



The RELAY)))

JANUARY
2023

The Official Publication of the Arrowhead Radio Amateur Club

A.R.A.C. Inc. P.O. Box 7164 Duluth MN 55807-7164 <http://www.thearac.org> Dues: Member \$20/Family \$25

INDEX

Space Launches	1
2022 Reibold Award	2
Board Mtg Minutes	3
Club Mtg Minutes	5
Prez Sez	7
Testing Sessions	7
In The Spotlight	8
CW Abbreviations	9
Band Plan	9
Nets	10
Repeaters	11
Members' Email	12
Calendar	13
Committee Chairs	14
Contest Calendar	18-22

The Relay Co-Editors:

Kim & Steve Waller

Kim - KEØNQS Steve - KEØNQT
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2023



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Space Launches at Record Level 2023 Projected to Outpace 2022

When the **National Defense Authorization Act** was signed into law on December 20th, 2019, the first new branch of the Armed Services in 73 years was created. It was called **Space Force**. Skeptics scoffed, saying there was no such need. The average citizen was a little surprised, as common public perception held that the U.S. wasn't particularly active in space missions anymore. Just three years later, it has become clear that that Space Force serves an essential function: operating what they see as U.S. "spaceports", akin to airports, with **multiple rockets launching daily**. These may be privately-owned tourism rockets, commercial rockets to launch satellites, or scientific research missions of various origins. The wisdom of creating **Space Force** was understanding **2 key things**:

1. The pace of privately-owned space companies was sharply escalating to mission-readiness in several projects.
2. The pace of foreign governments' escalation of plans to dominate space as a military strategy that affects United States National Security.

If these seem like overstatements, consider the data from [statistica.com](https://www.statista.com): The number of orbital space launches worldwide reached a milestone in 2021 with **132 launches**, the highest number since the beginning of the Space Race in 1957.

2022 went on to surpass 2021 with 186 total launches, **163** of them recorded as orbital launches, according to [aviationweek.com](https://www.aviationweek.com), which reports that a record number of 78 launches were from the United States. This represents a sharp increase over the previous record-setting year, with 45 U.S. launches in 2021.

So what is the purpose of all these rockets? First of all, most of the launches were orbital and some were sub-orbital. SpaceX dominated the orbital launch numbers by far, with 59 launches in 2022. In December alone, SpaceX launched 7 missions, and two of those were in the same day, December 16th at different launch sites. The missions vary in purpose from orbital tests, to commercial payload deployment to space tourism. Since 2019 SpaceX has successfully launched several missions each year to complete



The **United States Space Force** is the space service branch of the U.S. Armed Forces, one of the eight U.S. uniformed services, and the world's only independent space force.

Founded: December 20, 2019

Motto: **Semper Supra**, "Always above"
Headquarters: **The Pentagon; Arlington County, Virginia, U.S.**
Chief of Space Operations: **Gen B. Chance Saltzman**
Part of: **United States Armed Forces; Department of the Air Force**
Size: **8,400 military personnel; 77 spacecraft**
Known Engagements: **Global War on Terrorism; War in Afghanistan; 2020 Iranian missile strike on Al Asad Airbase**

Continued on Page 15



The 2022 Thomas J Reibold Award

The 2022 Thomas J Reibold Award

is hereby awarded to

Dave Miller - WØNWO



*Congratulations
Dave!*



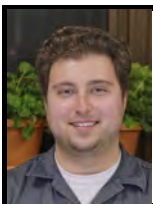
ARAC Board Meeting - December 6 2022

PRESIDENT



NØVRM
Gene Ellefsen
3710 Chambersburg Ave
Duluth, MN 55811
218-390-3272
lspitech@mail.com

VICE PRESIDENT



KØDJP
David Pyrlík

david.pyrlík@gmail.com

SECRETARY



KFØGJW
Melinda Nelson

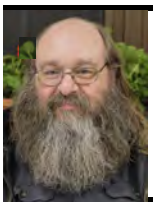
TREASURER



KEØYTM
Sam Frey

ke0ytm@gmail.com

3RD YEAR BOARD



AAØAC
Dave Davis

218-348-6649
aa0ac@outlook.com

2ND YEAR BOARD



AAØAW
Doug Nelson

aa0aw@arrl.net

1ST YEAR BOARD



WØDIO
Denny Anderson

Board Members

Gene Ellefsen – NØVRM, Dave Pyrlík – KØDJP, Bruce Carlson – KNØNUL, Gary Minter – KD9ABS, Melinda Nelson – KFØGJW, Dave Davis – AAØAC, Doug Nelson – AAØAW

Board Advisors (Non-Board Members)

Randy Wabik – KRØB Kim Waller - KEØNQS, Steve Waller - KEØNQY

Guests: Elmer Berg – KCØNGY, Del Minter – KEØCLI, Robin Davis, Sam Frey – KEØYTM

Meeting called to order by President Gene – NØVRM at 18:33 (6:33 pm)

Minutes:

Minutes were sent via email. Motion to approve Doug Nelson – AAØAW, Seconded by Gene Ellefsen – NØVRM, motion passed.

Treasurer's Report:

Checking:	\$1,844.69
Savings:	\$1,774.93
Repeater:	\$3,867.26
Subtotal Cash	\$7,486.88

Winter CD:	\$1,730.42
Summer CD:	\$0.00
Subtotal CD:	\$1,730.42

Assets Subtotal: \$9,217.30

Motion to approve by Doug Nelson – AAØAW, seconded by Dave Davis – AAØAC, motion passed.

Christmas Party:

The Christmas party will be held December 8th at 18:00 (6:00 pm). Will also have elections at this meeting. We have a couple meat and cheese trays coming. Getting the word out to as many as we can.

Repeater:

Randy Wabik – KRØB, Got the controller. Spirit Valley Amateur Club donated the radio and cables. Will order the UPS today. Dave Pyrlík found two power amplifiers. Was able to get one of the amplifiers to work. Will be able to get Matchaw up and running soon.

Continued on Page 4

ARAC Board Meeting continued

94- the receive sites have disappeared. Doug and Gene went up and looked at the 94 and found that there was some equipment that was loose, after touching them the receive sites came back up and were working.

Bell Ringing:

Thursday December 15th. Please feel free to dress up and sing carols. Just have fun. There is a sign-up sheet. If you are interested, please let Gene Ellefsen – N0VRM know.

Testing:

We have had a couple of testing the last few weeks. Will have a test session on January 10th for the Technician Class. There have been some upgrades in the VE system, but it does not affect anyone that is wanting to upgrade. The House of Refuge has been very accommodating in letting the club use the facilities for testing. As always if you are looking to test or upgrade, or know of anyone that is interested in testing please contact Doug Nelson at AA0AW@arrl.net

New Business:

Winter Field Day - last Saturday in January 13:00 (1:00 pm) to 13:00 (1:00 pm Sunday)

We have picked up some new net control operators for Sunday nets. Thank you to those who have stepped up to help with this.

Sky-warn recognition day - 1st time we have been back in the weather station since 2019. A lot of work needs to get done to get back up and running in the building.

Motion to make \$100.00 donation to The House of Refuge by Bruce Carlson - KN0NUL, seconded by Gene Ellefsen - N0VRM, motion passed.

