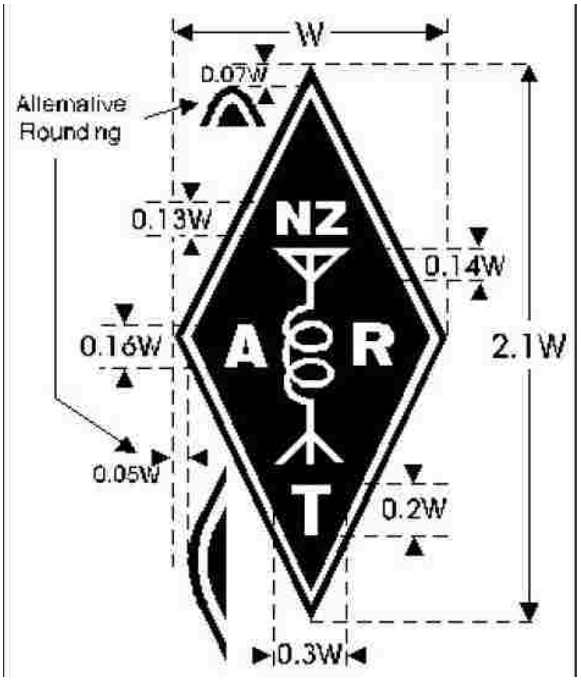
Ham Hum

July 2018

The official newsletter of
The Hamilton Amateur Radio Club (Inc.)
Branch 12 of NZART - ZL1UX
Active in Hamilton since 1923



Next Meeting

Midwinter Dinner

6:30pm 18th July (details inside)

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From the Editor

Midwinter Club Dinner

Wednesday 18 July 2018 at 6.30 pm

At the 'Cock & Bull'

Traditional English Pub and Restaurant

Corner Maui and Church Rd, Pukete, Hamilton

See **HERE** for menu

Wicked Wednesday - Desserts half price with every main meal ordered

Please advise Phil King via
Phone – 07 847 1320
Or
Email – zl1pk@xtra.co.nz
if you are coming

Propagation de K7RA

30 June, 2018

Conditions were good for Field Day weekend, with no major geomagnetic disruptions, while solar flux and sunspot numbers were relatively high for this part of the solar cycle. On Friday, Saturday and Sunday the sunspot numbers were 41, 34 and 16 while solar flux was 80.3, 77.1 and 74.5.

Planetary A index was 4, 16 and 7 on Friday through Sunday. On Saturday the College A index in Alaska reached 24, so I imagine Field Day stations in Alaska and Canada's northern latitudes suffered a bit, although I've received no reports. College K index was 4 at 0600 UTC, then 2 at 0900 UTC, then 5, 5 and 4 on 1200-1800 UTC.

But the middle-latitude A index (measured in Virginia) was 15 on Saturday, and the K index reached four on only two periods, at 1200 UTC and again at the end of the UTC day 12 hours later. Otherwise the mid-latitude K index varied from 2-3.

No sunspots are visible since Tuesday, June 26. Average daily sunspot number was 22.6 this reporting week (June 21-27), down slightly from the previous week's average of 25.7. Average daily solar flux actually increased this reporting week from 74 to 75.3. Average planetary A index increased from 6.7 to 9.9.

Predicted solar flux is 70 on June 29, 68 on June 30 through July 6, 72 on July 7-13, 75 on July 14-15, 77 on July 16, 80 on July 17-19, 77 on July 20-21, 75 on July 22, 72 on July 23-24, 70 on July 25-26, 68 on July 27 through August 2, 72 on August 3-9, 75 on August 10-11 and 77 on July 12.

Predicted planetary A index is 8 on June 29 to July 2, 5 on June 3-14, 15 on July 15, 5 on July 16-19, 15 on July 20, 8 on July 21-22, then 10, 25, 18, 12 and 8 on July 23-27, 5 on July 28 through August 10, 15 on August 11 and 5 on August 12.

