The BEACON

West Mountain RADIO

Quarterly Newsletter

Quarter I - 2019

Keep an eye out for our instructional CBA videos!

Videos will be featured on our YouTube channel and our Facebook!

The video series will feature many of the capabilities of the Computerized Battery Analyzer! Learn about what this awesome tool can do!

HT Battery Performance
By: Fred Schwierske, W9KEY

Love 'em, or hate 'em – you can not escape the fact that cheap Asian HT's have become commonplace in Amateur Radio. While lacking some features, the performance available in these $30 dual band VHF/UHF portable radios is simply amazing. And that $30 buys you the radio, battery pack, charging stand, belt clip, strap, and perhaps even an earphone / mic!

I have two tri-power dual band Baofeng radios and decided to measure their battery performance using my West Mountain Radio Computerized Battery Analyzer (CBA IV). One radio is 15 months old, the other 7 months. Spare battery packs were purchased at the same time.

For new hams starting out on a tight budget, inexpensive China radios offer instant access to local repeaters and a wide variety of low cost accessories - including higher gain portable antennas, SO-239 adapters, hand microphones, magnet mount automotive antennas, programming software / cloning cables, headsets, and more. These low cost options are readily available from Amazon, eBay, and local ham fests. Radios are typically supplied with a small (1800 mAh) Lithium battery pack, but higher capacity (3800 mAh) packs are available for about $10 more with your initial HT purchase, or later as a separate item. The larger battery pack is nice, but adds to the radio's size and weight.

Being uncertain of real-world operating times, I elected to purchase my two radios with both small and large battery packs. Plus, it is nice to have a back-up when your radio dies right in the middle of a net! Battery packs for Baofeng's UV-5R series (several generations) are interchangeable, but other China radios (even from Baofeng) use different packs, so pay close attention to model numbers when ordering.

As with any HT – your ability to effectively use these portable, low cost wonders is a direct function of their operating time. Can you expect them to last an entire day of community service work, or for an intense 2 meter net where you might even be the net controller? Let's test them and find out!

The CBA IV is an extremely versatile piece of test equipment that functions as a programmable "smart" load for evaluating DC power supplies, solar panels, and battery packs of all chemistries. It will effortlessly test, record, and graphically display battery performance, the output of which can be easily overlaid for direct visual comparison. The user interface works on Windows PC's with several basic test modes which can be expanded with optional Extended Software to include more complex cycle testing, temperature monitoring, constant power, and constant resistance load capability (in addition to basic constant current testing). You can even use your West Mountain Radio PWRcheck to record a complex DC load, then transfer that profile into the CBA to evaluate battery performance against "real world" load conditions. For complete CBA details, go to: http://www.westmountainradio.com/cba.php

Typical Usage:
Hams will never agree on what constitutes a "standard" operating duty cycle. It is simply a function of how you use your radio. For this article, I elected to define two operating conditions, "NetChat" and "Parade".

Baofeng Battery Test - NetChat Load Profile
CBA Multiple Discharge Test Parameters
Battery Type: Lithium-Ion 7.2 Volts 2 Cells
4 Steps Cutoff = 6.6 or 5.6 Volts Loop Steps
Step 1: 1.400 A for 180 sec (3 min)
Step 2: 0.075 A for 5 seconds
Step 3: 0.380 A for 720 sec (12 min)
Step 4: 0.075 A for 12 seconds

"NetChat" {Table 1} is a long 3 minute transmit, 12 minute receive (20% duty cycle) with a few seconds of quiet time between – typical of long-winded nets on local repeaters. Hopefully repeaters in your area include a 3 minute transmission time-out to flag verbose offenders like me! That same 20% transmit duty cycle could be a typical rag chew profile with friends. But be aware - this far exceeds

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Baofeng's published specification (3 min Tx ; 3 min Rx ; 54 min Stand By), resulting in the PA heat sink area (near antenna) to become really warm during long transmissions. In spite of such abuse both my radios have performed perfectly (at least so far).

