Smoke Signals

Newsletter of Fullerton Radio Club

November 2024

President's Column

November flew by and here I am at the end of November finishing Smoke Signals.

I'm pleased that we continue to have good participation in our weekly Wednesday night nets. This past month, our second check-ins were on 6 meter SSB, 70 cm SSB, and on Joe the WR6AAC Santiago Peak 1.25 meter FM repeater. Thanks to Joe Orrico for the use of his repeater.

FRC members have continued to meet at Hillcrest Park on the 2nd Saturday of each month. This month, our Hillcrest activity will coincide with the ARRL 10 meter contest, so we will have a station on the air to make a few contacts. This month we will meet on December 14 from 8-11 am then have lunch at the nearby Farmer Boys restaurant. You are encouraged to join us or just stop by and say hello.

Keep in mind that our annual Holiday Dinner is only a couple of weeks away on Wednesday, December 18 at the Sizzler on Harbor Blvd in Fullerton. Our treasurer, Gene Thorpe will be available to collect your membership dues for the upcoming year. Save yourself a stamp and renew at the dinner. Renewal forms are available on the club website and we will also have blank forms available at the dinner.

Until then…

2025 Election Results

On Wednesday, November 20, as required by our corporate bylaws, the Fullerton Radio Club held its annual election to certify Board Members for the 2025 year.

The following slate of candidates was elected by acclamation during our 11/20 Zoom meeting:

President - Bob Houghton AD6QF
Vice President - Robert Gimbel KG6WTQ
Secretary - Ray Rounds K6RAX
Treasurer - Gene Thorpe, KB6CMO
Walter Clark - Member at Large
Larry McDavid W6FUB - Member at Large
Bart Pulverman WB6WUW - Member at Large

You will see one new name in our roster of Board members. I would like to thank Ray Rounds for his willingness to serve as out new Club Secretary.

Cleyon Yowell AD6P, SK

Long-time FRC members will remember Cleyon Yowell AD6P as a technical expert, mentor and friend. Cleyon passed away on November 6 at age 93.

Cleyon was born in Lincoln, Nebraska. His family moved to Hutchinson, Kansas, where he graduated high school in 1949. He attended Massachusetts Institute of Technology, receiving his Bachelor of Science degree in 1953. After that, he returned to Kansas and worked at Boeing in Wichita until he was drafted and served in the army for two years at Fort Bliss in El Paso, Texas. Then he moved to southern California, where he obtained his Masters and Doctorate degrees from USC. During that time, he worked at Hughes Aircraft in Culver City and Fullerton. In 1966 he joined The Aerospace Corporation in El Segundo.

Cleyon loved technology and was an active member of the Astronet, which was FRC's predecessor to TAG in the 1970s and 1980s. Every

FRC November Board Meeting Minutes

The monthly FRC Board Meeting was called to order by President Bob Houghton AD6QF at 5:33 PM on Wednesday, November 6, 2024. Additional Board members present included Robert Gimbel KG6WTQ, Gene Thorpe KB6CMO, and Larry McDavid W6FUB.

Board members absent:, Walter Clark, Bart Pulverman WB6WUW

The November Board Meeting minutes were reviewed and approved without amendment.

Treasurer's Report
• Bank balance: $6237.53 as of October 31 bank statement
• New deposits: $.02 interest
• New expenditures: None
• New members: None
• Bob's records show 35 memberships 2024 paid and 1 life member as of 11/4/24.
• Old Business
  • Saturday 10/12: "2nd Saturday" Radio in the Park at Hillcrest
  • Should FRC have an EMCOMM liaison?
  • FRC Election planning / nominations
  • Reminder: Holiday Dinner is 12/18 at Sizzler Fullerton
• New Business
  • Board Meeting Attendance - do we need a different reminder system?
  • Ideas for 2025?
• Meeting was adjourned at 5:52 PM

Submitted by President Bob Houghton

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evening, FRC members and friends gathered on 3885 kHz to discuss ham radio, astronomy, seismology and other tech topics. The net grew in popularity and attracted regular participants from all of the states bordering California plus Washington State and Manitoba, Canada. At its peak, the Astronet roster had over 50 members.

In 1987, AD6P retired and moved back to Hutchinson. In addition to working lots of DX, he became a benefactor of the Kansas Cosmosphere, an international science education center and space museum. There he established W0WR, the Cosmosphere's satellite station, to interest and instruct youth and adults in Amateur Radio and astronomy. Indeed, Cleyon was a pioneer in STEM before it became a national movement!

Cleyon Yowell AD6P

TAG Activity Report for November 2024

This is the first meeting indoors in a while. Your host, Walter Clark, on *the far left*. (far left in the picture, that is.) Then, Larry McDavid, Fearless leader Bob Houghton, behind him Bart Pulverman then Harish Kumar, John Mock, Seated is Dick Palmer, then Ray Rounds, and Bill Webb.

