W5NC
Houston, Texas
Northwest Amateur Radio Society

NARS NEWS

The Northwest Amateur Radio Society
an ARRL Special Services Club #2120

November 2015

Important Dates

Monthly club meeting:
Third Friday of each month, 7:30 pm.
Cypress Creek Christian Community
Ctr. 6823 Cypresswood Drive

Board of Directors Meeting
Tuesday, November 24, 7:30 pm.
Ponderosa Fire Station
17061 Rolling Creek Drive

VE License Exam:
Saturday, November 21, at 10:15 am.
Lone Star College Tomball Library located at the south entrance to the College. Official address is:
30555 St. Hwy 249.

Lunch Break—North
Nov 11, Spring Creek BBQ
Nov 18, Pei Wei
Nov 25, Panera Bread
Dec 2, Jason's Deli
Dec 9, Baker Street Pub
Dec 16, Sweet Tomatoes

.**Lunch Break—Medical Center**
Nov 11, Pronto Cucinino
Nov 18, Jason's Deli
Nov 25, Buffalo Grille
Dec 2, Southwell's Hamburger Grille
Dec 9, Marco's Mexican Bar & Grille
Dec 16, Silver Palace Chinese Buffet

Tail Dragger's Lunch Bunch -
Mondays, 11 am.
Aviator's Grill, Hooks Aerodrome

Notice: NARS membership dues are $20 per year, renewable on anniversary date.

Breakfast at Denny's
Saturdays, 7 a.m.
6504 FM 2920, Spring, TX
Just a few blocks west of Kuykendahl at the intersection of TC Jester & FM 2920

November 20th Annual election for the NARS Board of Directors

Nominations will be taken from the floor for the following positions: Vice President and Director at Large. Please consider volunteering for one of these positions. No experience required!

Keith Dutson will present a short recap of the 2015 Texas QSO Party

Three cheers for our new future Board members!!

Get on Board….
NARS needs your participation.
Volunteer as a Board Member and be part of the decision making!

President's Column

Finally, some cooler weather along with a "little" rain. I look forward to the cooler weather and think that temperatures in the 70's are much better suited for antenna work than temperatures in the 90's. I am thinking of adding a dipole or two to my outdoor antenna collection. A 30 meter will be first because I have never tried working that band before. My beam is a 10-15 20 four element triband beam and I use a 40/80 meter trapped dipole for the other bands I work. The 30 meter antenna will fit on my lot and not be very visible. My subdivision has minimal antenna restrictions and only says that antennas shall be placed behind the building line. This has not caused me much of a problem, but then my small lot size would not be very conducive for erection of a larger antenna tower than the one that I already have. A taller antenna would be better for DX.

Some hams have tight restrictions, so tight in fact that their hobby on HF is essentially prohibited. There is legislation currently working its way through Congress that would provide some relief for these situations asking for reasonable accommodations for amateur radio antennas. This legislation is commonly known as The Amateur Radio Parity Act of 2015, or as H.R. 1301 in the US House of Representatives and S. 1685 in the US Senate. The bill would direct the FCC to extend its rules relating to reasonable accommodation of Amateur Service communications to private land use restrictions.

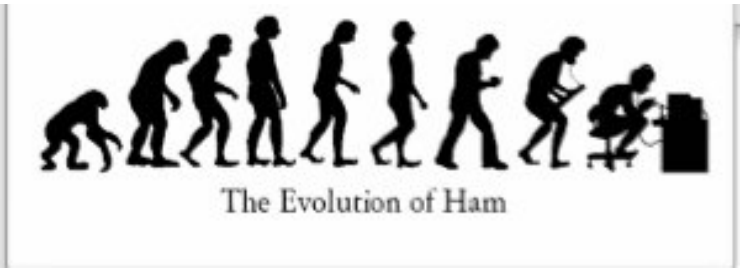
There is an ARRL video on YouTube called "Clarity on Parity" or "The Amateur Radio Parity Act: Separating Fact from Fiction". The video is only a few minutes long. You can view it at https://www.youtube.com/watch?v=AMY-5U1cJ6E . Ham radio operators are only a small percentage of the U.S population. If we want to be heard we need to speak up. Write letters to your Congressman and Representative supporting this legislation. Your legislators are far more likely to be swayed by letters than by email or texts. Find out who represents you in Congress and write to them. You may be the one who makes a difference.
Brad Nelson – WD5GNI

Election of NARS 2016 Officers!