Baofeng Battery Test - Parade Load Profile
CBA Multiple Discharge Test Parameters
Battery Type: Lithium-Ion 7.2 Volts 2 Cells
3 Steps Cutoff = 6.6 Volts Loop Steps
Step 1: 1.400 A for 30 seconds (0,5 min)
Step 2: 0.380 A for 330 seconds (5.5 min)
Step 3: 0.075 A for 240 seconds (4 mim)

"Parade" {Table 2} represents a typical community service assignment, consisting of a 30 second transmit, 5.5 minute receive, and 4 minutes quiet stand-by during the total 10 minute time period. Baofeng specifies Tx Current (1400mA), Rx Current (380mA), and Stand By Current (75mA). So monitoring in a quiet standby (squelch) condition will help extend battery life. High RF Power transmit currents for my radios were measured at about 1.45 Amps, so I used the published 1400mA value for CBA testing purposes.

Interestingly, the Parade duty cycle depleted large 3800 mAh battery packs at a similar rate as the factory charger re-charged these packs – about 7 hours, which would indicate cell C Rates were not being abused during this test. The same cannot be said for NetChat duty cycle, which depleted packs much faster (200 minutes).

Transmit Power Levels:
Of course, one way to extend battery life is to reduce transmitter output power – especially if (like me) you tend to be long-winded. Several newer Baofeng models offer 3 power level settings (1, 4, & 8 Watt), which I measured with an uncalibrated Daiwa wattmeter (on VHF) to be approximately:

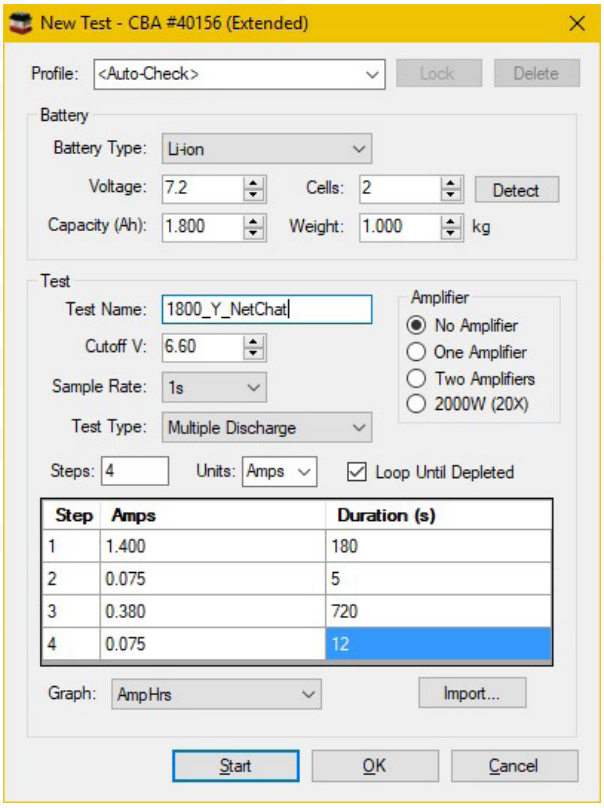
High Power (7/8 W setting)	**6.1 Watt RF actual**	**1400 mA battery current**
Med Power (5 Watt setting)	**5.4 Watt RF actual**	**1330 mA battery current**
Low Power (1 Watt setting)	**1.6 Watt RF actual**	**770 mA battery current**

It is likely actual RF output will vary across different frequencies & bands, But based on above measured currents, reducing transmit power will certainly extend your operating time – plus it's proper etiquette, and easily adjusted via Baofeng memory setting #2.

Test Procedure:
Each battery pack was charged, then capacity tested within 24 hours. Lithium batteries have excellent shelf life (very low self-discharge), so even a battery that has been sitting for several months will retain almost full capacity. That said, guidelines for long term storage recommends cells be charged or discharged to about 50% capacity, which you will find is how new lithium batteries are shipped. Attaining that 50% storage capacity is another handy feature of the CBA.