The Theme for the Evening: GPS

The pre-meeting discussion is usually done standing up while waiting for others to arrive. I was unable to document those discussions obviously. When there are many separate discussions there is optimized verbal satisfaction. But once seated, everyone is obligated to take turns; forced collaboration rather than interactive cooperation.

There was some very technical talk about not finding a boot on Bill's new desktop. It was way over my head but I'm sure he solved the problem so if you need new boots contact Bill Webb. (humor) What was easy to follow was Bill's high regard for hearing aids at Costco. Larry had good experience with them too. Still in the informal part of the meeting Walter brought up the fact that it was the 83rd anniversary of the first showing of Disney's Fantasia in 1940. A favorite subject of Walters, he went on and on about the engineering of that project. Here's a sample: 90 db S/N 7 channels. CDs are not that good. The Disney studio bought so much sound equipment it allowed Mr. Hewlett and Mr. Packard to move out of their garage. The amplifiers needed a trailer which toured the country in 1940.

FantaSound as it was called was only permanently installed in Carthay Circle Theater in Los Angeles. Disney was quite technological then. It won lots of technical as well as artistic awards.

John Mock brought a very old Bluetooth GPS receiver. The Bluetooth part was to communicate with your car's Bluetooth and early model cellphones that didn't have GPS. Here he is on the left wearing Larry's bone conduction headphones. Larry extolled the virtues of this type listening device and after we all got a chance to hear it, it was clear he was right. Not only is it more comfortable, the sound quality was amazing. And you don't have to remove them to hear someone with your ears. Larry bought top of the line Shokz at $160 but they are available as low as $20.

Ray Rounds and Bob Houghton led a discussion on the use of Cactus System of linked repeaters. Linked repeater systems use UHF radio links or the internet to connect two or more repeaters, allowing the signals to cover a much larger footprint. Walter was surprised to learn that these days, the HF bands are busier than the 2 meter band. The opposite was true 30 years ago after rule changes brought large numbers of new technicians to the bands. In that era, many folks got their ham license so they could use autopatches to make telephone calls from their HTs and mobile radios. After the arrival of affordable cell phones, traffic on the VHF and UHF bands diminished greatly. Of course a cellphone is handier if you just want to tell the wife you will be late for dinner. But using your own rig to reach other rigs with technology under your control. . . that's a hobby.

Here's a link to the Cactus repeater network that Ray Rounds recently used while camping near San Diego. https://coraradio.com/

Larry McDavid brought some GPS oriented industrial electronics magazines which led to a discussion of the various types of satellite based navigation systems. The all encompassing acronym is GNSS: Global Navigation Satellite Systems (GNSS). Various countries put up their own set of satellites which all countries can use:

> **GPS**: The United States' Global Positioning System consists of 24 satellites orbiting 12,500 miles above the Earth. They are not in geosynchronous orbits. They orbit in a semi-synchronous Medium Earth Orbit (MEO) meaning that they circle the planet exactly twice a (sidereal) day. Low By contrast, Low Earth Orbit (LEO) earth orbit has a period of 90 minutes. This higher orbit (MEO) means more coverage (few satellites).

> **GLONASS**: Russian

> **Galileo**: The European Union

> **BeiDou**/**Compass**: China

> **QZSS**: Japan (Regional, not global)

Harish Kumar talked about the NavIC (Navigation with Indian Constellation) system used in

India for GPS. The Indian system is a little different in that it is a regional system, covering India and the asian sub-continent. The system consists of three geostationary satellites in orbit over India and four more in Medium Earth Orbit.
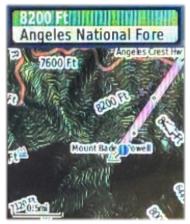
Dan Slater wasn't at the meeting but emailed to us the time of a Starlink launch from Vandenberg. Bill was online and kept us posted on any delay. It turns out the actual launch time was exactly when everyone was on their way home anyway so the meeting ended with the last 5 minutes outside. It was too late in the evening to see the sun's reflection off the exhaust, but the orange glow of the burning fuel was rewarding enough.

Bart Pulverman brought along a lithium battery that was in storage for a long time and bloated out of its container. That's what's in his left hand in the picture below. In his right hand is a Garmin eTrex-30. It traces on a small map where you've hiked.

Bart told us about a fascinating app that reads the GPS metadata on photos. It extracts latitude and longitude to put dots for those places on a map. A folder of vacation photos could be read and a map made that shows dots on all the places where pictures were taken. Brilliant.