Motion to adjourn by Doug Nelson – AA0AW, seconded by Bruce Carlson – KN0NUL, motion passed at 19:11 (7:11 pm)





ARAC Club Meeting Minutes

December 8, 2022

Present:

President: Gene Ellefsen – N0VRM
Vice President: Dave Pyrlik – K0DJP
Treasurer/Membership: Bruce Carlson – KN0NUL
Secretary: Melinda Nelson – KF0GJW
First Year Board: Doug Nelson – AA0AW
Second Year Board: Dave Davis – AA0AC
Third Year Board: Gary Minter – KD9ABS
Special Events: Open/Gene Ellefsen – N0VRM (acting)
Parliamentarian: Grant Forsyth – KC0WUP
Repeater: Dave Pyrlik – K0DJP
Testing: Doug Nelson – AA0AW
Repeater: Randy Wabik – KR0B
Property/Picnic: Scott Ahlgren – N0VYU
HamFest/Education: Bob Schulz – KC0NFB
Newsletter/Historian: Kim Waller – KE0NQS
Newsletter/Historian: Steve Waller – KE0NQT

Absent:

Chaplin:
Web Site: Thomas Dorr – KE0RHA

Meeting called to order at 18:05 (6:05 PM) by President Gene Ellefsen – N0VRM. Fifty-four (54) members in attendance.

Thomas J Reibold Award W9IBM Memorial Award:

This award is given to someone who has supported the Club as well as promote the hobby of Amateur Radio. This year's recipient has been very active in the ARAC Club, is the Emergency Coordinator in Douglas County RACES, Lake County RACES, ASRS (Arrowhead Sky-warn Response) team, WLSAR (Western Lake Superior Amateur Responders) board, health and welfare communications for various local races, Net Control Operator for South St. Louis County Net, as well as the Douglas County Net, taken time when he could to assist with various drills and meeting. The award this year is presented to Dave Miller – W0NWO. Congratulations Dave – W0NWO.

Minutes:

Minutes are posted on the website and in the newsletter. Motion to approve by Jeff Nast – KC0KMS

Treasurer's Report:

Checking: \$1,844.69

Savings: \$1,774.93

Repeater: \$3,867.26

Subtotal Cash \$7,486.88

Winter CD: \$1,730.42

Summer CD: \$0.00

Subtotal CD: \$1,730.42

Assets Subtotal: \$9,217.30

Continued on Page 6



ARAC Club Meeting Minutes, continued

Motion to accept as presented by Grant Forsyth – KC0WUP, seconded by Robin Davis, motion passed.

Question – Are we able to move those CD's. Answer – You can always take the money and run. The money will automatically roll over on the 24th. Motion made by Grant Forsyth – KC0WUP to keep the Winter CD as is, seconded by Jeffery Maker – AD0TH, motion passed.

Election of Officers:

White ballot for the following offices:

President: Gene Ellefsen – N0VRM

Vice President: Dave Pyrlik – K0DJP

Treasurer/Membership: Sam Frey – KE0YTM

Secretary: Melinda Nelson – KF0GJW

Second Year Board: Doug Nelson – AA0AW

Third Year Board: Dave Davis – AA0AC

Motion for white ballot on the above officers made by Bob Schulz – KC0NFB, seconded by Jeff Nast – KC0MKS, motion passed.

Election for First Year Board Member: Dennis Anderson – W0DIO, Jon Nelson – N0UOZ, and Gary Minter - KD9ABS. Dennis Anderson won the election for the new year.

Repeater:

Randy Wabik – KR0B, Got the controller. Spirit Valley Amateur Club donated the radio and cables. Will order the UPS today. Dave Pyrlik found two power amplifiers. Was able to get one of the amplifiers to work. Will be able to get Matchaw up and running soon.

Testing:

Doug Nelson – AA0AW there will be a testing session January 10th. If anyone needs testing contact Doug Nelson at AA0AW@ARRL.net and they will test individually. **Do not forget to get your FRN number prior to testing.** You can go to FCC.gov/uls and register. You will also need an email address going forward.

Salvation Army Bell Ringing:

We will be doing bell ringing on December 15th from 11:00 am to 20:00 (8:00pm) at the Burning Tree Plaza Super One Foods. There is a sing-up sheet. If you are planning on ringing bells, please have fun, dress up in holiday spirit. If you are interested, please contact Gene Ellefsen – N0VRM.

Door Prize was won by Jean Adams – KB9KQS

Motion to adjourn by Jeff Nast – KC0MKS, seconded by Bruce Carlson – KN0NUL, motion passed at 18:40 (6:40 PM). Christmas Party follows.



Prez Sez...

HAPPY NEW YEAR EVERYONE !!

I hope you all had a great Holiday Season. It is that time of year for Club Dues to be paid. If you can't make the monthly meeting you can send them in to the Club Post Office Box:

ARAC

P.O. Box 7164
Duluth, MN 55807-7164

Coming up on the last weekend in January is Winter Field Day 2023, which is held 1:00 PM Saturday Jan. 28 to 1:00 PM Sunday Jan. 29.

In the past this event was hosted by Joe Meese WØLWU (WØLong Winter Underwear). Joe will not be able to host it this year, so Dave Davis AAØAC volunteered to host it from his home in Cloquet.

This is a fun event that is gaining popularity every year. We hope a lot of you newer Hams will come out as this is a good learning experience to operate an HF station -- or just observe and feel free to ask questions, as we are there to help you. There is good fellowship , fun radio operation and good food. More information upcoming as we get closer to Winter Field Day. If you would like to learn more regarding what Winter Field Day is about, Google " Winter Field Day Association" for additional info.

Gene Ellefsen NØVRM



**LOOKING for an Amateur Radio License
TESTING SESSION?**

Schedule your own Testing Session *TODAY!*

Contact Doug Nelson-AA0AW at aa0aw@arrl.net or 218-391-5874

All Exam Candidates are REQUIRED to have an FCC Registration Number (FRN) before exam day, which will require your email address.

Not Currently Licensed? For New License Candidate FRN registration: go to www.fcc.gov/new-users-guide-getting-started-universal-licensing-system-uls

Upgrading to General or Expert Class & not sure you have an FRN number? go to <https://wireless2.fcc.gov/UlsApp/UlsSearch/searchLicense.jsp>

Upgrade Candidates: Please bring a copy of your current license to the exam session.



Western Lake Superior Amateur Responders

A new nonprofit called the **Western Lake Superior Amateur Responders** was set up in order to assist with financing the maintenance of existing infrastructure and to also assist with creating new infrastructure. **WLSAR** can donate to other organizations in the western Lake Superior area. Examples are repeaters, packet nodes, AX.25 packet nodes and BBS's.

The group's callsign is **WØLSA** and they are a 501 (C) (3) public charity. Donations to **WLSAR** are tax-deductible and they are also a registered charitable organization with [Smile.Amazon.com](https://www.smile.amazon.com), so you can select them as a donation recipient when you shop at Amazon Smile on your browser or app. Same prices as regular Amazon, but Smile is the nonprofit arm of Amazon that gives back a portion of your purchases to registered charities. If you'd like to select **WLSAR** as your Smile charity, go to [Smile.Amazon.com](https://www.smile.amazon.com) to sign up.

WLSAR is also working to create a website, so stay tuned for updates in future editions of *The Relay* for launch announcements. For more information about **WLSAR**, please contact Chair Doug Nelson AAØAW at aa0aw@chartermi.net



Western Lake Superior Amateur Responders - Board of Directors

Doug Nelson AAØAW - Chairperson, Dave Miller WØNWO - Treasurer, Jeff Nast KCØMKS - Secretary, Ray Barnes KEØZN - Board Member, John Cavanaugh KCØAFE - Board Member/Trustee.