Test parameters are entered in the CBA user interface per Figure 1. Insure all values are set correctly, then start the test. The CBA's fan will activate, screen will show "Running", Voltage & Current readings are updated on the right side, and main Graph will begin logging. Right clicking the Graph easily changes Graph view to show Amp Hours, Watt Hours, or Minutes of Operation. For the test mode I have chosen (optional Multiple Discharge), the CBA will apply a programmed load current profile to the battery pack (in steps) and continue looping through that profile until the pack reaches the 6.6 volt pre-set minimum voltage, at with point the test ends.

Fig, 1



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Warning - Take care to not to damage cells by over-discharging! Prior to testing, I determined my radio battery meter displayed 1 bar (of 3 max) at 6.68 volts, and shut down when the pack reached 6.36 volts. Given lithium's wonderfully flat discharge curve (followed by rapid voltage drop at the end), a Baofeng meter displaying 1 bar means you only have seconds of transmit time remaining. Sign-off fast! So 6.6 volts seemed like a reasonable point to terminate load testing. Setting it to 5.6 volts resulted in a considerably higher final Amp-Hour capacity (several more cycles), but beats up the cells and is lower than your radio will allow.

Equipment Used:
Baofeng UV-5R 7w Tri-Power Black (with 1800mAh & 3800mAh battery packs).
Baofeng BF-F9V2+ Tri-Power Yellow (with 1800mAh & 3800mAh battery packs).
Daiwa CN-901 HP SWR / Wattmeter (uncalibrated), on 20 watt range.
Fire Resistant Bag Safety Enclosure for battery packs during testing.
Battery Test Fixture Low Resistance "pogo stick" style spring contacts with PowerPoles.
West Mountain Radio PWRcheck to record transmit voltage & current.
West Mountain Radio CBA IV with Extended Software to control battery load profiles.

A Word About Temperature:
Batteries used in portable Amateur radio devices (NiCad, NiMH, Lead-Acid, and Lithium) are best used near 20 degrees C (68° F) room temperature. Performance of all battery chemistries decreases at lower temperature. So when you are using your HT to work a winter parade, winter field day, or while skiing or ice fishing, keep a spare battery in a warm inside coat pocket. Baofeng radios specify -20° C (-4° F) minimum operating temperature – but low temperatures reduce battery capacity, so carry a spare. Remember; never attempt to charge a lithium battery that is below freezing.

General Observations: {Refer to Charts 1-4)

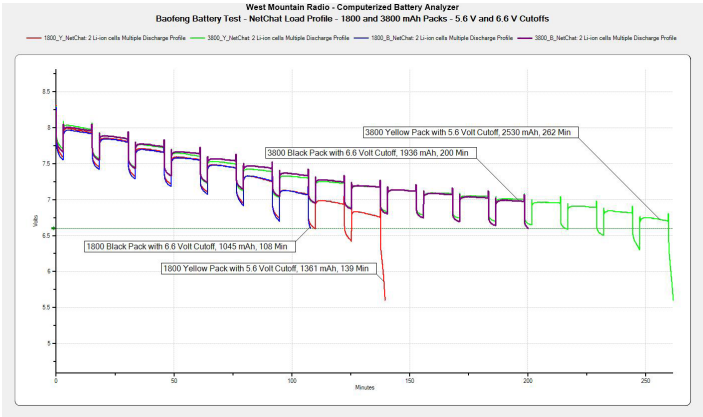


Chart 1

1. Chart 1 provides an operating time (minutes) comparison of two large (3800 mAh = 200 minutes) and two small (1800 mAh = 108 minutes) packs when discharged using the "NetChat" load profile. Two tests were halted at the recommended 6.6 volt level, but two others were allowed to continue to 5.6 volts – below Baofeng's normal shut down point, but the low minimum for typical Lithium cells. The radio's designers could have extracted additional energy from the packs, but at the expense of long term life.

2. Chart 2 shows the exact same test data as Chart 1, but graphs are displayed in Amp-Hours instead of Minutes. It is clear the "NetChat" duty cycle load does not result in any pack attaining its 3.8 (1.9 actual) or 1.8 (1.0 actual) Amp-Hour nameplate rating, even when discharged below recommended minimum voltage.

