



# The RELAY)))

MAY  
2022

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

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# SPRING 2022



Join us on  
Facebook!

## Webb Space Telescope Update Dazzling Images Exceed Expectations

Last Fall we extensively featured the design, launch and purpose of the new [James Webb Space Telescope](#) (JWST). The ambitious project is a collaboration of [NASA](#), the European Space Agency (ESA), and the Canadian Space Agency (CSA), and aimed to set a new standard of scientific observation in space.

[NASA](#) officially describes the JWST as “the world’s largest, most powerful, and most complex space science telescope ever built. Webb will solve mysteries in our solar system, look beyond to distant worlds around other stars, and probe the mysterious structures and origins of our universe and our place in it.”

[NASA Goddard Space Flight Center](#) took the lead in the development mission, with [Northrup Grumman Aerospace Systems](#) as the primary contractor. The [Space Telescope Science Institute](#) (STScI) manages operations of the telescope now that it is launched. Located in Baltimore, Maryland, STScI is operated by the Association of Universities for Research in Astronomy. They say, “We help humanity explore the universe with advanced space telescopes and ever-growing data archives.” In fact, the STScI continues to administer the science operations centers for both the Hubble Space Telescope and the Nancy Grace Roman Space Telescope. Their expertise made them the clear choice for a new science operations and mission operations center for the James Webb Space Telescope. *Continued on Page 16*

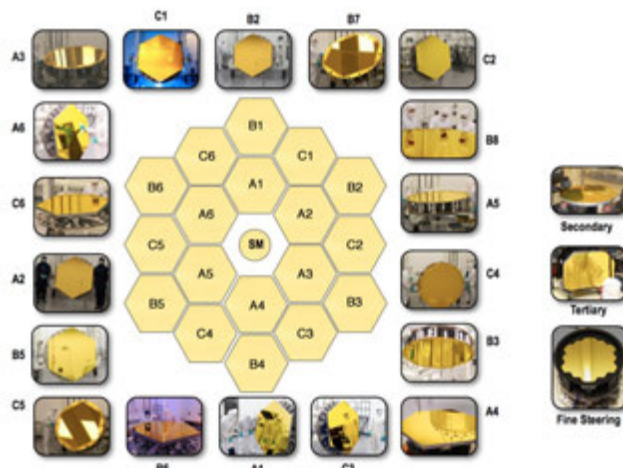


Image Courtesy NASA/James Webb Space Telescope team



**18 individual segments make up the JWST primary mirror.** The three independent sets of mirrors, labeled with letters A, B, and C and numbers 1-6, correspond to the installed position of each mirror on the telescope.

This stunning rendering is [NASA's James Webb Space Telescope](#) official poster. Image courtesy NASA

# ARAC Board Meeting - April 5, 2022

## PRESIDENT



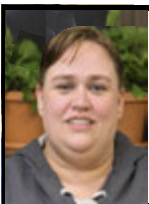
**NØVRM**  
Gene Ellefsen  
3710 Chambersburg Ave  
Duluth, MN 55811  
218-390-3272  
lspitech@mail.com

## VICE PRESIDENT



**KØDJP**  
David Pyrlík  
  
david.pyrlík@gmail.com

## SECRETARY



**KFØGJW**  
Melinda Nelson

## TREASURER



**KNØNUL**  
Bruce Carlson  
906 Anderson Rd  
Duluth, MN 55811  
763-315-2967  
carlsbr@gmail.com

## 3RD YEAR BOARD



**KD9ABS**  
Gary Minter  
1621 N 26th St  
Superior WI 54880

## 2ND YEAR BOARD



**AAØAC**  
Dave Davis  
  
218-348-6649  
aaøac@outlook.com

## 1ST YEAR BOARD



**AAØAW**  
Doug Nelson  
  
aaøaw@arrl.net

### Present:

#### Board Members

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

#### Board Advisors (Non-Board Members)

Bob Shulz - KCØNFB, Kim Waller - KEØNQS, Steve Waller - KENQT

#### Guests

Elmer Berg – KCØNGY, Del Minter – KEØCLI, Wendy Stanford –  
KO4YJO, Jon Nelson – NØUOZ, Rochelle Nelson

Meeting called to order by President Gene-NØVRM at 18:30 (6:30 pm)

#### Minutes:

Posted on the web page and in the newsletter. Moved to approve by  
Doug Nelson – AAØAW, seconded by Gary Minter -KD9ABS, motion  
passed.