CW Abbreviations

AR End of Message	AS Pse QRX	BK Back to You	SK End of Contact
TU Thank You	PSE Please	K Invite to Transmit	
QST Calling all Amateurs	QRL Are You Busy?	QRU Have anything for me	
QRV Are You Ready?	QRX Standby	QRS Transit Slower	

A	●■■■	M	■■■■	Y	■■■■●
B	■■■■●●	N	■■■●	Z	■■■■●●
C	■■■■●●●	O	■■■■■	1	●■■■■■
D	■■■■●●	P	■■■■●●●	2	●●■■■■■
E	●	Q	■■■■●●●	3	●●●■■■■
F	●●■■■■	R	■■■■●●	4	●●●●■■■
G	■■■■●●	S	●●●	5	●●●●●
H	●●●●	T	■■■	6	■■■■●●●
I	●●	U	●●■■■	7	■■■■●●●●
J	■■■■■■■	V	●●●■■■	8	■■■■●●●●
K	■■■■●●	W	■■■■●●●	9	■■■■●●●●
L	■■■■●●●	X	■■■■●●●	0	■■■■■■■



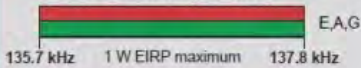
US Amateur Radio Bands

US AMATEUR POWER LIMITS

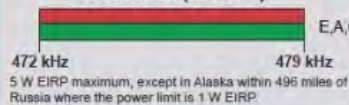
FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

On March 28, 2017, the Federal Communications Commission adopted rules that will allow Amateur Radio access to 472-479 kHz (630 meters) and to 135.7-137.8 kHz (2,200 meters). However, amateurs cannot use these frequencies until 30 days after the Report and Order is published in the Federal Register and the final procedures for registering stations with the Utilities Telecom Council (UTC) have been approved and announced. At the time this chart was created, the Report and Order had not been published and the UTC online registration site is not yet available. Follow ARRL news for further information. New charts will be published at www.arrl.org/graphical-frequency-allocations when the bands are fully available for use.

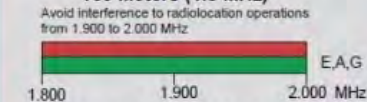
2,200 Meters (135 kHz)



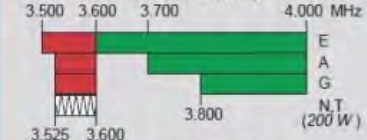
630 Meters (472 kHz)



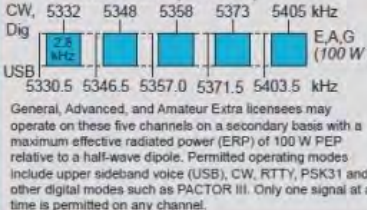
160 Meters (1.8 MHz)



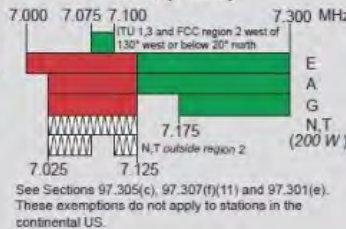
80 Meters (3.5 MHz)



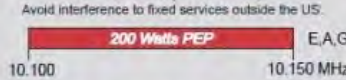
60 Meters (5.3 MHz)



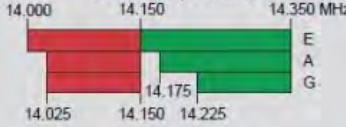
40 Meters (7 MHz)



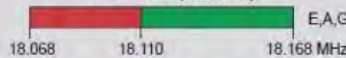
30 Meters (10.1 MHz)



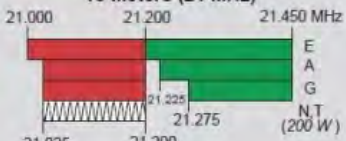
20 Meters (14 MHz)



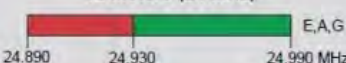
17 Meters (18 MHz)



15 Meters (21 MHz)



12 Meters (24 MHz)



Effective Date for
2,200 and 630 Meters
to be announced



ARRL The national association for
AMATEUR RADIO

KEY

Note: CW operation is permitted throughout all amateur bands.

MCW is authorized above 50.1 MHz, except for 144.0-144.1 and 219-220 MHz.

Test transmissions are authorized above 51 MHz, except for 219-220 MHz.

- = RTTY and data
- = phone and image
- = CW only
- = SSB phone
- = USB phone, CW, RTTY, and data
- = Fixed digital message forwarding systems only

- E = Amateur Extra
- A = Advanced
- G = General
- T = Technician
- N = Novice

See **ARRLWeb** at www.arrl.org for detailed band plans.

ARRL We're At Your Service

ARRL Headquarters:
860-594-0200 (Fax 860-594-0259)
email: hq@arrl.org

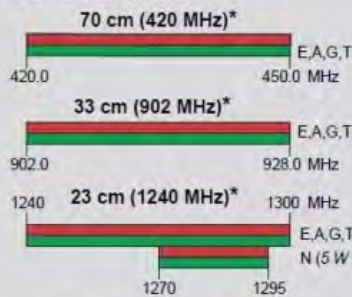
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Getting Started in Amateur Radio:
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email: ncwham@arrl.org

Exams: 860-594-0300 email: vec@arrl.org

*Geographical and power restrictions may apply to all bands above 420 MHz. See *The ARRL Operating Manual* for information about your area.



All licensees except Novices are authorized all modes on the following frequencies:

2300-2310 MHz	10.0-10.5 GHz ‡	122.25-123.0 GHz
2390-2450 MHz	24.0-24.25 GHz	134-141 GHz
3300-3500 MHz	47.0-47.2 GHz	241-250 GHz
5650-5925 MHz	76.0-81.0 GHz	All above 275 GHz

‡ No pulse emissions

NETS

Have a favorite HF/6m/2m/1.25m/70cm net that you check into or listen in on? Also, please send corrections and we will add it to the list below - Kim KEØNQS at my email KEØNQS.mn@gmail.com.