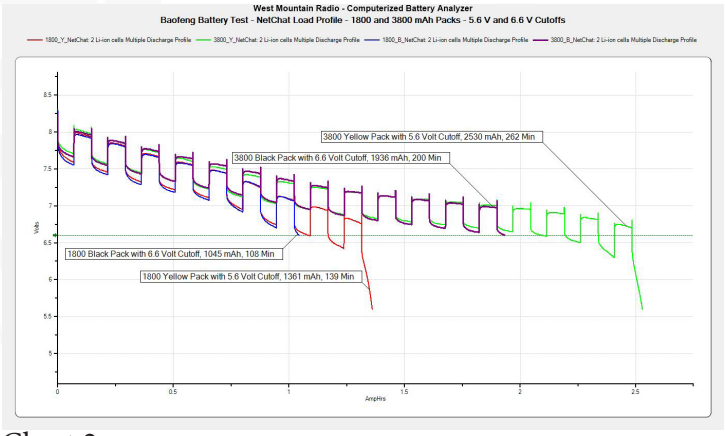


Chart 2

3. Chart 3 provides an operating time (minutes) comparison of two large (3800 mAh = 400 minutes) and two small (1800 mAh = 215 minutes) packs,

HT Battery Performance
By: Fred Schwierske, W9KEY

when discharged using the “Parade” load profile to the recommended 6.6 volt minimum. Since “Parade” load is a bit less stressful than “NetChat”, packs provide a little more energy before low voltage shut down. An additional test run was conducted near freezing (0.5° C / 33°F), resulting in a 10% energy decrease.

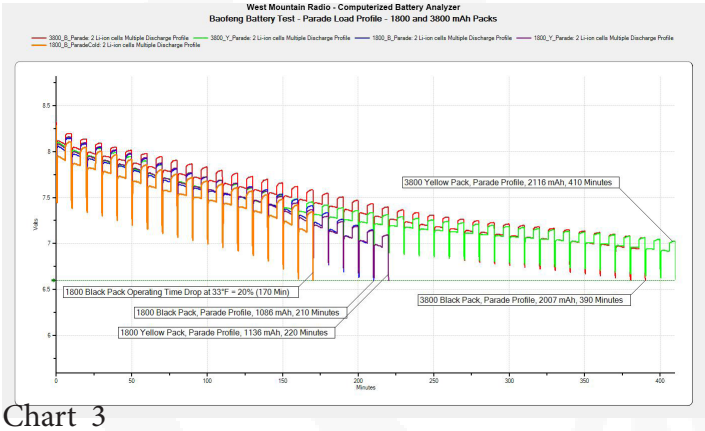


Chart 3

4. Chart 4 shows the exact same test data as Chart 3, but graphs are displayed in Amp-Hours instead of Minutes. The “Parade” duty cycle load also does not result in any pack attaining its 3.8 (2.0 actual) or 1.8 (1.1 actual) Amp-Hour nameplate rating, but total capacity is a little better than “NetChat”.

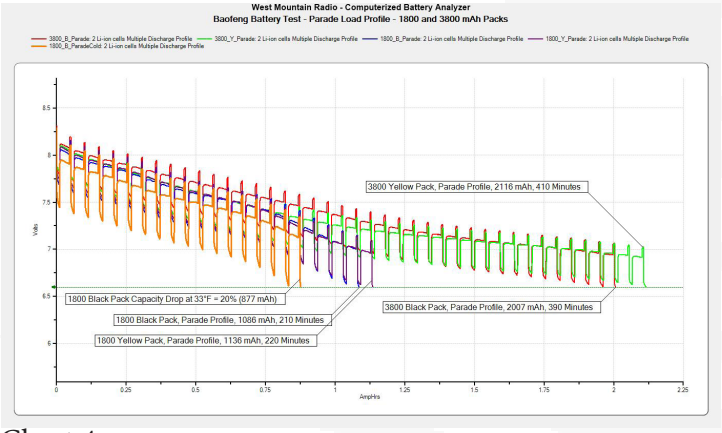


Chart 4

5. Baofeng battery packs fell short of their published mAh capacity. Best results only attained 76% of nameplate rating. But in fairness, this is common when cells are subjected to high load currents and duty cycles. Running lower current and adhering to factory specified duty cycles would result in higher capacity numbers.

