schedule prevent me from being a regular member in any of the clubs. As time passes that will change, and with luck I'll bring more hams from the family into the fray.

As far as equipment goes I work primarily with Icom radios. I only purchased the IC-7300 brand new, all of my other radios are used. I have two IC-208H, one ID-5100A (the hum machine), one IC-706 MkIIG, and (now) one ID-51a plus. All of my other HTs are Baofengs and I have a large assortment. I'm fairly fast at programming all of the radios with either the Icom software or chirp. I'm not an Icom expert but I do have experience with the radios.

## **Fresno Amateur Radio Club**

I'm the webmaster and training officer for the Fresno County ARES group. As the training officer I try to come up with clever (as clever as I can) ways to keep training engaging and interesting. I'm throwing a lot at the group and participation is welcome, but not required. For instance the winlink check-in, it's hit and miss. The message copy practice is generally well received. We will start doing PSK31 nets in May. I also do capability exercises once a quarter. Last quarter, in February, was a repeater failure exercise where we held the net on simplex. Next month I will have a Fresno-wide power outage simulation. This will not affect the repeater so we will continue the net as normal. This is on your honor, I'm not going to everyone's house to make sure they're on battery power.

I look forward to as many people possible participating in ARES events and training. Stretch your skills a bit, try new things. Everything that I present is another tool that can be used for emergency communications. I'm learning right along with a lot of you. The training I do is as much for me as it is for everyone that participates. If I'm doing something wrong please tell me. I'm not the be all end all when it comes to this. As you can see from my background I'm a jack of all trades, but certainly haven't mastered any of them.

There is a ton of information on our web site, please check it out. Everything from daily FEMA reports, training that we've done, Santa Clara training slides, relevant news and information, event calendar, and a San Joaquin Valley wide net schedule. If you have questions regarding Fresno County ARES, the web site, ARES training, or Icom radios please don't hesitate to ask.

I hope this is helpful and might get more people actively involved. Maybe open a dialogue as to what ARES means to you. Please don't be intimidated, if I can pull this off I promise you anyone can.

-73 K6OGR - Brian

### **EmComm Website**

We are now posting events and meetings on the calendar as well as posting articles on the home page. There is a lot of new information and links added to the site as well thanks to our **Webmaster Brian (K6OGR)**. Check us out at [fcmcomm.org](http://fcmcomm.org)

### **FC EmComm FB Page**

We have a Fresno County EmComm presence on Facebook. There you can find posts related to local events and emergencies. To access it, search for [@fcmcomm.org](https://www.facebook.com/fcmcomm.org) on Facebook, or you can click on the Facebook icon at the bottom of the web site at <https://fcmcomm.org>. It is just a page so there is no membership to join. To keep up to date you just need to like and follow.

### **Upcoming Emcomm Service Events**

As you know we assist CARP with their Public Service Events and use them as a training venue. We have one coming up in May, this is the Kirch Flat Ride. Please consider helping with these events, they are not only a great training venue but a lot of fun. After you sign up, please go to ARES Connect and check the events on the calendar so you will get your time logged onto ARES Connect when you participate.

### **2019 EMCOMM EVENTS**

**May 4, 2019 – FCC Kirch Flat Bicycle Ride – Sign up**

**June 22, 2019 – FCC Climb to Kaiser Bicycle Ride – Sign up**

**September xx, 2019 – Tour de Fresno Bicycle Ride**

**October 5, 2019 – North Fork Grizzly Century (not confirmed)**

**October 12, 2019 – FCC Bass Lake Double Century Bicycle Ride – Sign up**

**November 16, 2019 – FCC Raymond Gravel Grinder Ride --** If you are interested and want to sign up for one or more events please go to the CARP Website ([k6arp.org](http://k6arp.org)) and go to their sign up link.

## **NVIS, What is it?**

I was looking around on the web and found the following information on NVIS and it looked interesting so I am passing it on.

## Near vertical incidence skywave

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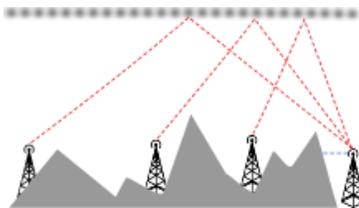
From Wikipedia, the free encyclopedia

**Near vertical incidence skywave**, or **NVIS**, is a skywave radio-wave propagation path that provides usable signals in the range between groundwave and conventional skywave distances—usually 50–650 km (30–400 miles). It is used for military and paramilitary communications, broadcasting,<sup>[1]</sup> especially in the tropics, and by radio amateurs for nearby contacts circumventing line-of-sight barriers. The radio waves travel near-vertically upwards into the ionosphere, where they are refracted back down and can be received within a circular region up to 650 km (400 miles) from the transmitter.<sup>[2]</sup> If the frequency is too high (that is, above the critical frequency of the ionospheric F layer), refraction fails to occur and if it is too low, absorption in the ionospheric D layer may reduce the signal strength.