- **Northland Weather Group Net:** Mondays 2000 on the ARAC repeater (146.940 MHz with a tone of 103.5 and standard offset).
- **Minnesota D-Star Net:** Sundays at 19:30 on Reflector 53A
- **Minnesota Section Net** 1200 and 1730 on 3.860 [Net Manager: NØYR] http://www.mn-section.org/dept_stm.html
- The non-non-net: Evenings 2000 144.200 USB except for Sunday evenings.
- Badger WX Net: 0500-0715 on 3.985. Give 24 hour high/low/current temperature, precipitation and snowfall.
- **PICONET:** 3.925 from 0900-1100 CT Mon-Sat and 1600-1700 CT Mon-Fri. Info at: <http://www.piconet3925.com>
- Michigan Upper Peninsula Net: 1600 (CST) on 3.921 MHz Sun-Sat and 1200 Sun. Info: <http://www.michupnet.com>
- Great Lakes Marine/Maritime Mobile Net: Morning 07:30 - 3.932; 08:15 - 7.261 MHz and evening 18:30 - 3.1730927; 19:15 - 7.268 MHz. Weekend extra net: 10:00 - 7.261/7.268 MHz. All CST, LSB and +/- QRM. See: <http://www.sailblogs.com/member/glimmnet/>
- MIDCARS: 07:30-13:00 - 7.258 MHz. See: <http://www.midcars.net>
- Iowa snowbird net on 14.257MHz, M-W-F at 10:00 am Local Time. This is an open net.
- Spider Web Net (Marco Island FL) on 14.347 every morning at 0730 CST/CDT: <http://www.spiderwebnet.net>
- Maritime Mobile Service Network: Daily at 1100—2100 Central on 14.300. <http://mmsn.org> and <http://www.14300.net>
- RV Radio Network: Every day at 1900 Central on 7.265 MHz. Web site: <http://www.rvradionetwork.com>
- Upper Midwest Ten Meter Net: Every Thursday Evening @ 8 PM – 28.480 MHz USB
- Wisconsin Sideband Net: Daily @ 5:15 PM – 3985 [or 3982.5] KHz LSB
- Hobby Helpers Net - Tuesday @ 8 PM – 28.330 MHz USB (Isanti MN) LSB [Net Manager: WOØA].
- Northstar Trader Net: 3.908 +/- at 0830 CST Sundays
- WARFA: 3.908 +/- Sun/Tue/Thu nights at 2200 CST, <http://warfa.org/>
- Youth Net: 14.320-14330 Sundays 1800-1900 UTC, Net Control: AC8PI
- YACHT: Saturdays 1900 CST on EchoLink #481872, <http://yachthams.webstarts.com>
- Northwestern Ontario ARES Net: Evenings at 20:15 (Central) on +/- 3.750Mhz
- The Iron Range Net: Saturdays at 0800 Central time on or near 3.919 Mhz. Look them up on Facebook!
- FORX Net: Mondays at 1900 Central at 3.941 Mhz +/- QRM. WAØJXT — Grand Forks, North Dakota
- HF CW: Fridays 08:00 CST, 7.112 MHz. Informal slow speed CW Net. W8IRT NCS. Email: w8irt@aol.com
- Minnesota ARES Digital Net: Thursdays at 2000 CST, 3.5835 MHz USB +/- QRM, Mode: Olivia 8/500.
- SARA Digital Net: Sundays at 1900 Local, 3.582.150 MHz USB +/- QRM, Mode: BPSK31/BPSK63
- Spider Web Net (Marco Island FL): 14.347 every morning at 0730 CST/CDT: <http://www.spiderwebnet.net>
- Broadcaster Net: 7.231 or 3.855 M/W/F @ 1500 UTC. 14.255 M-F @ 2130 UTC. <http://www.cbsretirees.com/ham.htm>
- Old Military Radio Net: 7.268 +/- nightly at 0200z. Other times/Frequencies too. See: <http://www.mrca.ar88.net/>
- Rag Chew Crew/Tailgaters/Freewheelers Nets: 3.916 +/- nightly at 1900 CST, <http://www.tailgatersnet.com>
- North South Net: 7.214.6 +/- at 0700 CST, Monday-Saturday



DULUTH AREA REPEATERS

ARAC System WØGKP

Frequency	Offset	Tone	Location
146.940	minus	103.5	Duluth
146.940	minus	107.2	Lakeside (recv)
146.940	minus	151.4	Two Harbors (recv)
146.940	minus	100.0	Gary-New Duluth (recv)
146.940	minus	110.9	Cloquet (recv)
147.000	minus	103.5	Mahtowa
444.100	plus	103.5	Duluth UHF Link

N9MMU/N9QWH System (WI)

145.310	minus	110.9	Duluth
145.490	minus	110.9	Solon Springs
147.255	plus	110.9	Hayward
145.110	minus	110.9	Rice Lake
147.345	minus	136.5	Holcombe
145.230	minus	110.9	Eau Claire

WECOMM – WI Statewide Linked System WE9COM

147.075	plus	110.9	Meteor Hill (closest repeater to Duluth)
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LSAC System #1

147.330	plus	151.4	Proctor
147.330	plus	103.5	Duluth (recv for Proctor)
147.270	plus	114.8	Two Harbors
147.270	plus	103.5	Wales
147.090	plus	114.8	Silver Bay
145.410	minus	114.8	Finland
147.300	plus	114.8	Isabella
145.150	minus	103.5	Washburn, WI
146.700	minus	103.5	Bayfield, WI
443.850	5.00	none	Bayfield, WI
147.165	plus	110.9	Hurley, WI
146.640	minus	151.4	Ely
443.500	5.00	141.3	Gilbert
147.060	plus	103.5	Virginia
147.360	plus	162.2	Cook
147.165	plus	114.8	Coleraine
443.925	5.00	110.9	Brainerd
443.200	5.00	114.8	Tamarack
147.360	plus	203.5	Aitkin
146.865	minus	146.2	Giese
147.570	simplex	146.2	Hinckley
444.575	5.00	146.2	Hinckley
443.325	5.00	146.2	Isanti

NARC System NAØRC

147.135	minus	1Ø3.5	Knife River
145.45Ø	minus	114.8	Park Point (rcv)
147.135	plus	114.8	Knife River - Park Point (rcv)

Stand Alone Repeaters

145.21Ø	minus	11Ø.9	Clam Lake, WI
146.88Ø	minus	123.Ø	Grand Rapids. MN
146.91Ø	minus	146.2	Duxbury, MN

Fusion

Fusion (Analog has tone and C4FM digital with no tone)

147.15Ø	plus	151.4	NTØB Gilbert, MN Fusion Repeater
145.17Ø	minus	11Ø.9	WA9KLM Superior – Douglas County RACES/ARES Fusion Repeater (Digital only) Fusion Room 28373

443.1ØØ 5.ØØ1Ø3.5 KBØYHX Cloquet - Carlton County RACES/ARES Fusion Repeater

Fusion continued

444.3ØØ 5.ØØ 1Ø3.5 NØEO Spirit Valley Amateurs Fusion Repeater WIRES-X NØEO (Analog only) Fusion Room 40494

444.3ØØ 5.ØØ 1Ø3.5 NØEO Spirit Valley Amateurs Fusion Repeater WIRES-X NØEO (Analog only) Fusion Room 40494

444.400 5.00 103.5 NAØRC Knife River, MN – Wires X Connected to NØEO Room 40494

444.500 5.00 103.5 NØLCR Two Harbors, MN – Wires X Connected to NØEO Room 40494

444.600 5.00 103.5 NØLCR Silver Bay, MN – Wires X Connected to NØEO Room 40494

D Star

147.375	plus	NØEO D Star
442.200	plus	NØEO D Star

Revised by KCØWDQ on 4/29/2022 for The ARAC Relay

ST. Louis County Department of Emergency Services Net Control Roster

N9DMG	Scott Swanson	NØVRM	Gene Ellefsen
AAØAW	Doug Nelson	KCØWDQ	Paul Dallavia
WØNWO	Dave Miller	WØDIO	Dennis Anderson
KØDSL	Diane Saunders	AAØME	Randy Johnson

Sunday Nights at 21ØØ on the ARAC System
(See Calendar for net control schedule)

Ten Meter SSB Net Control Roster

AAØAW	Doug Nelson	WØLWU	Joe Meese
NUØW	Gary Hanson	K9KDK	Al Babcock
WØDIO	Dennis Anderson	NØVRM	Gene Ellefsen
AAØME	Randy Johnson	KØDSL	Diane Saunders

Sunday Nights at 2ØØØ on 28.45Ø MHz USB

Ten Meter CW Net Control Roster

AAØAW	Doug Nelson	NØPDG	Mike Lovold
-------	-------------	-------	-------------

Sunday Nights at 193Ø on 28.125 MHz

Northland Weather Group Net Control Roster

KCØMKS Jeff Nast

Monday Nights at 2ØØØ on the ARAC System

Douglas County Net

Tuesday Nights at 2ØØØ on 145.49Ø (N9QWH System)

Central Carlton County Net

Tuesday Nights at 2Ø3Ø on the ARAC System

Lake County RACES/ARES Net

2nd & 4th Wednesday Nights at 19ØØ on the LSAC 1 System

Elmers

El-mer / el-mør / [el-mer]

1. a male given name: from Old English words meaning "noble" and "famous."
2. an adhesive used to bond like or unlike materials
3. An experienced ham radio operator who mentors new and prospective hams.