6. Testing indicates a small 1800 mAh pack will get you through two (1 hour) nets.

7. My radios shut down at 6.4 volts (3.2 volts per cell). Lithium cells are typically considered “discharged” at 2.8 to 3.0 volts. Two “NetChat” tests were run to 5.6 volt cutoff, with a noticeable capacity increase. It was nice to see Baofeng is treating the packs conservatively, which should extend their life.

8. I had expected a more pronounced energy decrease during cold (32 F) testing. The CBA (optional probe) verified pack temperatures remained constant during testing. However, Lithium cells perform better at low temperatures than other chemistries, reportedly losing only 10% of their capacity at 0 degrees C.

Summary:

Although you probably do not need a formal test to know how long your HT will last, it is handy to evaluate different battery sizes against various operating (transmit) duty cycles.

Baofeng Battery Test Results - NetChat Load Profile					
Pack Size/Color/Test	Capacity (Ah)	Energy (Wh)	Time (m:s)	Stop Test (V)	Capacity (%)
1800_Y_NetChat	1.361	9.826	139:34	5.6	76%
3800_Y_NetChat	2.530	18.007	261:47	5.6	67%
1800_B_NetChat	1.045	7.713	107:58	6.6	58%
3800_B_NetChat	1.936	14.055	200:16	6.6	51%

“NetChat” {Table 3} test data verifies a severe long-winded one hour net / rag chew is possible (maybe even 2 hours), when using small 1800 mAh battery packs. Approximately double operating time can be expected with the larger 3800 mAh packs. This matches my actual experience over the past year.

Baofeng Battery Test Results - Parade Load Profile					
Pack Size/Color/Test	Capacity (Ah)	Energy (Wh)	Time (m:s)	Stop Test (V)	Capacity (%)
1800_Y_Parade	1.136	8.486	220:14	6.6	63%
3800_Y_Parade	2.116	15.415	410:26	6.6	56%
1800_B_Parade	1.086	8.132	210:19	6.6	60%
3800_B_Parade	2.007	14.775	390:16	6.6	53%
1800_B_ParadeCold	0.877	6.543	170:11	6.6	49%

“Parade” {Table 4} test conditions, with shorter transmission times, allow a small 1800 mAh pack to last about 3.5 hours – at least in temperatures fit for human life. Region 9 people might want the added insurance of a larger 3800 mAh pack during winter operation. Operating in near-freezing (33 F / 0 C) temperatures will reduce battery capacity about 10%.

73,

Fred, W9KEY

FreeDV HF Digital Voice Mode: Global QSO Party

Posted by VK5GR

The Amateur Radio Experimenters Group is proud to announce a new event on the Amateur Radio Calendar. The FreeDV HF Digital Voice QSO Party!

The aim is to encourage as many Radio Amateurs as possible to learn about FreeDV and encourage as many FreeDV signals to be on the air as possible to help spread the word about this new mode.

If you can use WSJT-X for FT8 or any other digital modes software then, with the addition of Headphones and a microphone on your PC, you can switch to digital voice transmission in an instant! Its that easy! So why not give it a try? This is a great way to experiment with something new from the comfort of your own armchair, like the FreeDV software. All it takes is a little bit of time to download, install and setup the software – nothing more! Pair it up with a RIGblaster for great results!

The Rules

When: April 27th 0300z to April 28th 0300z 2019

Where: All HF Bands from 80m – 10m (excluding the WARC bands)

How: Work as many stations as possible using the FreeDV 700D or FreeDV 1600 modes in 24 hours.