The election of NARS 2016 officers takes place at the November meeting. Keith Dutson , currently Vice President will be the incoming President for 2016.

The club needs to elect a new Vice President and a Director or two to fill vacancies. Please consider taking one of these positions. NARS needs new ideas to insure its future. All it takes is to attend board meetings each month and assist in voicing your ideas on how to better the operation of the Northwest Amateur Radio Society. You can help make a difference!

Contact Brad Nelson at wd5gni@swbell.net or just come to the general meeting on November 20th. We'll do the rest…..



Volunteers needed for this years Salvation Army Bell Ringers event!

Each year Narsians get together for one Saturday to man the kettles for the Salvation Army at the Wal-Mart located at the corner of US 249 and Spring Cypress Road. This year NARS members will be ringing the bells on December 5th. Two volunteers are needed for each one hour shift, starting at 10 a.m.

Jerry Whiting KB5VGD, is coordinator for this worthy event and is now accepting names of those wanting to devote a little time for those in need. Quite a few have volunteered to date but there are still a few 1 hour shifts open. Jerry can be reached at his email address: g_whiting@sbcglobal.net

Hey! Get off your duff and do something nice. The "Great Provider" may decide to give you a break some day….

Annual K5ZTY Show-n-Tell scheduled for December 18th meeting!

The **K5ZTY Show-n-Tell** night will once again be held at our December meeting. Any projects, kits, or mods you've made to your station over the past year, we'd like to hear about it. Just one month to get your bragging rights in order. Don't wait until the last minute….

Heathkit on its way back!

Heathkit announcing its rising from the ashes. The following is an announcement from the President of the new Heathkit.

"It's been a while since we wrote to our Heath Insiders. We promised not to clutter your email inbox until we had something to say. Here's a quick summary of what we've quietly been doing at Heathkit during the past year: We assembled a terrific team of very talented, hard-working, inventive people. We acquired another company and merged its management, products, assets, and operations gracefully into Heath Company. We ensured we own every last bit of Heathkit intellectual property, to bring you all the manuals, books, vintage designs, and classic logos you love, unencumbered and in perpetuity. We built a company division and acquired a line of vintage add-on designs to sustain the vintage products so important to many Insiders. We developed and integrated our eBay site, so you can buy or bid on auctioned items. We authored and published a helpful Android software app on Heathkit's GooglePlay site, with more apps to come.

That's a lot, but there's more. We've designed and developed a wide range of entirely new kit products. We authored the manuals for these kits, complete with the beautiful line art you rely on, preserving and respecting our iconic historic Heathkit style. We developed many new inventions and filed patents on them. We relocated Heathkit, and set up a factory, and a warehouse, and offices, in Santa Cruz, California, near Silicon Valley. We built the back office infrastructure, vendor and supply chain relationships, systems, procedures, operations methods, and well-thought-out corporate structure that a manufacturing company needs to support its customers, to allow us to scale instantly the day we resume major kit sales. All this effort enables us to introduce a fleet of new kits and helps ensure Heathkit can grow, prosper, and continue to bring you great new products for a very long time.

We'll have many product announcements coming, but today I want to tell you about our flagship kit. It's a simple kit—by intent. We feel an enormous responsibility to respect and maintain the incredible legacy of Heathkit. To us this means, bringing you kits you can build yourself, using our historic renowned Heathkit you-can-do-it "We won't let you fail"™ approach, yielding working useful appliances so beautiful you'll be proud to display and use them daily. It also means creating an educational experience that teaches you how they work, and how you can modify or repair what you own.

Further, we feel a very strong commitment to making this experience available to everyone, from 8 to 88 years old. That's an especially high hurdle. And we've done it. The result is the Explorer Jr.™ It's a simple, beautiful professional-looking little radio. It's a historic design, made new. It comes in several different colors. You build it yourself. Take it anywhere. When you build it and as use it, you'll learn to fall in love with radio, for the first time—or all over again. And it's just the first in a series.

As a Heath Insider, you are special to us. In a few days, we'll connect www.heathkit.com to our new website where our new products are listed. But you stayed with us through this process. And we want to thank you. So we are giving you, as an Insider, personal advance notice of the new products and new website through this email, before we tell the general public. We want you to know we appreciate your enthusiasm and respect for the Heathkit name and history.