#### Treasurer's Report:

#### Treasurer's Report:

Checking: \$1,708.09

Savings: \$1,074.44

Repeater: \$4,880.31

**Subtotal Cash \$7,662.84**

Winter CD : \$1,730.42

Summer CD: \$0.00

**Subtotal CD: \$1,730.42**

**Assets Subtotal: \$9,393.26**

Question – When does the General Insurance come due? Insurance is  
due in February.

Motion to accept Minutes as written by Melinda Nelson – KFØGJW, se-  
conded by Gary Minter – KD9ABS; motion passed.

#### Repeater:

Randy Wabik – KRØB, has been unable to attend meeting tonight. No  
new updates on the repeaters.

#### Vice President:

Dave Pyrlík – KØDJP has been updating the Facebook page with up-  
coming events and major news.

#### Grandma's Marathon:

Anyone who worked a spot last year it is your spot unless you contact  
Doug Nelson – [AAØAW@ARRL.net](mailto:AAØAW@ARRL.net) that you are unable to assist this

*Continued on Page 3*

# ARAC Board Meeting - continued from page 2

year. 2022 Grandma's Marathon Volunteer Registration is ready. Volunteers just need to go to <http://grandmasmarathon.volunteerlocal.com/volunteer>. Password is **HAM22**. You will need to enter the password at the top of the page, otherwise the Ham Radio Volunteer position will be hidden. If you have volunteered before, can you let us know your location.

Meeting Night will be June 9, 2022. If anyone who has not helped in the past and would like to please get ahold of Doug Nelson – AA0AW or Scott Ahlgren – N0VYU and they will get you set up in a spot.

## **Testing:**

Doug Nelson – AA0AW Testing individuals when they are ready. May 7<sup>th</sup> there will be a testing session at HamFest. Starting April 19<sup>th</sup> all new testing will also have to pay an additional \$35.00. This fee will not apply to most license modifications, including those to upgrade an amateur radio licensee's operator class and changes to club station trustees. The new fees will apply only to applications for a new license, renewal, rule waiver, or a new vanity call sign. If anyone needs testing contact Doug at [AA0AW@ARRL.net](mailto:AA0AW@ARRL.net) and they will test individually.

## **HamFest:**

Bob Schultz – KC0NFB currently stand at 31.5 tables for our HamFest. Will be going to Brainard's HamFest to poach the vendor there. As for Yasue – have been told to stay away from HamFest. He is still planning on coming as an independent. Sent HRO in Milwaukee a message to see if they could send some magazines, or door prizes. Offered them a table to do a demo table. Still looking for door prizes. Grand Prize will be held at 12:30 pm.

## **Anything new to bring up:**

Comments on the Newsletter – Kim Waller – KE0NQS

I apologize for the late posting of the newsletters.

If anyone who has submissions for the newsletters. Anyone who wants to sell something, etc. please send to Kim at [KE0NQS.mn@gmail.com](mailto:KE0NQS.mn@gmail.com)

Motion to adjourn by Doug Nelson – AA0AW, seconded by Bruce Carlson – KN0NUL, motion passed at 19:27 (7:27 pm)





# ARAC Club Meeting Minutes

**April 14, 2022**

**Present:**

President: Gene Ellefsen – N0VRM  
Vice President: Dave Pyrlík – 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)  
HamFest/Education: Bob Schultz – KC0NFB  
Repeater: Dave Pyrlík – K0DJP  
Testing: Doug Nelson – AA0AW  
Parliamentarian: Grant Forsyth – KC0WUP

**Absent:**

Property/Picnic: Scott Ahlgren – N0VYU  
Repeater: Randy Wabik – KR0B  
Chaplin:  
Web Site: Thomas Dorr – KE0RHA  
Newsletter/Historian: Kim Waller – KE0NWS  
Newsletter/Historian: Scott Waller – KE0NQS

Meeting called to order at 18:02 (6:02 PM) by President Gene Ellefsen – N0VRM. Thirty-nine members in attendance.