Centre Frequencies: 1870kHz, 3630kHz, 7180kHz, 14130kHz, 21180kHz, 28330kHz (chosen in accordance with IARU Bandplans)

Points:

Stations participating can earn points per QSO

1 point per contact within a continent
5 points per contact between continents
50 points per contact with VK5ARG
(AREG's club station is planned to be manned for the 24hrs looking particularly for inter-continental DX on 40/20 and 15m)

Multipliers:

1 per call area in VK/VE/JA/ZL per band +
1 per DXCC entity per band +
1 per inter-continental contact
Final Score:

Sum all points x sum all multipliers
You can work a station once per band.

Stations earning 50 points or more will be entitled to an emailed PDF certificate indicating their successful participation in this inaugural event!

Categories:

There is one entry per station callsign only.

Log Submission:

You MUST submit your ADIF formatted log via email within 7 days after the event to:

FreeDV.QSOParty@areg.org.au

Article sourced from http://www.areg.org.au/archives/209376

Amateur Radio is transitioning from analog to digital, much as it transitioned from AM to SSB in the 1950's and 1960's. How would you feel if one or two companies owned the patents for SSB, then forced you to use their technology, made it illegal to experiment with or even understand the technology, and insisted you stay locked to it for the next 100 years? That is exactly what was happening with digital voice. But now, hams are in control of their technology again!

Magnetic Field Changes

Adapted from Nature Online, article by Alexandra Witze

https://www.nature.com/articles/d41586-019-00007-1

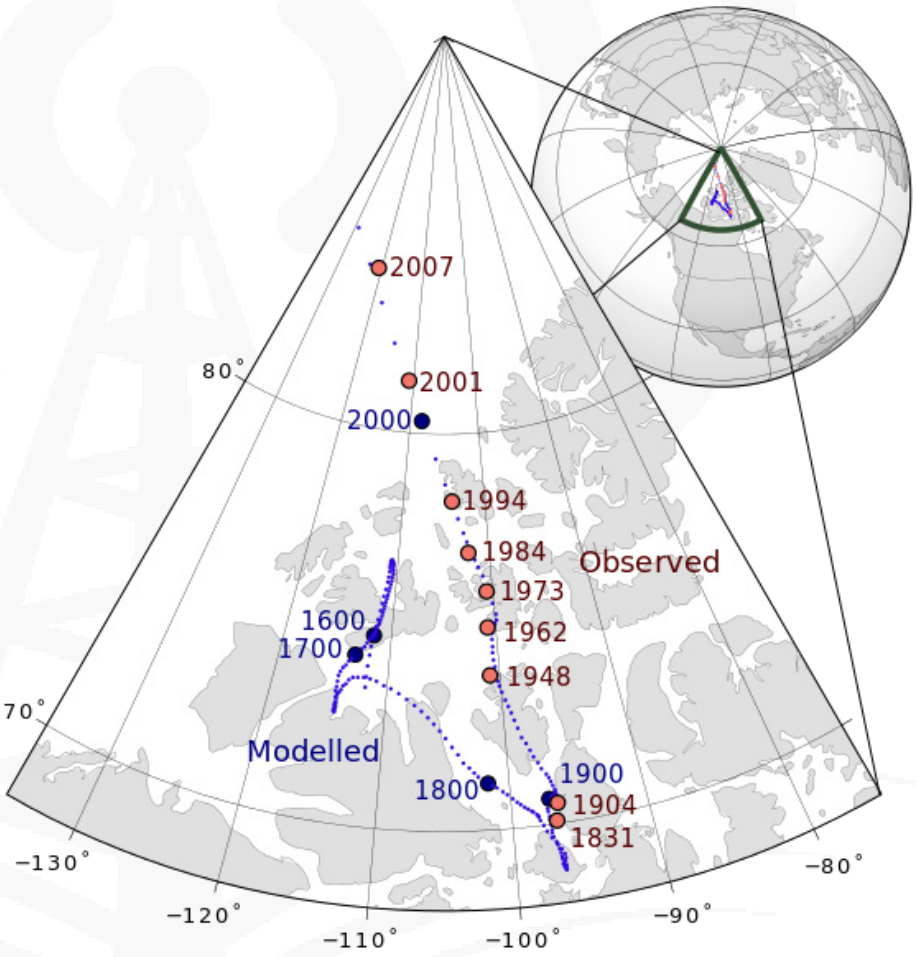
Earth's north magnetic pole has been moving away from Canada and over towards Siberia, due to the liquid iron stirring through the core of the planet. These movements have been so quick that it forced the world's geomagnetism into a rare move.