Name	Call Sign	Expertise
Jeff Nast	KCØMKS	APRS, EchoLink, WinLink, Fusion, Contesting
Bob Schulz	KCØNFB	Contesting
Jim Anderson	NØJWA	QsoNet
Doug Nelson	AAØAW	HF, VHF/UHF, Contesting, Packet, APRS, Morse Code, VE testing, Echolink, Allstar, EmCom...

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Contact Kim or Steve Waller to include your name in this listing!

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Members, please check your name and email address for accuracy. If you are not on this list and want to be on the list, contact us with your info. If you need to make a change, please let us know at KEØNQS.mn@gmail.com Or KEØNQT@gmail.com




SUNDAY NIGHT NETS
 1930 - CW - 28.125 MHz USB-CW
 2000 - USB 28.450 MHz
 2100 - Southern St. Louis County
 Emergency Services Net
MONDAY NIGHT NETS
 2000 - Northland WX Net - ARAC Repeater

JANUARY

CLUB EVENTS

TUESDAY NIGHT NETS
 2000 - Douglas Cty 145.490 MHz
 2030 - Central Carlton County
WEDNESDAY NIGHT NETS
 1900 - Lake County - LSAC1
 2nd & 4th Wednesdays
 2100 - BWAR

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1  HAPPY NEW YEAR! CW 1930 NØPDG USB 2000 K9KDK ES 2100 NØVRM	2	3 ARAC BOARD MEETING Sammy's Pizza 6:30 pm DC Net 2000 CC Net 2030	4	5	6	7
8	9 DC ARES/RACES Mtg 1900 DC EOC WX 2000 KCØMKS CW 1930 AAØAW USB 2000 NØVRM ES 2100 N9DMG	10 DC Net 2000 CC Net 2030	11 Lake County ARES/RACES Meeting 1800 Lake County Net 1900 2100 - BWAR	12  ARAC Club Meeting Coppertop Church 7:00 PM	13	14
15 CW 1930 NØPDG USB 2000 NØPDG ES 2100 AAØAW	16 WX 2000 KCØMKS	17 DC Net 2000 CC Net 2030	18 St Louis County ARES/RACES Meeting 1800 2100 - BWAR	19	20	21
22 CW 1930 AAØAW USB 2000 AAØAW ES 2100 KD9KVKI	23 WX 2000 KCØMKS	24 DC Net 2000 CC Net 2030	25 Lake County Net 1900 2100 - BWAR	26 Carlton County ARES/RACES Meeting 1900 CC EOC	27	28 ARAC Club Breakfast The Chalet 4833 Miller Trunk Hwy Hermantown, MN 8 AM
29 CW 1930 NØPDO USB 2000 KB9WLB ES 2100 KCØWDQ	30 WX 2000 KCØMKS	31 DC Net 2000 CC Net 2030				

Get this newsletter *faster*
via email!

Email Doug AAØAW at
aa0aw@arrl.net

Next Club Meeting:
Thursday,
January 12th, 2023 - 7 pm
at the *Coppertop Church!*

ARAC Committee Chairs



Club License Trustee:

Ray Barnes KEØZN

Control Operators:

AAØAW - NØKXT - KCØNFB

Newsletter/Historian:

Kim KEØNQS & Steve KEØNQT
Waller

Education Chair:

Bob Schulz KCØNFB

Hamfest Chair:

Bob Schulz KCØNFB

Chaplain:

Rollie Bockbader KBØCK

Visiting Chaplain:

Parliamentarian:

Grant Forsyth KCØWUP

Website:

Thomas Dorr KEØRHA

Membership:

Bruce Carlson KEØNIT

Property Chair:

Scott Ahlgren NØVYU

Testing:

Doug Nelson AAØAW

Field Day:

Picnic Chair:

Scott Ahlgren, NØVYU

Repeater Chairs:

Randy Haglin NØBZZ
Randy Wabik KAØJZV

Contest Calendar at www.contestcalendar.com

National Contest Journal at www.ncjweb.com

QSO Party Note: State/Province/National QSO Parties are abbreviated with the 2 or 3 letter abbreviation for the state/province/national designation followed by QP for QSO Party:

Examples: Minnesota QSO Party is MNQP
British Columbia QSO Party = BCQP

QRZ web site at www.qrz.com

VHF Propagation site at www.aprs.mountainlake.k12.mn.us

Reminder: The Contest Corral monthly listing of contests can be found in each issue of QST. ARRL sponsored contests can be found in Contest Corral, highlighted, or on the ARRL's web site at arrl.org.

Space Launches, *continued from page 1*

and expand the **Starlink** satellite internet access system operated by SpaceX that currently offers coverage to 45 countries, including the U.S., with coverage for residential, business, RV, maritime and aviation customers. Starlink plans significant expansion of coverage in 2023, so if it is not available in your area yet, by the end of the year it likely will be. Starlink also has plans for a global mobile phone service sometime in the next couple of years. This translates to more SpaceX rocket launches in 2023 specifically for Starlink missions.

Here's quick look at mission purposes for rocket launches around the world last year:

2022 Launch Missions Overview

- Launching satellite payload** into orbit for various commercial entities
- Government Launches** to deploy space station modules: For example, **China** finished its **Tiangong** space station, with two launches (July & October) of final modules, then launched a crewed capsule to dock at Tiangong in November 2022.
- Government launches** to deploy or maintain state-owned satellites
- Lunar exploration**: For example, **NASA's Artemis I** mission on November 16th launched CubeSats and the lunar space vehicle **Orion**
- Launch of a Multi-purpose orbital space capsule**: in May 2022, a six day orbital test mission of **Boeing's** new **Starliner**. The capsule will be able to accommodate commercial passengers for space tourism and also plans to transport professional astronauts to ISS under contract with NASA
- Sub-orbital space vehicle or satellite testing**
- Sub-orbital astronomical observation & imaging**
- Sub-orbital microgravity research**
- Sub-orbital ionospheric research**



NASA's Space Launch System rocket carrying the Orion spacecraft launches on the Artemis I flight test, Wednesday, Nov. 16, 2022, from Launch Complex 39B at NASA's Kennedy Space Center in Florida. *Photo Credit: NASA/Bill Ingalls*

2022 Orbital Launch Stats by Country

78	- The United States of America
61	- China
22	- Russia
9	- New Zealand/USA
5	- Europe
4	- India
1	- Japan
1	- Iran
1	- North Korea

Some space stat sites say that **twenty-three launches in 2022 were sub-orbital**, so they are not reflected in the above chart.

Wow. There are so many really cool facts about the 2022 rocket launches if you're interested in diving in deeper. We are resisting the urge to do so in this article as we'd never have the time and space to do them justice! We will, however turn our attention to 2023. Stephen Clark of **Spaceflight.com** interviewed the Space Force Commander of the 1st Range Operations Squadron recently. The Squadron provides range safety support for launches from the Eastern Range at **Cape Canaveral Space Force Station**. Here's a portion of what **Lieutenant Colonel Colin Mims** said:

"We expect to have about 87 launches from the Cape in calendar year 2023. I think it just shows the pace at which the commercial demand is growing... it's our geography here, being off of the coast, that we can launch into a polar orbit or an equatorial orbit, that's very advantageous. And our ability to rapidly turn the pads and schedule launches quickly, that shows our ability to provide services to these launch service providers."