Jon Jones, N0JK reported a 6 meter opening to Asia on Thursday, June 21:
"A major sporadic-E opening on 50 MHz between Japan, China, Korea to North America June 21. Hundreds of contacts were made, most via FT8.
"I got off work at 4:30 pm CDT (2130z) and drove home to Lawrence from Kansas City. I had seen some spots that a good opening to JA was developing prior to leaving work. Stopped at the I-70 'Lawrence rest stop' at 5 pm (2200z) between KC and Lawrence to 'check the band.'

"This is what I decoded on 50.313 MHz FT8 with just a 1/4 wave mag mount whip on the car in the parking lot:
"JA8XTG, JH8XVH, JP1LRT, JH7DFZ, JE1BMJ, JG3IFX/8, CM2XN JA1UAV Cuba to Japan, JE1BMJ, and JA7QVI.

"I tried to work some of the JAs -- but the mobile setup was unable to get through.

Went home, got my portable set up with a 2 el Yagi and back on the air at 2315z. I was able to work a number of JAs including JA7QVI and JA9SJI. Got one decode of BH4IGO. The opening got weaker after 2340z. JA stations worked Cuba, Cayman Island and other islands in the Caribbean. Larry, N0LL said signals were strong enough he worked a few JAs on CW."

On June 28 Mark Lunday, WD4ELG of Greensboro, North Carolina reported:
"15 meters has been almost completely TEP for days and days on FT8. Suddenly at 2200 UTC today, I start picking up 9K2HS (Kuwait) calling CQ! Then I hear SP2HQP (Gdansk, Poland).

"I am working EU on 17 and 20 meters at the same time, but this is the first time in a while that 15 has been open in the EU/SW Asia direction in a while."

(TEP is trans-equatorial propagation, meaning signals seem to be propagating only over a north-south path, across the equator).

Last week on June 22, Bob German, KG6PJG of Big Bear Lake, California reported:
"I maintain an APRS VHF I-gate from my home in Big Bear Lake, California, located at an elevation of approximately 7,260 feet.
Most packets received are from a fairly localized area with a few from more distant locations. However on 6/19/18 from 1646:17 to 1837:14 Zulu I received some very surprising packets. I believe this was likely due to unusual atmospheric conditions that were reflecting 2M, and likely 6M, signals much further than normal. These packets were sent from Arkansas, Kansas, and Oklahoma with the most distant being 2,168.3 km. The sending locations can be viewed at:
http://aprs.link/app/aprs/stations/digiusermap-KG6PJG-10

"My station consists of a Kenwood TMV71A using a Diamond X300A antenna. APRS software are Direwolf and APRSIS32.
"I would guess that other amateur services probably experienced these conditions and I thought it might of some value to pass along. I have no experience with DXing but hope to engage in this activity in the future."

Looks like Bob observed some nice VHF sporadic-E propagation.

Jeff, N8II of Shepherdstown, West Virginia reported last Sunday, June 24:
"It would seem that magical things would happen with such a drastic increase in SFI with low K index, but at times, especially around 1200-1300Z on 20M things have seemed pretty unchanged from SFI in high 60s. I did work some EU and AS Russians, Finland, Israel, and UN6P Kazakhstan around 0200-0300Z on 20 CW June 22. The next night was not nearly as good. Then there was the opposite of all week long, almost no Es on any band during FD on Saturday (15/10M dead at 2300Z) followed by tremendous Es on Sunday! More to follow.

"I did notice some improvement on 17M around 1300Z (signals still quite weak vs.

nil) and some late EU on 17M (could have been Es in PM).
"The JAs have been loud but very few in number on 20 around 1200Z and probably earlier."

In the Letters section of the July 2018 issue of QST, Bob Kozlarek, WA2SQQ of Elmwood Park, New Jersey points out that "85% of my best 160-meter activity took place during the low part of the last solar cycle. While 10, 15 and 20 meters were quiet, I was very active on 160, 75 and 40 meters. It's time to retune and start thinking about making the best of these situations. Days without sunspots can be a great time to explore new or seldom used bands or modes, such as 2 meters SSB and digital mobile radio."

If you would like to make a comment or have a tip for our readers, email the author at k7ra@arrl.net.

For more information concerning radio propagation, see the ARRL Technical Information Service at http://arrl.org/propagation-of-rf-signals.

For an explanation of numbers used in this bulletin, see http://arrl.org/the-sun-the-earth-the-ionosphere.