Sincerely, Andy (President) and the team at Heathkit"

IARU Administrative Council Stresses Importance of Antenna Systems for Amateur Radio

The International Amateur Radio Union (IARU) Administrative Council (AC) has adopted a resolution calling on IARU member societies to encourage governments to recognize the importance of the Amateur Radio Service and of Amateur radio antennas. The AC held its 38th meeting on October 9 and 10 in Bali, Indonesia, in conjunction with the IARU Region 3 Conference there.

The antenna resolution also called on member societies "to advocate for planning and development regulations that properly recognize the importance of an Amateur Radio antenna and do not place undue restrictions on the erection of antennas." It also urged member societies to discourage the imposition of any fees related to ham antennas, "particularly in view of the non-pecuniary nature of Amateur Radio and its popularity in the student and senior communities."

The AC completed its preparations to represent Amateur Radio at World Radio communication Conference 2015 (WRC-15), which will take place during November in Geneva. The AC reviewed IARU positions and strategies for each WRC-15 agenda item that may affect ham radio. These included proposals for a secondary amateur allocation near 5.3 MHz. The Council also looked ahead to agenda items for the next WRC, which is anticipated for 2019. These would include an amateur allocation at 50 MHz in Region 1 (Europe and Africa) and "global harmonization" of the 1800-2000 kHz allocation.

"It is anticipated that a significant effort by IARU will be needed in preparation for WRC-19 to defend the amateur allocations between 137 and 960 MHz, in light of the pressure for spectrum for small, non-amateur satellites," the AC said in a statement. "Close coordination of regional efforts will be required."

In a departure from its practice of recent years, the Council adopted a continuing theme for World Amateur Radio Day each April -- "Celebrating Amateur Radio's Contribution to Society." The Council could adopt a special theme in any given year, if appropriate.

In other actions, the IARU Administrative Council:

- Discussed the environmental impact and burden on the international QSL Bureau system of unsolicited and unwanted QSL cards and plans to revisit the issue at a future meeting.

- Will draft possible revisions to the IARU Constitution and By-laws to introduce "some degree of flexibility in dealing with 'second societies.'"

The IARU Administrative Council will hold a "virtual meeting" in early 2016. The next in-person meeting will take place in Chile in October 2016, in conjunction with the IARU Region 2 Conference.

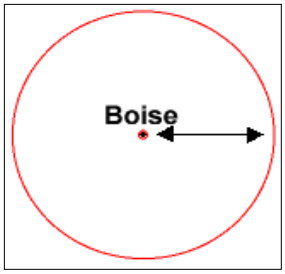
How GPS Receivers Work

Our ancestors had to go to pretty extreme measures to keep from getting lost. They erected monumental landmarks, laboriously drafted detailed maps and learned to read the stars in the night sky. Things are much, much easier today. For less than $100, you can get a pocket-sized gadget that will tell you exactly where you are on Earth at any moment. As long as you have a GPS receiver and a clear view of the sky, you'll never be lost again.

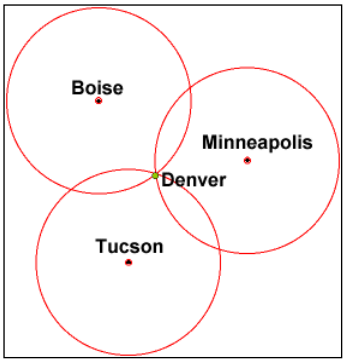
When people talk about "a GPS," they usually mean a **GPS receiver**. The **Global Positioning System** (GPS) is actually a **constellation** of 27 Earth-orbiting satellites (24 in operation and three extras in case one fails). The U.S. military developed and implemented this satellite network as a military navigation system, but soon opened it up to everybody else. Each of these 3,000- to 4,000-pound solar-powered satellites circles the globe at about 12,000 miles (19,300 km), making two complete rotations every day. The orbits are arranged so that at any time, anywhere on Earth, there are at least four satellites "visible" in the sky. A GPS receiver's job is to locate four or more of these satellites, figure out the distanc-e to each, and use this information to deduce its own location. This operation is based on a simple mathematical principle called **trilateration**. Trilateration in three-dimensional space can be a little tricky, so we'll start with an explanation of simple two-dimensional trilateration.