Author Stephen Clarks says "The U.S. Space Force runs the Eastern Range, which oversees public safety for launches out of Florida's Space Coast. Space Launch Delta 45, formerly the 45th Space Wing, has upgraded infrastructure, streamlined operations, and encouraged rocket companies to switch to autonomous flight safety systems to help shorten the time needed between launches. There were 16 space launches from the Eastern Range in 2019. The launch rate in 2022 more than tripled that number." In addition, Clark writes about the change in protocols for launch site assignments.

Continued on Page 16

Space Launches, continued from page 14

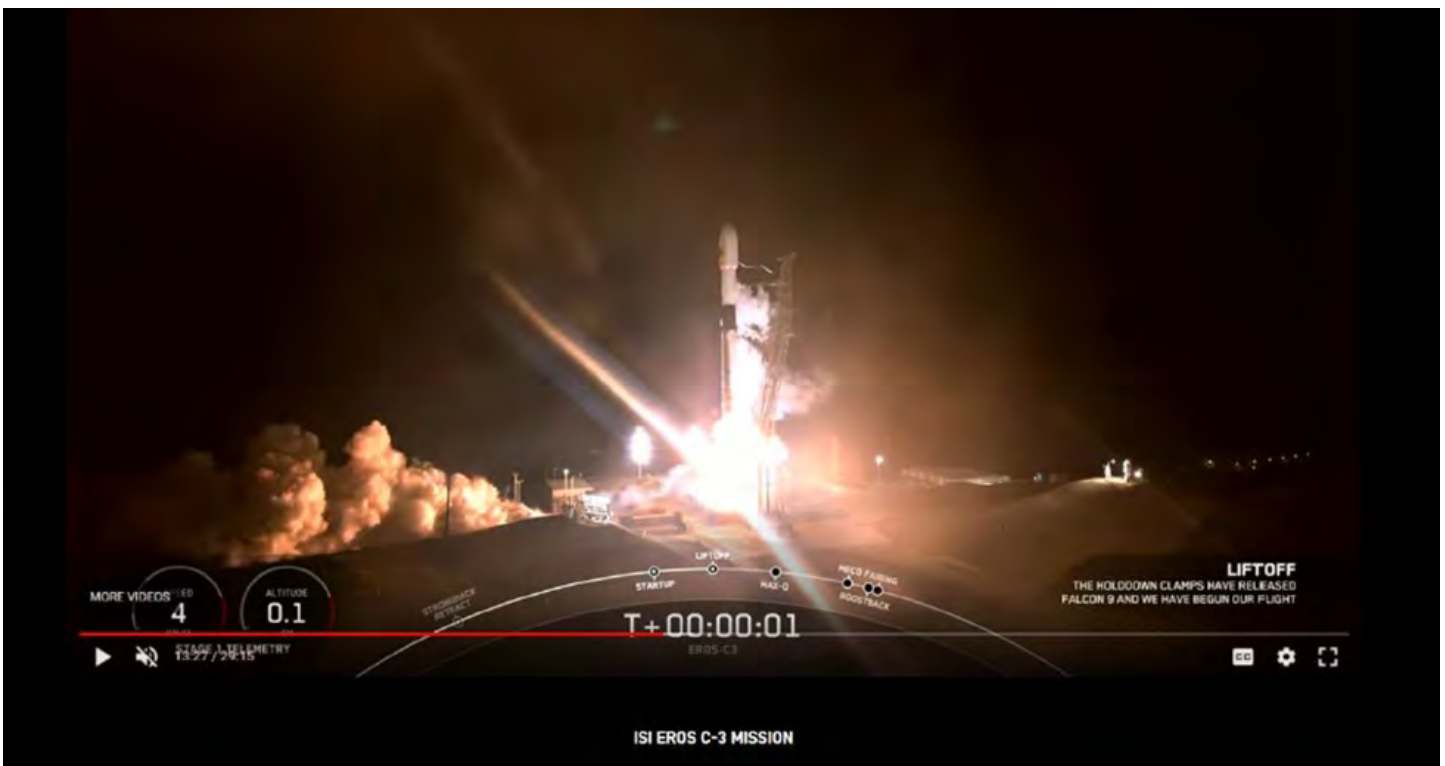
“Launches into polar orbit used to be the near-exclusive domain of **Vandenberg Space Force Base in California**,” explains Clark, “but the Eastern Range approved a SpaceX request to begin launching on a southern corridor from Cape Canaveral in 2020, the first polar orbit mission from Florida since 1969.

“On August 4, 2022 the Eastern Range supported two launches by United Launch Alliance’s Atlas 5 rocket and SpaceX’s Falcon 9 **just 12 hours and 39 minutes apart**, the shortest duration between two space launches from the Space Coast since 1967. On December 16, the military team that runs the range was ready to accommodate two launches by SpaceX Falcon 9 rockets from different pads **just 33 minutes apart**. But SpaceX ended up delaying one of the missions to give priority to the other.

“The demand for launch services is increasing in the United States” says Clark. “SpaceX alone aims to launch as many as 100 times this year, including flights out of Florida, California, and test flights of the Starship mega-rocket from South Texas. SpaceX hasn’t disclosed how many of those launches it will base out of Cape Canaveral, but the majority of the missions on the company’s 2023 manifest are expected to fly from Florida’s Space Coast.”

And quoting **Jason King, Commander of the 45th Weather Squadron at Patrick Space Force Base and Cape Canaveral Space Force Station**:

“Three years ago ... we would surge for every launch. It was a major ordeal. We’ve since then changed the mindset to where we’re operating more like an airport now. We call it a **Spaceport**. So we don’t want to full-on surge for every launch attempt, and we want to change the mindset into where it’s pretty much normal operations.



December 29 2022 SpaceX closes out their Launch Manifest for the year by launching the ISI Eros C-3 from **Vandenberg Space Force Base** in California. *Screenshot courtesy SpaceX*

“We’ve just begun to see the increase,” King continues. “We estimate in the next probably two to three years we’ll have 100 launches here on the Eastern Range. But commercial launch service providers and commercial satellites are being launched at the quickest rate we’ve ever seen. So we just anticipate the launch rate to continue to increase.”

2023 looks like it will be another record pace of space launches. Clark compiled a preliminary list of planned launches for this year in the U.S. alone, with more detail to emerge on these in the coming

Continued on Page 17

Space Launches, continued from page 15

months. Here's the 2023 launch list so far, with much more specifics available for January:

January 3: SpaceX Mission "Transporter 6" at Cape Canaveral

Falcon 9 rocket launch with 114 small satellites and micro-payloads into a polar orbit for customers around the world. Eight minutes after liftoff, Falcon 9's first stage booster returns to Landing Zone 1 at Cape Canaveral Space Force Station.

January 8: SpaceX Falcon 9 rocket launch to deploy 40 internet satellites for OneWeb

January 12: SpaceX Falcon Heavy rocket is scheduled to launch from Kennedy Space Center. The Falcon Heavy consists of putting together three Falcon 9 rocket cores. This will enable deployment of 2 satellites into a high-altitude geosynchronous orbit for Space Force.

January 18: SpaceX Falcon 9 rocket launch to deploy GPS navigation satellite for the Space Force

January Continued: SpaceX plans launches for more of Starlink internet satellites and the Spanish-owned Amazonas Nexus communications satellite before the end of the month, with an estimated 6 or 7 missions in January launched from Florida alone. SpaceX hopes to reach 100 launches in 2023. These will include several crew launches for NASA, Axiom Space, and the all-private Polaris Dawn mission with the first commercial spacewalk in Earth orbit.

Two new commercial launch companies

will be at Cape Canaveral this year:

United Launch Alliance and Relativity Space.