An archive of past propagation bulletins is at http://arrl.org/w1aw-bulletins-archive-propagation. More good information and tutorials on propagation are at http://k9la.us/.

Monthly propagation charts between four USA regions and twelve overseas locations are at http://arrl.org/propagation.

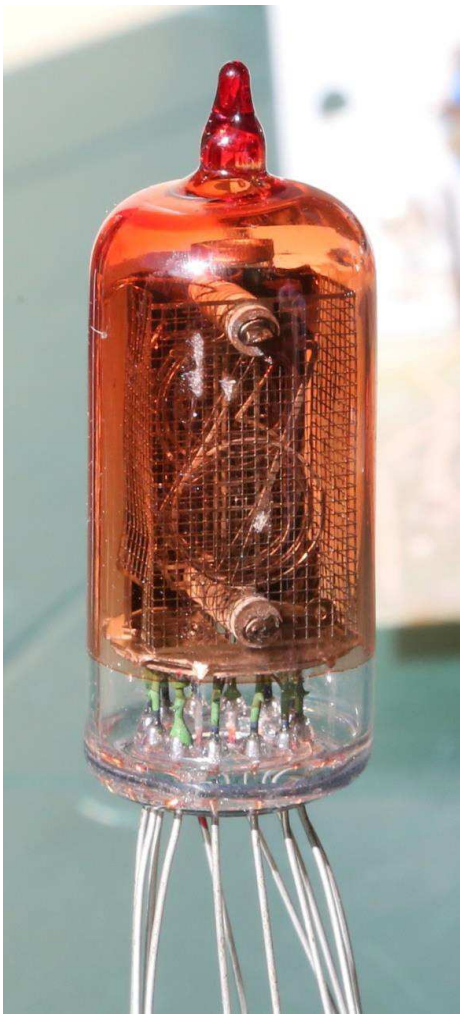
Instructions for starting or ending email distribution of ARRL bulletins are at http://arrl.org/bulletins.

Sunspot numbers for June 21 to 27, 2018 were 41, 41, 34, 16, 14, 12, and 0, with a mean of 22.6. 10.7 cm flux was 81.5, 80.3, 77.1, 74.5, 72.8, 71.1, and 70, with a mean of 75.3.
Estimated planetary A indices were 3, 4, 16, 7, 12, 20, and 7, with a mean of 9.9.
Estimated mid-latitude A indices were 4, 4, 15, 8, 10, 17, and 7, with a mean of 9.3.

Arduino & Nixie Tubes

As mentioned in my last “Binary Clock” article, I’ve finally made some headway with making a Nixie tube clock – What, another clock I hear you say, well there are two sides to this, 1 – Treat it as ‘how to connect xxx displays to a micro, or 2 – How to display/use one’s collection of ‘antique’ display devices. I could just leave them

in a box to be forgotten about, or I could 'light them up', and to me the most obvious is as a clock. I also have a 7 digit Nixie module available, from a very old digital volt meter, that I had thoughts of making into a frequency display for my Yaesu FT101 – Pity I killed the radio!.



So what is a Nixie tube anyway – well maybe it's time for a little digital display history. Apart from decatron tubes, if you built something that produced a digital number, you of course need to display it. The first method was to use a row of light globes, either as binary, or in rows of 10 representing '0' through to '9', with multiple banks required for a multi-digit number.