The app that Bart uses to display the location of each photo on a map for the desktop is *Adobe Lightroom*. The GPS part of this app is done by the cellphone when the picture was taken. Bart said that if you want to view the metadata there are several websites that allow you to either drag and drop or navigate to a photo file on your computer. Here's an easy one Bart recommends: https://onlineexifviewer.com/ ← click on this then find any picture on your PC and drag and drop it into the large rectangle. Then click on the + symbol to zoom in. So easy. So handy.
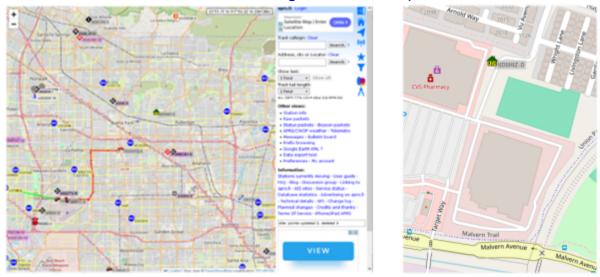
Bart also told us about his experience with an Apple Vision Pro demonstration. Here's a one minute demo to blow your mind: https://www.youtube.com/watch?v=IY4x85zqoJM

Dick Palmer brought a GPS device that transmits your position via a 2-meter band signal to an APRS (Automatic Packet Reporting System) digipeater so your position can be displayed for all to see.

The GPS is connected on the right side of the TinyTrak3. The TinyTrak is a microcontroller from a company in California, Byonics. On its left side, it connects to the microphone input of a 2-meter radio that transmits your location to a digipeater connected to the internet for all to see. On your browser enter this: **aprs.fi** ← yes that's the complete URL. Don't add the

dot com. It looks like this. On the right is a blow-up around Fullerton.

Above the Amerige Heights shopping center is KD5HIZ: Howard Chang.
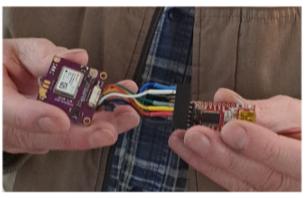
Bill Webb brought a GPS receiver and display. Notice how simple the wiring is. And no software to upload. The box on the left is merely a source of USB standard voltage. The GPS receiver on the right is about $9. Underneath the ceramic patch antenna is the microprocessor that does the calculations. It receives signals from multiple satellites (six to twelve). It has orbital data (Keplarians) for each satellite and there's a clock signal from the satellites as well. Such computational sophistication is mind boggling for only $9. And there are as many of these as there are cellphones: billions.

The display is very popular in the Arduino world. Look up The Cheap Yellow Display on an ESP32-driven development board. It is $17 from Amazon.
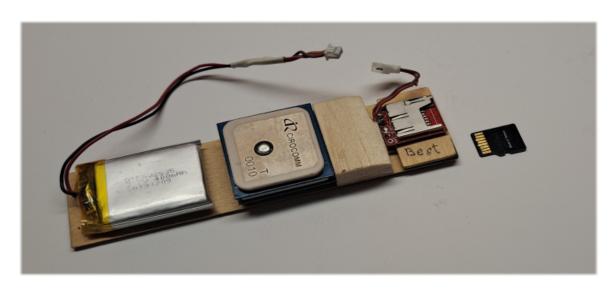

Even cheaper at AliExpress. At the left, Bill is holding his first GPS project and it is even simpler: The computer and GPS antenna are on the left and the smaller thing with the large connector

is an FTDI allowing the little GPS to work with a laptop or desktop PC via USB. The PC provides the 5V to run the FTDI as well as the GPS receiver. Here is the link to the GPS project using the Cheap Yellow Display. https://randomnerdtutorials.com/esp32-cyd-lvgl-gps-location/