The World Magnetic Model was updated on January 15th. This model describes the planet's magnetic field and sets the stage for all modern navigation, like Google maps on a smart phone and naval vessels out at sea. The model had been released in 2015 and was set to update in 2020, but with the rapid shifts in the magnetic field, researchers had to fix the model and release it earlier than expected.

Part of the problem is due to the moving pole positions, and the rest is due to the shifts within the earth. Liquid churning in Earth's core generates most of the magnetic field, and as the deep flows change, the magnetic field varies. In early 2018, researchers from NOAA and the British Geological Survey in Edinburgh discovered during their annual check of the model that the data was so inaccurate that it would soon lead to navigational errors. It began in 2016 when a geomagnetic pulse beneath South America came just months after the 2015 model had been updated. To make matters worse, the motion of the north magnetic pole came soon after the aforementioned pulse, which threw readings off even more. The quick shifts in the pole's position is making northern regions more prone to navigational errors.

nature
International journal of science

Image from https://geekswipe.net/technology/transport/the-effect-of-magnetic-pole-movements-in-aviation/



WE WANT TO HEAR FROM **YOU**!

If you would like to submit an article for consideration in future newsletters please contact marketing@westmountainradio.com

Morse Code Made Easy!

by Laura Schneider

A new method of learning Morse Code has been released, and it is perfect for beginners, children and visual learners! This is an application for smart phones, but can also be used with a desktop computer.

Many people find Morse Code a daunting ability to pick up. In 1863, Morse Code was invented by an American called Samuel Finley Breese Morse. It was an alternative for telephones and made communicating over long distances more convenient It was integrated into Amateur Radio because the signals always get through. However, since it is no longer required for Amateur Radio Licensing Tests, a lot of people never bother to learn the skill. There are many clubs with classes dedicated to learning Morse Code, but with the busy world we live in today, sometimes it is hard to make room in your schedule for something that might not seem as necessary.

This application was initially developed by a woman who is unable to communicate vocally. She found that Morse Code helped her communicate, and wanted to share her success with those around her. She helped develop the application and a Morse Code keyboard for smart phones to give people who suffer from Aphasia or other disorders a way to communicate with the world around them! People are able to type in Morse Code into an app, and the words form on the screen or manifest as audio! This opens up a whole new world for those with communication disabilities and amateur radio hobbyists looking to expand their skills!