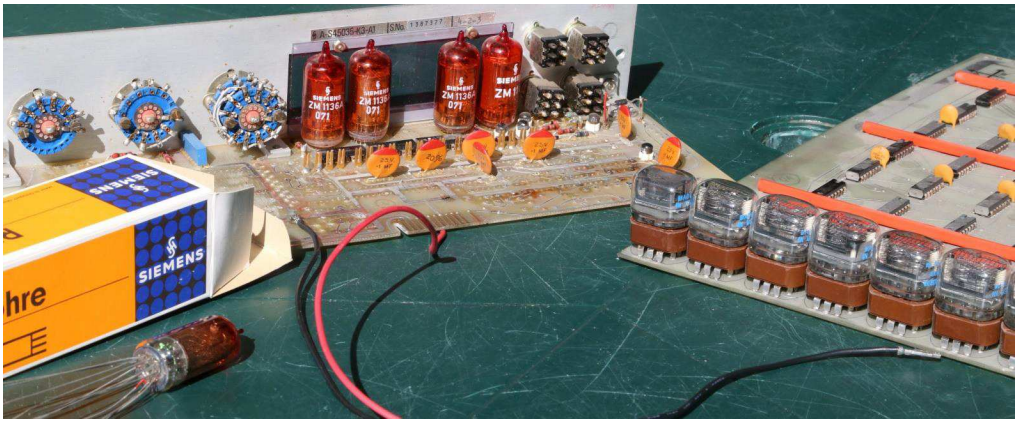
Here is an 'ancient' Racal counter showing '4044', this is the deluxe version as there are numbers mounted in front of the rows of lamps. So now the race was on, on how to make a more compact display. Apart from some very imaginative ways to use light bulbs and lenses etc., the Nixie tube was born. Inside the tube are 10 'cathodes' shaped as the digits 0 though to 9, in a tube filled with Neon gas. If you pass a current though the tube (~120V) the negative element will glow, giving you a digit. For a more detailed look, have a look at the http://danyk.cz/digitrony_en.html website.

So how do you drive them? Well the first thing to remember is these are a 'negative resistance' device, if you just hook a variable high voltage supply up to them and turn up the volts till the tube strikes, you will quickly destroy it. You need about 200-300V and a current limiting resistor, so that when the tube strikes, the current will be kept to about 2mA.

So how do you connect a 300V display tube to a 5V logic IC, well the first option is a bank of 10 high voltage transistors, or a custom display driver IC. As you can imagine, 10 transistors and their associated resistors soon add up to quite a bit of board space, assuming you don't go down the microscopic surface mount path. (Some have) The other problem here is these 10 transistors then need driving. If you only have one digit, it's not a big problem, but multi-digit displays start to bring

up a few issues. The path I took was to use 7441/74141 driver IC's – yes they are about as old as the tubes they were meant to drive, but they are available, usually

out of the equipment you scavenged the Nixie tubes from. There is only one limitation with these IC's, unlike their LED drive versions (7447, 7448) they cannot blank the display, there is always a digit displayed. There is a simple reason for this, the output transistors can only handle about 70V, so if one cathode is pulled low, letting the others float up to 60/70V is sufficient to extinguish those digits. Turning off all 10 outputs will place 200 odd volts on the outputs, a bit of a problem. (The 7441 does appear to have built in protection) In the Nixie era nobody seems to have been bothered, so '40' would be displayed as '000040' etc. not ' 40' as is done these days. This is called leading zero blanking, the later 7447 & 7448 decoder drivers have pins to take care of this. In my case of the clock, having a display like '04:20' didn't seem quite right, However as the first digit only ever needed to show a '1' or maybe a '2' for 24Hr time, I elected to use two transistors for that



digit rather than a 7441, so 300V DC is no longer a problem.

This brings us to the IO limitations of an Arduino Nano, as I was happy with only 4 digits I could get away with it.

Normally a digit requires 4 bits to display the full 0-9, however as 2 of my clock digits don't need the full range, I saved a few I/O lines.

If you want the full 4 bits for 4 digits, that is not a big problem, it just means you have to be a bit more sneaky with any other inputs you desire. For a bigger display, like say 6 digits, then a regular Arduino Nano/Uno has reached its limits, you need either a bigger Arduino, or use some form of port expansion using shift register IC's etc. I picked up a pile of 74HC595's off the internet for a very cheap price; these give you 8 extra outputs (i.e. 2 digits) per IC.

Actually, this driver I am making is far more versatile than just for driving nixie tubes, the BCD output can easily be used to drive any seven segment displays, either LED, LCD, or even a VFD.

In a radio shack as the displays are being run from DC, and not multiplexed, the digital hash generated should be far less, yes the Arduino itself will generate some hash, however that part can be put into a shielded box, with suppressor feed throughs etc., as only DC is leaving it. Trying to shield a multiplexed LED display, whilst still having it visible is a problem, but if it and its driver ICs are running on pure DC, no (or minimal) shielding is needed.