**Minutes:**

Posted on the web page and in the newsletter. Motion to approve by Grant Forsyth – KC0WUP, seconded by Elmer Berg – KC0NGY motion passed.

**Treasurer's Report:**

Checking: \$1,708.09  
Savings: \$1,074.44  
Repeater: \$4,880.31  
**Subtotal Cash \$7,662.84**

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

**Assets Subtotal: \$9,393.26**

Motion to accept as presented by Grant Forsyth – KC0WUP, seconded by Dave Davis – AA0AC, motion passed.

*Continued on Page 5*



# ARAC Club Meeting Minutes, continued

## **Repeater:**

Randy Wabik – KR0B, has been unable to attend meeting due to being ill.

## **HamFest:**

May 7<sup>th</sup>, 2022, from 9:00 AM to 13:00 (1:00 PM). Just remember we need door prizes, help with kitchen, set up and tear down. Have not heard from HRO or Yasue yet. We have thirty-two tables.

## **Education:**

Currently nothing until the Fall. Next class will start in September. If you need tutoring Bob Schultz – KCONFB is available.

## **Testing:**

Registered for testing at the HamFest. Nothing big scheduled till then. If you are ready to test, we will still do individual testing. Contact Doug Nelson if you are ready at [AA0AW@ARRL.net](mailto:AA0AW@ARRL.net).

## **Licenses:**

Starting April 19<sup>th</sup>, the FCC is instituting a \$35.00 fee. This fee will not apply to most license modifications, including those to upgrade an amateur radio licensee's operator class and changes to club station trustees. The new fees will apply only to applications for a new license, renewal, rule waiver, or a new vanity call sign.

## **Grandma's Marathon:**

Anyone who worked a spot last year it is your spot unless you contact Doug Nelson – AA0AW that you are unable to assist this year. 2022 Grandma's Marathon Volunteer Registration is ready – <http://grandmasmarathon.volunteerlocal.com/volunteer>. Password is **HAM22**. You will need to enter the password at the top of the page, otherwise the Ham Radio Volunteer position will be hidden. If you have volunteered before, can you let us know your location. If you have never volunteered before and wish to do so. Please reach out to Doug Nelson – AA0AW or Scott Ahlgren – N0VYU/

## **Field day:**

4<sup>th</sup> Saturday in June. Event sponsored by the ARRL, nationwide for clubs and individuals to go out and operate away from home. We set up at Spirit Mountain, parking lot C. We have the reservation for this set up. Looking forward to seeing you all.

## **New members/Ham's:**

Welcome to the club and the hobby!

William Turk – KF0ILA

Bryan Gibson – KD0DHA

Aaron Johnson – KE0OPK

Door Prize was won by Dave Davis – AA0AC.

Motion to adjourn by Robin Davis, seconded by Dave Davis – AA0AC, motion passed at 18:19 (6:19 PM).  
Program Skywarn.







## Prez Sez...

Hi everyone,

Coming up quick is the A.R.A.C. Hamfest on Saturday May at the Head of the Lakes Fairground on Tower Ave in Superior. Set up starts at 6:00 am so we need help getting the tables up. The Vendor doors open at 7:00 a.m. and the Public is in at 9:00 a.m. There a good number of tables already reserved so should be a nice selection of equipment for sale.

June is going to be a busy month. First there is Grandma's Marathon on Saturday June 18. If you would like to help out, talk to Doug Nelson AA0AW or Scott Ahlgren N0VYU and they will set you up.

Field Day is the next weekend, June 25 & 26 at Spirit Mountain, parking lot C. This is a nation-wide event and a good opportunity for you new Hams to get on HF !!!