United Launch Alliance's new medium-to-heavy lift Vulcan rocket (replacing its Atlas 5 and Delta 4 rocket groups) will launch for the first time in 2023.

The first Vulcan launch will carry **Astrobot-ic's** commercial moon lander. This Vulcan mission will also have two test platforms for **Amazon's** planned **Kuiper** satellite internet network.

Another Vulcan launch is planned some-time later this year, deploying **Sierra Space's** first **Dream Chaser** cargo freighter for the International Space Station.

California-based **Relativity Space** is also nearing its first orbital launch attempt with its **Terran 1 rocket**, which was rolled to Launch Complex 16 at Cape Canaveral in December to prepare for final fueling tests and engine test-firings. The Terran 1 was designed to deliver small to medium-size payloads to space, with a lift capability of nearly a ton to a polar sun-synchronous orbit.

United Launch Alliance, which was founded by **Boeing Company & Lockheed Martin Corporation in 2006**, plans five flights with its Atlas 5 rocket this year from Cape Canaveral. **The Atlas 5 missions will include the launch of astronauts on Boeing Starliner crew capsule.** The Atlas 5 rocket will share the same launch pad with the Vulcan rocket. ULA also plans one launch of a **Delta 4-Heavy rocket** for the **National Reconnaissance Office.**

OK. So that's just a glimpse of what's going on in 2023 space launch plans in the United States. There are many other projects (especially watch SpaceX, Blue Origin and United Launch Alliance) which are in the final stages of development or testing that are likely to announce launches in 2024, and maybe even squeak a couple of surprise launches in the fourth quarter of this year!

Let us know if you have photos or comments on what's currently happening in space technology. Whether launch-ready missions or projects in current design and development, we'd love to hear your thoughts. Just email us at ke0nqs.mn@gmail.com and we'll publish your content in an upcoming issue of **The Relay**. ★



SpaceX Falcon Heavy Rocket, consisting of 3 Falcon 9 rocket cores, is one of the most powerful rockets. Falcon Heavy can lift almost 64 metric tons (141,000 lbs) into orbit. [Screenshot: SpaceX](#)



Contest Calendar - January 2023

<u>+ AGB New Year Snowball Contest</u>	0000Z-0100Z, Jan 1
<u>+ SARTG New Year RTTY Contest</u>	0800Z-1100Z, Jan 1
<u>+ AGCW Happy New Year Contest</u>	0900Z-1200Z, Jan 1
<u>+ AGCW VHF/UHF Contest</u>	1400Z-1700Z, Jan 1 (144) and 1700Z-1800Z, Jan 1 (432)
<u>+ K1USN Slow Speed Test</u>	0000Z-0100Z, Jan 2
<u>+ ICWC Medium Speed Test</u>	1300Z-1400Z, Jan 2
<u>+ OK1WC Memorial</u>	1630Z-1729Z, Jan 2
<u>+ ICWC Medium Speed Test</u>	1900Z-2000Z, Jan 2
<u>+ Worldwide Sideband Activity Contest</u>	0100Z-0159Z, Jan 3
<u>+ ARS Spartan Sprint</u>	0200Z-0400Z, Jan 3
<u>+ ICWC Medium Speed Test</u>	0300Z-0400Z, Jan 3
<u>+ QRP Fox Hunt</u>	0200Z-0330Z, Jan 4
<u>+ Phone Weekly Test</u>	0230Z-0300Z, Jan 4
<u>+ A1Club AWT</u>	1200Z-1300Z, Jan 4
<u>+ CWops Test</u>	1300Z-1400Z, Jan 4
<u>+ Mini-Test 40</u>	1700Z-1759Z, Jan 4
<u>+ VHF-UHF FT8 Activity Contest</u>	1700Z-2100Z, Jan 4
<u>+ Mini-Test 80</u>	1800Z-1859Z, Jan 4
<u>+ CWops Test</u>	1900Z-2000Z, Jan 4
<u>+ UKEICC 80m Contest</u>	2000Z-2100Z, Jan 4
<u>+ Walk for the Bacon QRP Contest</u>	0000Z-0100Z, Jan 5 and 0200Z-0300Z, Jan 6
<u>+ CWops Test</u>	0300Z-0400Z, Jan 5
<u>+ CWops Test</u>	0700Z-0800Z, Jan 5
	1800Z-1900Z, Jan 5 (CW) and 1900Z-2000Z, Jan 5 (SSB) and 2000Z-2100Z, Jan 5 (FM) and 2100Z-2200Z, Jan 5 (Dig)
<u>+ NRAU 10m Activity Contest</u>	

Continued on Page 19



Contest Calendar - January 2023

<u>+ SKCC Sprint Europe</u>	2000Z-2200Z, Jan 5
<u>+ NCCC RTTY Sprint</u>	0145Z-0215Z, Jan 6
<u>+ QRP Fox Hunt</u>	0200Z-0330Z, Jan 6
<u>+ NCCC Sprint</u>	0230Z-0300Z, Jan 6
<u>+ K1USN Slow Speed Test</u>	2000Z-2100Z, Jan 6
<u>+ PODXS 070 Club PSKFest</u>	0000Z-2400Z, Jan 7
<u>+ Marconi Club ARI Loano QSO Party Day</u>	0700Z-2100Z, Jan 7
<u>+ WW PMC Contest</u>	1200Z, Jan 7 to 1200Z, Jan 8
<u>+ SKCC Weekend Sprintathon</u>	1200Z, Jan 7 to 2400Z, Jan 8
<u>+ RSGB AFS Contest, CW</u>	1300Z-1700Z, Jan 7
<u>+ Original QRP Contest</u>	1500Z, Jan 7 to 1500Z, Jan 8
<u>+ ARRL RTTY Roundup</u>	1800Z, Jan 7 to 2400Z, Jan 8
<u>+ ARRL Kids Day</u>	1800Z-2359Z, Jan 7
<u>+ EUCW 160m Contest</u>	2000Z-2300Z, Jan 7 and 0400Z-0700Z, Jan 8
<u>+ DARC 10-Meter Contest</u>	0900Z-1059Z, Jan 8
<u>+ K1USN Slow Speed Test</u>	0000Z-0100Z, Jan 9
<u>+ 4 States QRP Group Second Sunday Sprint</u>	0100Z-0300Z, Jan 9
<u>+ ICWC Medium Speed Test</u>	1300Z-1400Z, Jan 9
<u>+ OK1WC Memorial</u>	1630Z-1729Z, Jan 9
<u>+ ICWC Medium Speed Test</u>	1900Z-2000Z, Jan 9
<u>+ Worldwide Sideband Activity Contest</u>	0100Z-0159Z, Jan 10
<u>+ ICWC Medium Speed Test</u>	0300Z-0400Z, Jan 10
<u>+ QRP Fox Hunt</u>	0200Z-0330Z, Jan 11
<u>+ Phone Weekly Test</u>	0230Z-0300Z, Jan 11
<u>+ A1Club AWT</u>	1200Z-1300Z, Jan 11
<u>+ CWops Test</u>	1300Z-1400Z, Jan 11
<u>+ Mini-Test 40</u>	1700Z-1759Z, Jan 11
<u>+ VHF-UHF FT8 Activity Contest</u>	1700Z-2100Z, Jan 11
<u>+ Mini-Test 80</u>	1800Z-1859Z, Jan 11