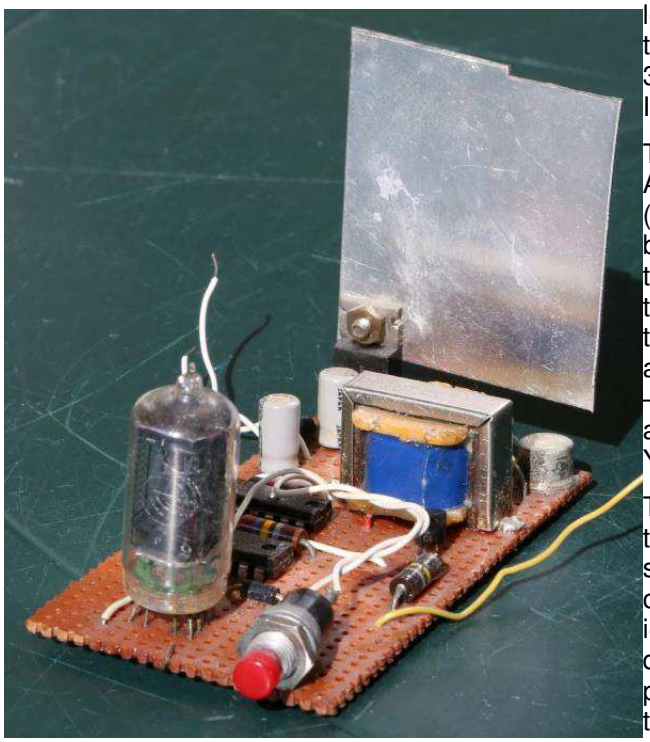
Back to the nixie's. have a look at https://www.youtube.com/watch?v=7uogKucrPks for driving them using more modern IC's with serial inputs, however he had the same 70V limit, plus surface mounting can be a problem for some, but as designing a PCB was not a problem for him, SMB was not an issue, so it all worked out ok for his project.

Next comes the power supply, if this was quite a few years back, a power trans-

```
pinMode(A0, OUTPUT); // Ten's Hours bit 1
pinMode(A1, OUTPUT); // Ten's Hours bit 2 (Only needed for 24Hr mode)
pinMode(A2, OUTPUT); // Hours bit 1
pinMode(A3, OUTPUT); // Hours bit 2
pinMode(A4, OUTPUT); // Hours bit 3
pinMode(A5, OUTPUT); // Hours bit 4
pinMode(A6, INPUT);  // Hours set button
pinMode(A7, INPUT);  // Minutes set button

pinMode(2, OUTPUT);  // Ten's Minutes bit 1
pinMode(3, OUTPUT);  // Ten's Minutes bit 2
pinMode(4, OUTPUT);  // Ten's Minutes bit 3
pinMode(5, OUTPUT);  // Minutes bit 1
pinMode(6, OUTPUT);  // Minutes bit 2
pinMode(7, OUTPUT);  // Minutes bit 3
pinMode(8, OUTPUT);  // Minutes bit 4
pinMode(9, INPUT);   // nu
pinMode(10,INPUT);   // 12/24 hour switch - 'hourmode'
pinMode(13,OUTPUT);  // Arduino nano onboard LED (Half hertz flasher)
```

former from a small valve radio would have been the obvious choice, however transformers with 200V secondaries are extremely rare these days, Yes I do have one, but it is earmarked for an upcoming (10 years already) valve project. For testing purposes I used a variac and a 240/240V mains isolation transformer, but of course this is of no use in the final device. Many years ago I built a single digit nixie counter, this used a small audio transformer as an inverter to light the tube. As it only produced a milliamp or two, everything was happy with the high-voltage limit resistor being left out, as far as the tube was concerned, the inverter was a constant current source – ideal. This is actually a much safer way to do things, as the actual HV on the board is only the run/struck voltage of the tube, you will be much less likely to get a 'belt' from this one, whereas a full 200-300V DC rail can really bite. I know! (now)