73, Gene Ellefsen NØVRM  
Club President

## CLUB REPEATER WØGKP

146.94 (-)  
CTCSS TONE

### The ARAC RELAY



*Published monthly and distributed free to members, "The RELAY" is the official publication of the Arrowhead Radio Amateur Club, Inc. Members are encouraged to submit articles, opinions, and classifieds. Your submission will be placed as soon as possible providing it does not conflict with the bylaws of the Arrowhead Radio Amateur Club, Inc. The editors reserve the right to omit any submission that is not a required item. If a submission is questionable, it will be presented to the Board of Directors at the next scheduled board meeting for authorization.*



# Arrowhead Radio Amateur Club **HAMFEST!**

**Saturday May 7<sup>th</sup>, 2022 9am - 1pm**

HEAD OF THE LAKES FAIRGROUNDS, MULTI-PURPOSE BUILDING  
4700 Tower Ave (WI Hwy 35), Superior, WI 54880

Fairgrounds are located next to the Superior Airport

**Admission: \$7 (12 and under FREE)**

Free parking for most vehicles.

Used and like new radios, electronic equipment, tools,  
vendor reps, parts, and computer items.

<<< QSL card checking for ARRL awards programs by: Mike Cizek WØVTT >>>

Mike's email: [mgcizek@gmail.com](mailto:mgcizek@gmail.com)



**ARRL**  
The national association for  
**AMATEUR RADIO**

This is an A.R.R.L. sanctioned event.

Talk-in on WØGKP Repeater:  
146.940 (-) [103.5] Duluth  
147.000 (-) [103.5] Mahtowa  
146.940 (-) [151.3] Two Harbors

Testing on Site!

10am 4-H Building  
Contact: Doug AAØAW  
218-391-5874  
[aa0aw@arrl.net](mailto:aa0aw@arrl.net)

Dealer / Vendor Tables:  
4 foot table: \$5  
8 foot table: \$10  
Vendor setup starts at: 7am

Table Reservations

Robert Schulz, KCØNFB  
115 Eden LN, Duluth, MN 55805-1533  
218-481-7458  
[arac\\_hamfest@charter.net](mailto:arac_hamfest@charter.net)

**WWW.THEARAC.ORG**

**Hourly Drawings! Grand Prize: \$500**



# 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

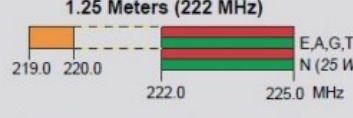
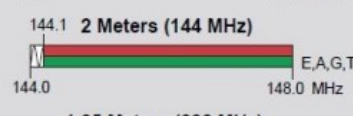
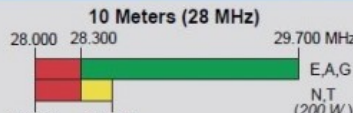
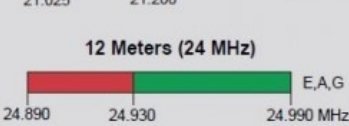
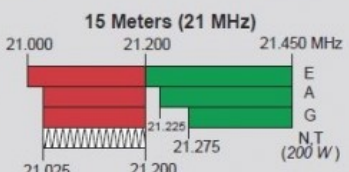
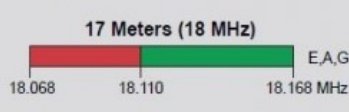
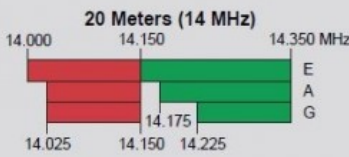
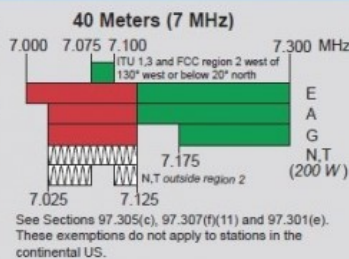
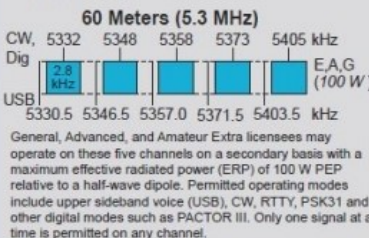
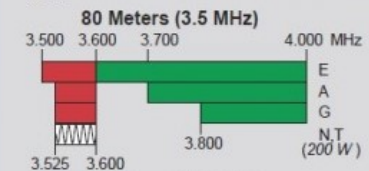
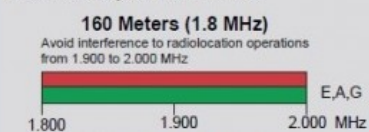
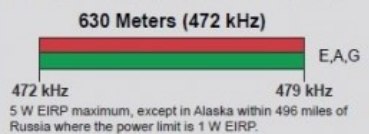
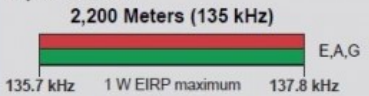
FCC 97.313 An amateur station must use the minimum transmitter power necessary to carry out the desired communications. (b) No station may transmit with a transmitter power exceeding 1.5 kW PEP.