2-D Trilateration

Imagine you are somewhere in the United States and you are TOTALLY lost -- for whatever reason, you have absolutely no clue where you are. You find a friendly local and ask, "Where am I?" He says, "You are 625 miles from Boise, Idaho." This is a nice, hard fact, but it is not particularly useful by itself. You could be anywhere on a circle around Boise that has a radius of 625 miles, like this:



You ask somebody else where you are, and she says, "You are 690 miles from Minneapolis, Minnesota." Now you're getting somewhere. If you combine this information with the Boise information, you have two circles that intersect. You now know that you must be at one of these two intersection points, if you are 625 miles from Boise and 690 miles from Minneapolis. If a third person tells you that you are 615 miles from Tucson, Arizona, you can eliminate one of the possibilities, because the third circle will only intersect with one of these points. You now know exactly where you are -- Denver, Colorado. This same concept works in three-dimensional space, as well, but you're dealing with **spheres** instead of circles.



Fundamentally, three-dimensional trilateration isn't much different from two-dimensional trilateration, but it's a little trickier to visualize. Imagine the radii from the previous examples going off in all directions. So instead of a series of circles, you get a series of spheres. If you know you are 10 miles from satellite A in the sky, you could be anywhere on the surface of a huge, imaginary sphere with a 10-mile radius. If you also know you are 15 miles from satellite B, you can overlap the first sphere with another, larger sphere. The spheres intersect in a perfect circle. If you know the distance to a third satellite, you get a third sphere, which intersects with this circle at two points.

The Earth itself can act as a fourth sphere -- only one of the two possible points will actually be on the surface of the planet, so you can eliminate the one in space. Receivers generally look to four or more satellites, however, to improve accuracy and provide precise altitude information. In order to make this simple calculation, then, the GPS receiver has to know two things: The location of at least three satellites above you and the distance between you and each of those satellites.

The GPS receiver figures both of these things out by analyzing high-frequency, low-power **radio signals** from the GPS satellites. Better units have multiple receivers, so they can pick up signals from several Satellites simultaneously.

Radio waves are electromagnetic energy, which means they travel at the speed of light (about 186,000 miles per second, 300,000 km per second in a vacuum). The receiver can figure out how far the signal has traveled by timing how long it took the signal to arrive. At a particular time (let's say midnight), the satellite begins transmitting a long, digital pattern called a **pseudo-random code**. The receiver begins running the same digital pattern also exactly at midnight. When the satellite's signal reaches the receiver, its transmission of the pattern will lag a bit behind the receiver's playing of the pattern.

The length of the delay is equal to the signal's travel time. The receiver multiplies this time by the speed of light to determine how far the signal traveled. Assuming the signal traveled in a straight line, this is the distance from receiver to satellite. In order to make this measurement, the receiver and satellite both need clocks that can be synchronized down to the nanosecond. To make a satellite positioning system using only synchronized clocks, you would need to have atomic clocks not only on all the satellites, but also in the receiver itself. But atomic clocks cost somewhere between $50,000 and $100,000, which makes them a just a bit too expensive for everyday consumer use.

The Global Positioning System has a clever, effective solution to this problem. Every satellite contains an expensive atomic clock, but the receiver itself uses an ordinary quartz clock, which it constantly resets. In a nutshell, the receiver looks at incoming signals from four or more satellites and gauges its own inaccuracy. In other words, there is only one value for the "current time" that the receiver can use. The correct time value will cause all of the signals that the receiver is receiving to align at a single point in space. That time value is the time value held by the atomic clocks in all of the satellites. So the receiver sets its clock to that time value, and it then has the same time value that all the atomic clocks in all of the satellites have. The GPS receiver gets atomic clock accuracy "for free."

When you measure the distance to four located satellites, you can draw four spheres that all intersect at one point. Three spheres will intersect even if your numbers are way off, but *four* spheres will not intersect at one point if you've measured incorrectly. Since the receiver makes all its distance measurements using its own built-in clock, the distances will all be **proportionally incorrect**.

Continued on page 5

The receiver can easily calculate the necessary adjustment that will cause the four spheres to intersect at one point. Based on this, it resets its clock to be in sync with the satellite's atomic clock. The receiver does this constantly whenever it's on, which means it is nearly as accurate as the expensive atomic clocks in the satellites. In order for the distance information to be of any use, the receiver also has to know where the satellites actually are. This isn't particularly difficult because the satellites travel in very high and predictable orbits. The GPS receiver simply stores an **almanac** that tells it where every satellite should be at any given time. Things like the pull of the moon and the sun do change the satellites' orbits very slightly, but the Department of Defense constantly monitors their exact positions and transmits any adjustments to all GPS receivers as part of the satellites' signals.