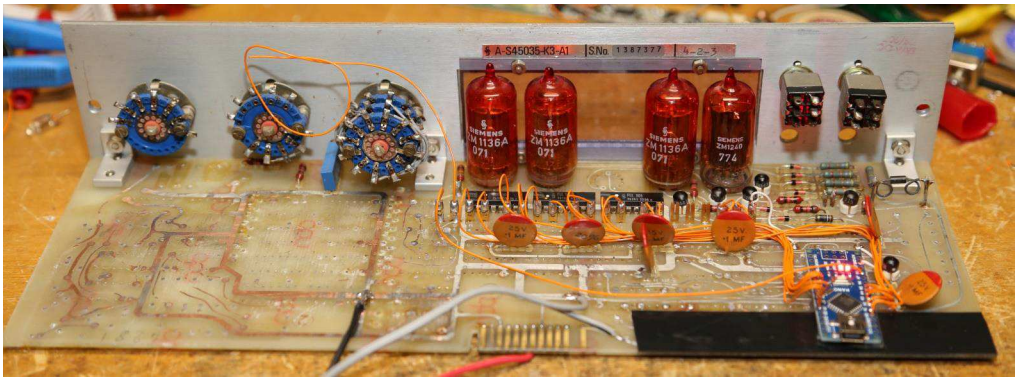
This is my recycled Siemens AK-001 Pulse measuring set (Hamfest special?) The black electrical tape under the Arduino Nano is to cover the HV line that runs from the edge connector right around the side of the board – no covering, just where I accidentally placed my finger YIKES!

There is one big limitation to the nice little inverter on my single digit counter, it will only drive one tube, as nixies are negative resistance devices, you cannot directly parallel them and expect them to current share. One will strike first, bringing the supply down to 90 odd volts, leaving the other tube blank, as 90V is far below its striking voltage. I would either need 4 of these inverters, or a larger one producing many more volts with the normal limit resistors, so they can all live together. Currently I am investigating the use of a CCFL (cold cathode florescent light) inverter from an old laptop's LCD display backlight, I just need some high speed, high voltage diodes to rectify its output as I need DC, not AC.

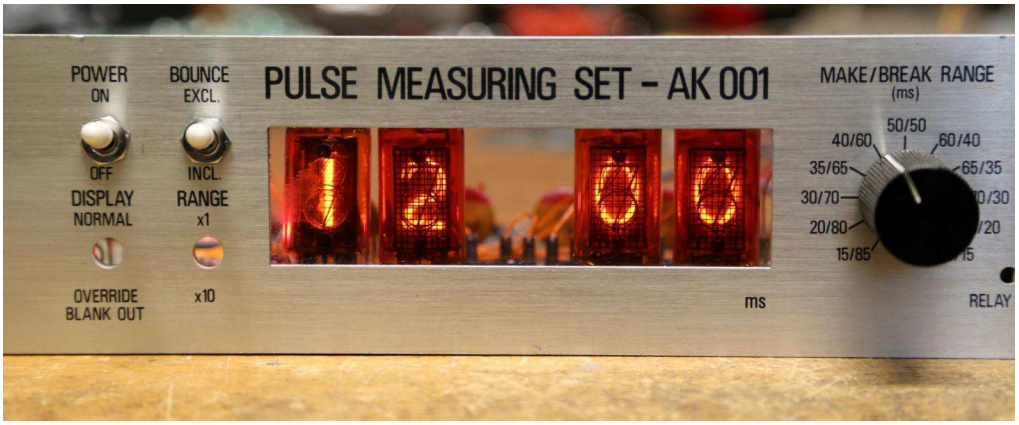
One extra thing, you can usually dispense with the usual HV supply filter capacitor, so if you do make contact, the zap potential is a lot less, and turning off the power

completely kills the HV.

This is it as it stands now, the gap in the middle (someone broke that tube) will be used for the clock colon using two standard neon bulbs, probably flashing at 0.5Hz



via the pin 13 flash routine already in my code. I had various ideas what to use all



the switches for, however I will probably cut it down and lose the three rotary switches. The power switch will be power (it is to be driven by my external time source, so no need to be on 24/7), the 'bounce' switch will be a 12/24 hour display selector, leaving the bottom two hole for time set buttons - not needed at my QTH, but handy for demoing it at a club meetings etc.