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

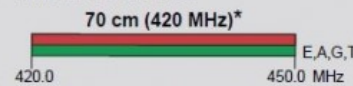


ARRL The national association for AMATEUR RADIO®

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](http://www.arrl.org/graphical-frequency-allocations) when the bands are fully available for use.



\*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

### 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](http://www.arrl.org) for detailed band plans.

### ARRL We're At Your Service

ARRL Headquarters:  
860-594-0200 (Fax 860-594-0259)  
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Getting Started in Amateur Radio:  
Toll-Free 1-800-326-3942 (860-594-0355)  
email: [newham@arrl.org](mailto:newham@arrl.org)

Exams: 860-594-0300 email: [vec@arrl.org](mailto:vec@arrl.org)

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# 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](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.rvradionet.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
- Upper Midwest Ten Meter Net: Every Thursday Evening @ 8 PM – 28.480 MHz USB
- 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](mailto: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



# UPCOMING EVENTS

## Next ARAC Board Meeting

Tuesday, April 3, 2022

@ 6:30 p.m.

Sammy's Pizza - Spirit Valley

## Next ARAC Club Meeting

Thursday, May 12th

7 p.m.

Coppertop Church!

May Program:

TBD

**PLUS**

**AA0AW Demo:**

*How to Register for  
Volunteering at Grandma's  
Marathon in 3 Easy Steps*

*Interested in providing a program,  
or have an idea for one?*

Contact us at  
[ke0nqs.mn@gmail.com](mailto:ke0nqs.mn@gmail.com)

## HAMFEST 2022

Used and like-new radios,  
electronic equipment,  
tools, vendor reps, parts,  
and computer items.

Saturday May 7, 2022

9:00AM - 1:00PM

See Page 7 for Details!

License Testing On-site



**LOOKING**

for an

**Amateur Radio License  
TESTING SESSION?**

Did you miss the Hamfest  
testing session this time?  
No need to wait for a class!

**Schedule your own  
Testing Session TODAY!**

Contact Doug Nelson-AA0AW at  
[aa0aw@arrl.net](mailto:aa0aw@arrl.net) or 218-391-5874



# DULUTH AREA REPEATERS

## ARAC System WØGPK

Frequency	Offset	Tone	Location
146.940	minus	103.5	Duluth
146.940	minus1	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.ØØ	1Ø3.5	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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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