There is no fundamental difference between NVIS and conventional skywave propagation; the practical distinction arises solely from different desirable radiation patterns of the antennas (near vertical for NVIS, near horizontal for conventional long-range skywave propagation).

## Frequencies and Propagation

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NVIS radiation pattern

While the groundwave (blue) cannot propagate, the refracted skywaves (red) achieve HF coverage within the common first hop (~500km).

The most reliable frequencies for NVIS communications are between 1.8 MHz and 8 MHz. Above 8 MHz, the probability of success begins to decrease, dropping to near zero at 30 MHz. Usable frequencies are dictated by local ionospheric conditions, which have a strong systematic dependence on geographical location. Common bands used in amateur radio at mid-latitudes are 3.5 MHz at night and 7 MHz during daylight, with experimental use of 5 MHz (60 meters) frequencies. During winter nights at the bottom of the sunspot cycle, the 1.8 MHz band may be required.<sup>[3]</sup> Broadcasting uses the tropical broadcast bands between 2.3 and 5.06 MHz, and the international broadcast bands between 3.9 and 6.2 MHz. Military NVIS communications mostly take place on 2–4 MHz at night and on 5–7 MHz during daylight.

Optimum NVIS frequencies tend to be higher towards the tropics and lower towards the arctic regions. They are also higher during high sunspot activity years. The usable frequencies change from day to night, because sunlight causes the lowest layer of the ionosphere, called the D layer, to increase, causing attenuation of low frequencies during the day<sup>[4]</sup> while the maximum usable frequency (MUF) which is the critical frequency of the F layer rises with greater sunlight. Real time maps of the critical frequency are available.<sup>[5]</sup> Use of a frequency about 15% below the critical frequency should provide reliable NVIS service. This is sometimes referred to as the optimum working frequency or FOT.

NVIS is most useful in mountainous areas where line-of-sight propagation is ineffective, or when the communication distance is beyond the 50 mile (80 km) range of groundwave (or the terrain is so rugged and barren that groundwave is not effective), and less than the 300–1500 mile (500–2500 km) range of lower-angle sky-wave propagation. Another interesting aspect of NVIS communication is that direction finding of the sender is more difficult than for ground-wave communication (i.e. VHF or UHF). For broadcasters, NVIS allows coverage of an entire medium-sized country at much lower cost than with VHF (FM), and daytime coverage, similar to mediumwave (AM broadcast) nighttime coverage at lower cost and often with less interference.

## Antennas

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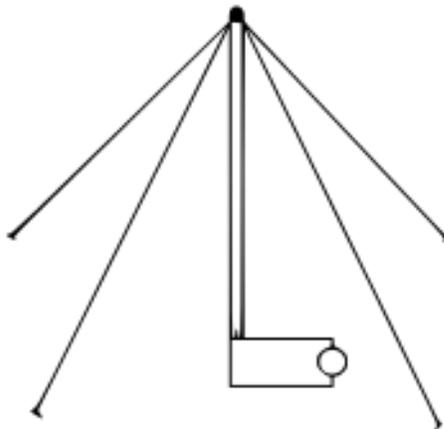
An NVIS antenna configuration is a horizontally polarized (parallel with the surface of the earth) radiating element that is from 1/20th wavelength ( $\lambda$ ) to 1/4 wavelength above the ground. Optimum height is about 1/4 wavelength, and high angle radiation declines only slightly for heights up to about 3/8 wavelength. <sup>[6]</sup> That proximity to the ground forces the majority of the radiation to go straight up. Overall efficiency of the antenna can be increased by placing a ground wire slightly longer than the antenna parallel to and directly underneath the antenna. One source says that a single ground wire can provide antenna gain in the 3–6 dB range. <sup>[7]</sup> Another source indicates 2 dB for a single wire and nearly 4 dB for multiple ground wires. <sup>[8]</sup> Ground wires are more necessary when using lower dipoles over poor soils as without them considerable energy goes into heating the ground.

Depending on the specific requirements, various antennas (i.e. Sloper, T2FD, Dipole) can be used for NVIS communication, with horizontal dipoles or inverted V dipoles at about 0.2 wavelengths above ground giving the best results on transmit and at about 0.16 wavelengths on receive, according to military sources and an extensive study by Dutch researchers. <sup>[9]</sup> <sup>[10]</sup> Very low antennas are much inferior on transmit, less so on receive, where both noise and signal are attenuated.