Continued on Page 20



Contest Calendar - January 2023

<u>+ CWops Test</u>	1900Z-2000Z, Jan 11
<u>+ CWops Test</u>	0300Z-0400Z, Jan 12
<u>+ CWops Test</u>	0700Z-0800Z, Jan 12
<u>+ EACW Meeting</u>	1900Z-2000Z, Jan 12
<u>+ NCCC RTTY Sprint</u>	0145Z-0215Z, Jan 13
<u>+ QRP Fox Hunt</u>	0200Z-0330Z, Jan 13
<u>+ NCCC Sprint</u>	0230Z-0300Z, Jan 13
<u>+ K1USN Slow Speed Test</u>	2000Z-2100Z, Jan 13
<u>+ YB DX Contest</u>	0000Z-2359Z, Jan 14
<u>+ WAB 1.8 MHz Phone</u>	0600Z-2200Z, Jan 14
<u>+ UBA PSK63 Prefix Contest</u>	1200Z, Jan 14 to 1200Z, Jan 15
<u>+ North American QSO Party, CW</u>	1800Z, Jan 14 to 0559Z, Jan 15
<u>+ NRAU-Baltic Contest, SSB</u>	0630Z-0830Z, Jan 15
<u>+ NRAU-Baltic Contest, CW</u>	0900Z-1100Z, Jan 15
<u>+ RSGB AFS Contest, Data</u>	1300Z-1700Z, Jan 15
<u>+ Run for the Bacon QRP Contest</u>	2300Z, Jan 15 to 0100Z, Jan 16
<u>+ K1USN Slow Speed Test</u>	0000Z-0100Z, Jan 16
<u>+ ICWC Medium Speed Test</u>	1300Z-1400Z, Jan 16
<u>+ OK1WC Memorial</u>	1630Z-1729Z, Jan 16
<u>+ ICWC Medium Speed Test</u>	1900Z-2000Z, Jan 16
<u>+ Worldwide Sideband Activity Contest</u>	0100Z-0159Z, Jan 17
<u>+ ICWC Medium Speed Test</u>	0300Z-0400Z, Jan 17
<u>+ QRP Fox Hunt</u>	0200Z-0330Z, Jan 18
<u>+ Phone Weekly Test</u>	0230Z-0300Z, Jan 18
<u>+ A1Club AWT</u>	1200Z-1300Z, Jan 18
<u>+ CWops Test</u>	1300Z-1400Z, Jan 18
<u>+ Mini-Test 40</u>	1700Z-1759Z, Jan 18
<u>+ VHF-UHF FT8 Activity Contest</u>	1700Z-2100Z, Jan 18
<u>+ Mini-Test 80</u>	1800Z-1859Z, Jan 18
<u>+ CWops Test</u>	1900Z-2000Z, Jan 18

Continued on Page 21



Contest Calendar - January 2023

[+ Walk for the Bacon QRP Contest](#)

[+ NAQCC CW Sprint](#)

[+ CWops Test](#)

[+ CWops Test](#)

[+ NTC QSO Party](#)

[+ NCCC RTTY Sprint](#)

[+ QRP Fox Hunt](#)

[+ NCCC Sprint](#)

[+ K1USN Slow Speed Test](#)

[+ PRO Digi Contest](#)

[+ Hungarian DX Contest](#)

[+ RSGB AFS Contest, SSB](#)

[+ NA Collegiate Championship, SSB](#)

[+ North American QSO Party, SSB](#)

[+ ARRL January VHF Contest](#)

[+ Feld Hell Sprint](#)

[+ K1USN Slow Speed Test](#)

[+ ICWC Medium Speed Test](#)

[+ OK1WC Memorial](#)

[+ ICWC Medium Speed Test](#)

[+ Worldwide Sideband Activity Contest](#)

[+ ICWC Medium Speed Test](#)

[+ SKCC Sprint](#)

[+ QRP Fox Hunt](#)

[+ Phone Weekly Test](#)

[+ A1Club AWT](#)

[+ CWops Test](#)

[+ Mini-Test 40](#)

[+ Mini-Test 80](#)

[+ CWops Test](#)

[+ UKEICC 80m Contest](#)

[+ Australia Day Contest](#)

[+ AWA Linc Cundall Memorial CW Contest](#)

0000Z-0100Z, Jan 19 and

0200Z-0300Z, Jan 20

0130Z-0330Z, Jan 19

0300Z-0400Z, Jan 19

0700Z-0800Z, Jan 19

1900Z-2000Z, Jan 19

0145Z-0215Z, Jan 20

0200Z-0330Z, Jan 20

0230Z-0300Z, Jan 20

2000Z-2100Z, Jan 20

1200Z, Jan 21 to 1159Z, Jan 22

1200Z, Jan 21 to 1159Z, Jan 22

1300Z-1700Z, Jan 21

1800Z, Jan 21 to 0559Z, Jan 22

1800Z, Jan 21 to 0559Z, Jan 22

1900Z, Jan 21 to 0359Z, Jan 23

2000Z, Jan 21 to 0559Z, Jan 22

0000Z-0100Z, Jan 23

1300Z-1400Z, Jan 23

1630Z-1729Z, Jan 23

1900Z-2000Z, Jan 23

0100Z-0159Z, Jan 24

0300Z-0400Z, Jan 24

0000Z-0200Z, Jan 25

0200Z-0330Z, Jan 25

0230Z-0300Z, Jan 25

1200Z-1300Z, Jan 25

1300Z-1400Z, Jan 25

1700Z-1759Z, Jan 25

1800Z-1859Z, Jan 25

1900Z-2000Z, Jan 25

2000Z-2100Z, Jan 25

2200Z, Jan 25 to 1000Z, Jan 26

2300Z, Jan 25 to 2300Z, Jan 26 and

2300Z, Jan 28 to 2300Z, Jan 29

Continued on Page 22

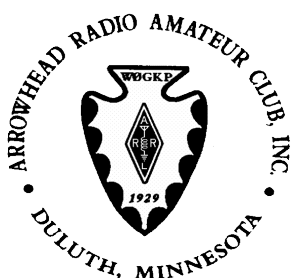


Contest Calendar - January 2023

+ NAQCC CW Sprint	0130Z-0330Z, Jan 26
+ CWops Test	0300Z-0400Z, Jan 26
+ CWops Test	0700Z-0800Z, Jan 26
+ NCCC RTTY Sprint	0145Z-0215Z, Jan 27
+ QRP Fox Hunt	0200Z-0330Z, Jan 27
+ NCCC Sprint	0230Z-0300Z, Jan 27
+ K1USN Slow Speed Test	2000Z-2100Z, Jan 27
+ CQ 160-Meter Contest, CW	2200Z, Jan 27 to 2200Z, Jan 29
+ REF Contest, CW	0600Z, Jan 28 to 1800Z, Jan 29
+ BARTG RTTY Sprint	1200Z, Jan 28 to 1200Z, Jan 29
+ UBA DX Contest, SSB	1300Z, Jan 28 to 1300Z, Jan 29
+ Winter Field Day	1900Z, Jan 28 to 1900Z, Jan 29
+ K1USN Slow Speed Test	0000Z-0100Z, Jan 30
+ QCX Challenge	1300Z-1400Z, Jan 30
+ ICWC Medium Speed Test	1300Z-1400Z, Jan 30
+ OK1WC Memorial	1630Z-1729Z, Jan 30
+ ICWC Medium Speed Test	1900Z-2000Z, Jan 30
+ QCX Challenge	1900Z-2000Z, Jan 30
+ Worldwide Sideband Activity Contest	0100Z-0159Z, Jan 31
+ ICWC Medium Speed Test	0300Z-0400Z, Jan 31
+ QCX Challenge	0300Z-0400Z, Jan 31

Our thanks to **Bruce Horn, WA7BNM** for use of this calendar!
Visit Bruce at www.contestcalendar.com/contestcal.html

The ARAC RELAY



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