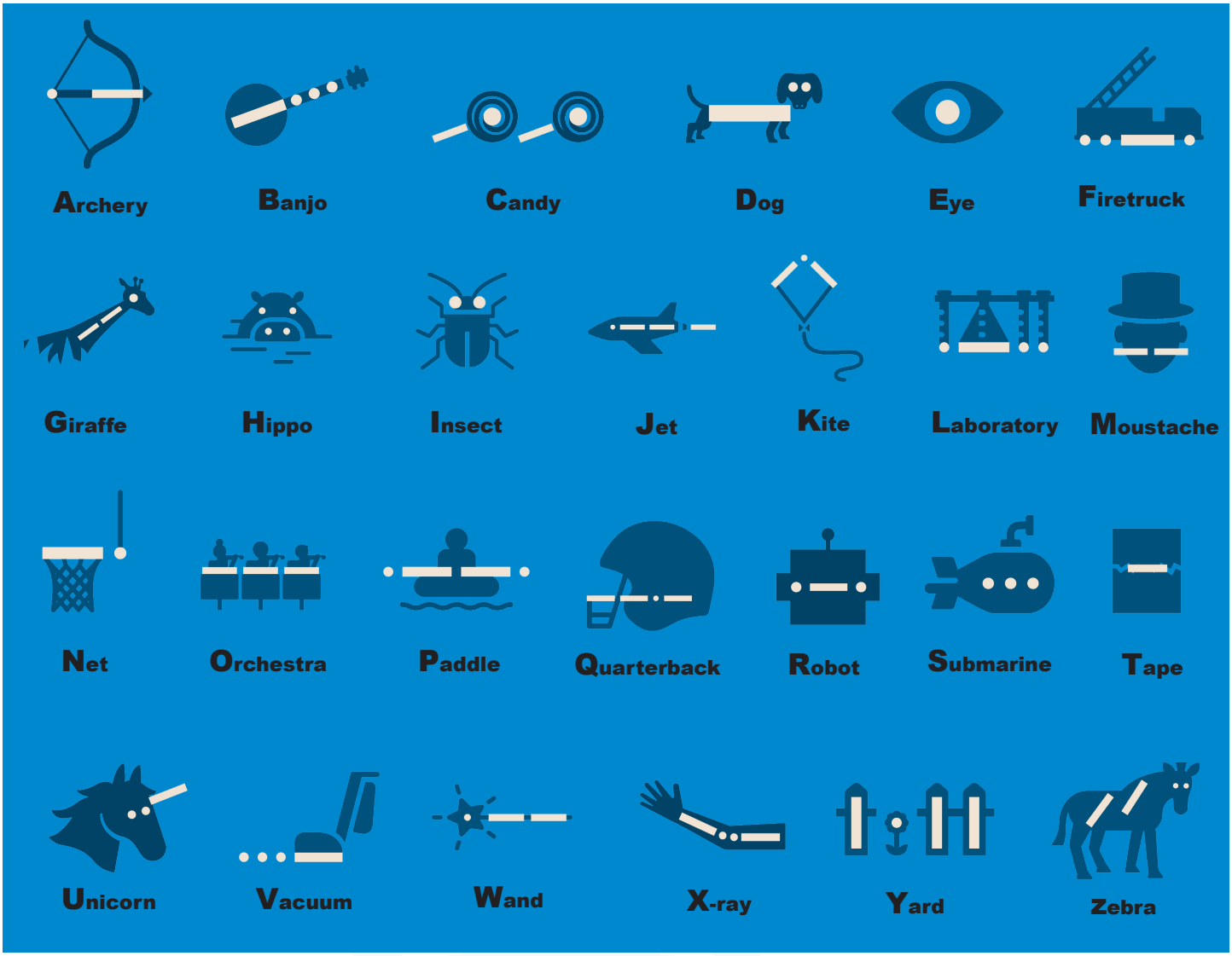
Google has released the app that can be found online at https://morse.withgoogle.com/learn/

Images from https://experiments.withgoogle.com/collection/morse
https://github.com/googlecreativelab/morse-learn/tree/master/assets/images/png

It uses associative images to help beginners learn the code (See pg. 9). The images still read left to right, so you are still learning the code in the correct order. When you play the app, the dots and dashes light up in order, and if you begin to hesitate on any letters it will bring up the image to jog your memory!

With no experience, I was able to pick up quite a good amount of Morse Code after playing with the app for a good while. This is a great option for visual learners and those who benefit from mnemonic devices. Give it a try for yourself to see how easy it is!

Morse Code Made Easy!
by Laura Schneider



Bulletin Board

Visit Our Booth!

Dayton Hamvention
May 17-19

Plano Ham-Com
June 7-8

Attention!

West Mountain Radio is focused on making products in the U.S.A. Unfortunately, due to the rise in raw materials and labor costs, we are forced to raise our prices. Thank you for your continued support to provide quality products worldwide.

Order a customized DC-to-Go Box for Lithium Batteries too!

Use the online tool to configure size, power products, connectors, and accessories:
www.westmountainradio.com/custom-go-boxes

or look for the button

Available now!

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