Significant increases in communication will obviously be realized when both the transmitting station and the receiving station use NVIS configuration for their antennas. In particular for low profile operations NVIS antennas are a good option. <sup>[11]</sup>

For broadcasting, typical antennas consist of a dipole about 1/4 wavelength above ground, or arrays of such dipoles. <sup>[12]</sup> Up to 16 dipoles can be used, allowing strong signals with relatively low power by concentrating the signal in a smaller area. Limiting the coverage may be dictated by licensing, language or political considerations. Arrays of dipoles can be used to "slew" the pattern, so that the transmitter need not be in the center of the coverage footprint. Broadcast NVIS antennas usually use an extensive ground screen to increase gain and stabilize the pattern and feed impedance with changing ground moisture.

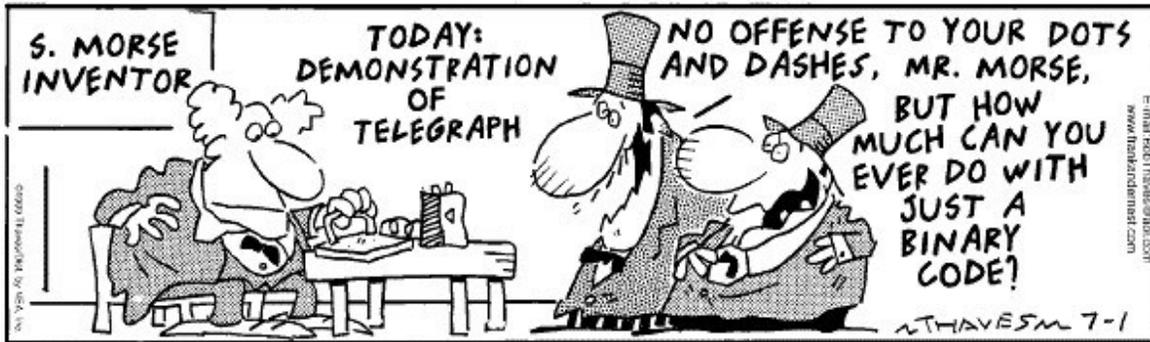
### AS-2259 antenna



AS-2259 NVIS Antenna

A military NVIS antenna is the AS-2259 Antenna, <sup>[13]</sup> which consists of two V-shaped dipoles: The four dipole wires also serve as guy rope for the antenna mast. An alternative configuration consists of a transmitting loop antenna which is configured for maximum signal transmission upwards. <sup>[14]</sup>

## A Little Hummer:



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## We Need Your Input!

We have started our Steering Committee up again. We are looking for ideas for projects, training events, etc. that would promote interest and participation of our members. If you have any ideas, please email me. We will do our best to make this a more interesting, efficient, and enjoyable organization.

## Net Control Staff Needed

We are looking for volunteers to take a turn as net control on Monday nights. This is not a difficult task. We will provide the preamble and net roster. This is a great way to enhance your skills running a net for emergency situations. If you are interested, please contact Gary (KI6OYW) at 559-269-1340 or email [g\\_greenberg@att.net](mailto:g_greenberg@att.net)

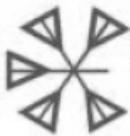
## Our Calendar

Don't forget the **Monday Night EmComm Net** at 19:30 hr. on the 147.15 MHz PI 141.3. We have some good information and camaraderie. On the third Friday of the month there is the **EmComm & Coffee** located at Denny's, 39 W. Herndon Ave (North East corner of Blackstone and Herndon) 07:00hr. And last but not least the EmComm Meetings are held on the Fourth Thursday of month **at 1900 hr.** at the **Hinds Hospice Building, 2490 W. Shaw Fresno.**

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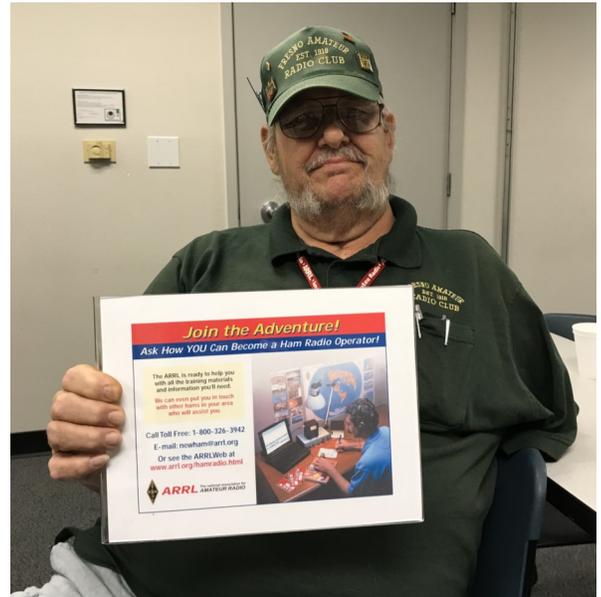
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