Walter Clark has been flying GPS recorders in his R/C Gliders since 2017. This one is the latest of about six such pairings of GPS receiver and microSD card recorder. Each generation was purchased in the hope they were more accurate. Nope. But they did get smaller. The only wiring is four leads under the balsa wood block.
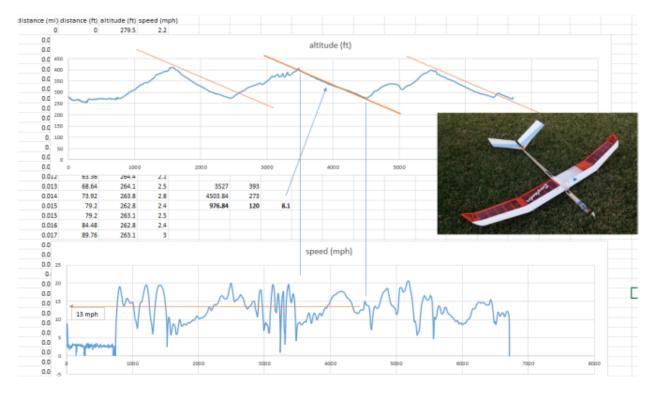
Each time you unplug and re-plug the battery, the recorder makes a new file. The file looks like this…

```
$GNRMC,155110.00,A,3355.36488,N,11757.45651,W,0.117,,141122,,,D*7D
$GNVTG,,T,,M,0.117,N,0.217,K,D*3B
$GNGGA,155110.00,3355.36488,N,11757.45651,W,2,12,0.71,87.3,M,-32.7,M,,0000*47
$GNGSA,A,3,32,10,21,22,27,08,23,24,31,,,,1.39,0.71,1.19*13
$GNGSA,A,3,71,85,87,72,73,,,,,,,,1.39,0.71,1.19*1D
$GPGSV,4,1,13,01,02,317,20,08,33,274,25,10,54,041,32,18,,,21*4A
$GPGSV,4,2,13,21,26,317,28,22,60,221,20,23,29,072,27,24,12,044,34*78
$GPGSV,4,3,13,27,35,232,30,31,15,171,15,32,87,350,29,46,49,200,*74
$GPGSV,4,4,13,48,50,193,*49
$GLGSV,3,1,10,65,01,245,21,70,18,043,26,71,56,358,25,72,44,272,28*6D
$GLGSV,3,2,10,73,08,106,41,80,15,152,,85,32,167,16,86,77,214,31*61
$GLGSV,3,3,10,87,32,328,21,,,,26*54
$GNGLL,3355.36488,N,11757.45651,W,155110.00,A,D*66
…… etc.
```

Each line is called a sentence. Each one means something to whoever is paying for the information. The 13 sentences repeat once per second. There's a website which I call upon to convert one of those sentences per second, to a file that looks like this:

*converting doc.txt - Notepad

File Edit Format View Help

type	time	latitude	longitude	altitude (ft)	speed (mph)	course	slope (%)	distance (mi)	distance_interval (ft)		sat
T	2022-11-14 15:51:10	33.922748000	-117.957608500	286.4	0.1			0.000		12	0.71
T	2022-11-14 15:51:11	33.922749333	-117.957610833	283.8	0.7	13.1	-305.9	0.000	0.86	12	0.77
T	2022-11-14 15:51:12	33.922745167	-117.957607667	281.8	0.4		-109.7	0.001	1.79	12	0.68
T	2022-11-14 15:51:13	33.922743000	-117.957612833	280.2	0.1		-93.5	0.001	1.75	12	0.72
T	2022-11-14 15:51:14	33.922748000	-117.957614167	280.2	0.2		0.0	0.001	1.86	12	0.72
T	2022-11-14 15:51:15	33.922748500	-117.957616000	280.8	0.5		112.1	0.001	0.59	12	0.68
T	2022-11-14 15:51:16	33.922749000	-117.957618000	280.2	0.3		-103.6	0.001	0.63	12	0.68
T	2022-11-14 15:51:17	33.922748500	-117.957618833	280.2	0.1		0.0	0.001	0.31	12	0.68
T	2022-11-14 15:51:18	33.922747667	-117.957619500	280.2	0.2		0.0	0.002	0.36	12	0.68
T	2022-11-14 15:51:19	33.922747667	-117.957619667	279.9	0.1		-647.6	0.002	0.05	12	0.68
T	2022-11-14 15:51:20	33.922748167	-117.957619333	279.9	0.2		0.0	0.002	0.21	12	0.69

The website that decodes the data also has a distance function. It does the square root of the sum of the squares of each lat/long step. (one second intervals) That way "distance" through the air is stretched out into one long straight flight. There's a function in Excel for getting the slope of any segment of the flight path. That slope is the glide angle: so many feet through the air per foot down. A good glide angle is 7 to 1.

distance (mi)	distance (ft)	altitude (ft)	speed (mph)
0	0	279.5	2.2

altitude (ft)

distance (mi)	distance (ft)	altitude (ft)	speed (mph)		
0.012	63.36	264.4	2.1		
0.013	68.64	264.1	2.5	3527	393
0.014	73.92	263.8	2.8	4503.84	273
0.015	79.2	262.8	2.4	976.84	120	8.1
0.015	79.2	263.1	2.5		
0.016	84.48	262.8	2.4		
0.017	89.76	263.1	3		

speed (mph)

13 mph

The lower curve is speed and for some reason the calculation of speed has lots of errors in it. Notice the 2.5 mph on the left. That's me walking the plane out to where I tossed it in the air. I've probably flown GPS recorders over a hundred times. One flight the plane got away from me and it ended up in the middle of Imperial. Another website converts the data into a format that can be entered into Google Earth. Notice on the left it's going east on Imperial. That's after I put the remains of the plane in the car and drove it home.