Differential GPS

So far, we've learned how a GPS receiver calculates its position on earth based on the information it receives from four located satellites. This system works pretty well, but inaccuracies do pop up. For one thing, this method assumes the radio signals will make their way through the atmosphere at a consistent speed (the speed of light). In fact, the Earth's atmosphere slows the electromagnetic energy down somewhat, particularly as it goes through the ionosphere and troposphere. The delay varies depending on where you are on Earth, which means it's difficult to accurately factor this into the distance calculations. Problems can also occur when radio signals bounce off large objects, such as skyscrapers, giving a receiver the impression that a satellite is farther away than it actually is. On top of all that, satellites sometimes just send out bad almanac data, misreporting their own position.

Differential GPS (DGPS) helps correct these errors. The basic idea is to gauge GPS inaccuracy at a stationary receiver station with a known location. Since the DGPS hardware at the station already knows its own position, it can easily calculate its receiver's inaccuracy. The station then broadcasts a radio signal to all DGPS-equipped receivers in the area, providing signal correction information for that area. In general, access to this correction information makes DGPS receivers much more accurate than ordinary receivers.

The most essential function of a GPS receiver is to pick up the transmissions of at least four satellites and combine the information in those transmissions with information in an electronic almanac, all in order to figure out the receiver's position on Earth. Once the receiver makes this calculation, it can tell you the latitude, longitude and altitude (or some similar measurement) of its current position. To make the navigation more user-friendly, most receivers plug this raw data into map files stored in memory.

You can use maps stored in the receiver's memory, connect the receiver to a computer that can hold more detailed maps in its memory, or simply buy a detailed map of your area and find your way using the receiver's latitude and longitude readouts. Some receivers let you download detailed maps into memory or supply detailed maps with plug-in map cartridges. A standard GPS receiver will not only place you on a map at any particular location, but will also trace your path across a map as you move. If you leave your receiver on, it can stay in constant communication with GPS satellites to see how your location is changing. With this information and its built-in clock, the receiver can give you several pieces of valuable information:

How far you've traveled (odometer)

- How long you've been traveling
- Your current speed (speedometer)
- Your average speed
- A "bread crumb" trail showing you exactly where you have traveled on the map. The estimated time of arrival at your destination if you maintain your current speed.

Ok. No test on all this stuff. Either you get the idea how GPS works or you don't. Never the less, you should have walked away with some knowledge of the basics.. Right? If not, do not pass go and collect 200 bitcoins. Go directly to the beginning of this article and read it again, and, this time, pay attention! We don't want to have a talk with your Mom about this….

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NARS in rewind…. November, 2006

George Carlson KC5RCC presented a program on communications from the Moon. "How did they do that?"

"I remember watching the TV as Neil Armstrong took those first steps on the moon. The fact that they got to the moon was remarkable enough, but how did they bring that TV signal back 1/4 million miles with portable equipment, in 1969?" George continued with, "How did they design and test that equipment without the use of fancy computer controlled test equipment? They didn't even have a MFJ-259!"

He went on to talk about how RF and Microwave measurements were done well before automatic spectrum & network analyzers were common. Surprisingly, most of these measurements were done with mechanical apparatus using fairly simple scientific principals, Many of these same techniques can be used today using inexpensive instruments & a little RF trickery.

Oh, no! RFI getting into their cable TV again?

Welcome, Congratulations and Condolences

Welcome new members,

Kenneth Peabody KF5PJA, Bill Hielscher KG5WPH,

NARS Resource list

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Building Electronics & kits:
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Meetings
Monthly General Membership 3rd. Friday each month (except January) at 7:30 pm.
Cypress Creek Christian Community Ctr.
6823 Cypresswood Drive

Saturday Breakfast
Denny's 6504 FM 2920, Spring
(Just a few blocks west of Kuykendahl)

Wednesday Lunch-11 am.
Various places. Info on front page.

NARS News is published monthly by the Northwest Amateur Radio Society. Send all articles and materials for the newsletter to: Editor, Joe Sokolowski KD5KR, 281 353-2196 kd5kr@arrl.net Deadline for articles to appear in the next newsletter is the last day of each month.
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