If you are wondering why so much blank board, well it wasn't initially blank, it was covered in IC's. I initially tried to de-solder them, but my tool was not up to it, so I just started snipping the leads, then removing some of the left-over track work. I originally had ideas of putting the power supply there, but now it will probably just face the hacksaw.

One surprise I had, was when I swapped the left hand tube from a ‘symbol’ tube to a regular 0-9 nixie, was that one of the wire leads had been accidentally crimped / folded over when it was inserted at the factory, and had been hiding there all along, never causing an issue.

VK3TGX

New Compact Heavy-Duty 7 m (23 ft) Portable Mast

Working with a specialist composites manufacturer, SOTABEAMS has designed a unique heavy-duty fibreglass mast. The **Tactical 7000hds** has been designed for portable operators who need a more rugged and reliable mast than the normal fibreglass telescopic poles that are available.

With a packed length of less than 60cm (23 inches), this is very much a "go anywhere" solution. The mast uses heavy-gauge composites to make it unusually stiff - ideal for use in extreme weather conditions where the tension in wire antennas can cause lesser masts to bend and ultimately fail. The Tactical 7000hds also incorporates a base shock absorber and comes in a camouflage style bag.

Details at:
https://www.sotabeams.co.uk/compact-heavy-duty-7-m-23-ft-mast/

https://youtu.be/gbBpFEEQwz4

ARISS radio upgrade on ISS for student outreach

ARISS is in critical need of an infrastructure update to ensure that programs like students talking to astronauts in space via amateur radio can continue

Through your donations ARISS seeks the following upgrades:
• Next Generation radio system will support easier radio mode transition, to enable new, exciting capabilities for hams, students and the general public including:
-- New amateur radio communication and experimentation capabilities, including an enhanced voice repeater and updated digital packet radio (APRS) capabilities
-- Slow Scan TV (picture up and downlinks) in both the US and Russian segments of ISS
• New multi-voltage power supply will support present and future radio capabilities and allow wireless experiments to be conducted
• ARISS needs to build 10 Next Generation Radio Systems to support our development, on-orbit operations, training and long-term maintenance. This includes units on-orbit (2 units--1 unit each in US and Russian segment), flight spares (2 units), training (3 units), testing (1 unit) and ground-based maintenance & troubleshooting (2 units)

See the ARISS Fundrazr page at
https://fundrazr.com/arissnextgen

Upcoming Happenings & Events

Date	*Happenings & Events*
2nd July	HF Net, 3.575 MHz, 19:30
3rd July	VHF Net, 146.525 MHz, 20:00
6th July	**NZART Infoline**
9th July	HF Net, 3.575 MHz, 19:30
10th July	VHF Net, 146.525 MHz, 20:00
16th July	HF Net, 3.575 MHz, 19:30
17th July	VHF Net, 146.525 MHz, 20:00
18th July	**Annual Club Midwinter Dinner**
20th July	**NZART Infoline**
23rd July	HF Net, 3.575 MHz, 19:30
24th July	VHF Net, 146.525 MHz, 20:00
30th July	HF Net, 3.575 MHz, 19:30
31st July	VHF Net, 146.525 MHz, 20:00

3rd August—NZART Infoline

4-5 August—NZART Brass Monkey Contest

15th August—Club Meeting

17th August—NZART Infoline

6-7 October—NZART Microwave Contest

1-2 December—NZART Field Day Contest

For more information on any of the above please contact myself or any committee member.

Club Information

Contacts :-	
Business Meeting:	1930 First Wednesday of each month except January 88 Seddon Road, Hamilton
General Meeting:	1930 Third Wednesday of each month (except Jan) 88 Seddon Road, Hamilton
Homepage:	http://www.zl1ux.org.nz
eMail:	branch.12@nzart.org.nz
HF Net:	**3.580 temporarily (**3.575MHz LSB)1930 Mondays
VHF Net:	146.525MHz simplex 2000 Tuesdays
2m Repeater:	145.325MHz -600kHz split
STSP	146.675MHz -600kHz split
Repeaters:	438.725MHz -5 MHz split
ATV Repeater:	Off air pending channel changes

Cover Photo: Official measurements on the NZART logo.

Sender	Hamilton Amateur Radio Club (Inc) PO Box 606 Hamilton 3240