Co-Editors,



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

**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

# MAY

## 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  CW 1930 AA0AW USB 2000 K9KDK ES 2100 N9DMG	2  WX 2000 KC0MKS	3 <b>ARAC BOARD MEETING</b> Sammy's Pizza 6:30 pm DC Net 2000 CC Net 2030	4  2100 -BWAR	5	6	7 <b>HAMFEST</b> 9 a.m.-1:00 p.m. Head of the Lakes Fairgrounds 4700 Tower Ave Superior, WI
8 Mothers Day  CW 1930 N0PDG USB 2000 N0VRM ES 2100 AA0AW	9 <b>DC ARES/RACES Mtg</b> 1900 DC EOC WX 2000 KC0MKS	10  DC Net 2000 CC Net 2030	11 <b>Lake County ARES/RACES Meeting 1800</b> Lake County Net 1800 2100 -BWAR	12  <b>ARAC Club Meeting</b> Coppertop Church 7:00 PM	13	14
15  CW 1930 AA0AW USB 2000 N0PDG ES 2100 KC0WDQ	16  WX 2000 KC0MKS	17  DC Net 2000 CC Net 2030	18 <b>St Louis County ARES/RACES Meeting 1800</b> Lake County Net 1900 2100 -BWAR	19	20	21
22  CW 1930 N0PDG USB 2000 AA0AW ES 2100 W0NWO	23  WX 2000 KC0MKS	24  DC Net 2000 CC Net 2030	25  Lake County Net 1900 2100 -BWAR	26 <b>Carlton County ARES/RACES Meeting</b> 1900 CC EOC	27	28 <b>ARAC Club Breakfast</b> <b>The Chalet</b> 4833 Miller Trunk Hwy Hermantown, MN 8 am
29  CW 1930 AA0AW USB 2000 W0LWU ES 2100 N0VRM	30  WX 2000 KC0MKS	31  DC Net 2000 CC Net 2030				

Get this newsletter *faster*  
via email!  
Email Doug AAØAW at  
[aa0aw@arrl.net](mailto:aa0aw@arrl.net)

Next Meeting: Thursday,  
May 12th, 2022 - 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

**Chaplains:**

**Visiting Chaplain:**

Denny Anderson WØDIO

**Parliamentarian:**

Grant Forsyth KCØWUP

**Website:**

Thomas Dorr KEØRHA

**Membership:**

Bruce Carlson KEØNIT

**Property Chair:**

Wulf Gar WU1FGR

**Testing:**

Doug Nelson AAØAW

**Field Day:**

Dennis Anderson WØDIO

**Picnic Chair:**

Scott Ahlgren, NØVYU

**Repeater Chairs:**

Randy Haglin NØBZZ  
Randy Wabik KAØJZV

**Contest Calendar** at [www.contestcalendar.com](http://www.contestcalendar.com)

**National Contest Journal** at [www.ncjweb.com](http://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](http://www.qrz.com)

**VHF Propagation** site at [www.aprs.mountainlake.k12.mn.us](http://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](http://arrl.org).



# FOR SALE

## FOR SALE by KOGX

**Electronix Servicing**  
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### RF2K + GERMAN SOLID STATE 1500 WATT H.F. AMPLIFIER

2-BLF 189XRA LD MOS DEVICES Each Rated at 1900 Watts  
 Frequency Range . . . 1.8-30 + 50-54 MHz  
 RF Output . . . 1500 Watts at 240VAC  
 Built-in Auto Tuner . . . 7" Touch Screen . . . Quiet Fans  
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2. AMERITRON ALS-600/PS600	Solid State Amplifier 10-160m 600w	\$1275.00
3. DENTRON CLIPPERTON-L	HF Tube Amplifier 10-160m 1200w	\$650.00
4. ICOM IC-706	Mobile Transceiver 2 Meter/HF 10-160m 100w	\$475.00
5. ICOM IC-735	HF Transceiver	\$375.00
6. ICOM IC-2340H	Dual Band Mobile Transceiver UHF/VHF	\$150.00
7. ICOM IC-718	HF Transceiver 10-160m 100w	\$475.00
8. ICOM IC-7200	HF/VHF/UHF Transceiver 6-160m 2m 70cm	\$525.00
9. ICOM IC-751	HF Transceiver 10-160m 100w	\$475.00
10. DRAKE TR-4C	HF Transceiver	\$375.00
11. ALINCO DX-70	HF Mobile Transceiver 10-160m + 6m	\$350.00
12. KENWOOD TS-430S	HF Transceiver 10-160m 100w	\$325.00
13. BIRD 4300-400	Peak Reading Kit for BIRD 43	\$55.00
14. YASEU MD-100	Desk Microphone	\$95.00
15. MFJ-9020	20M QRP CW Transmitter	\$99.00

List Your **FOR SALE** items in the next ARAC Relay! Submit photos and descriptions to [ke0nqs.mn@gmail.com](mailto:ke0nqs.mn@gmail.com)

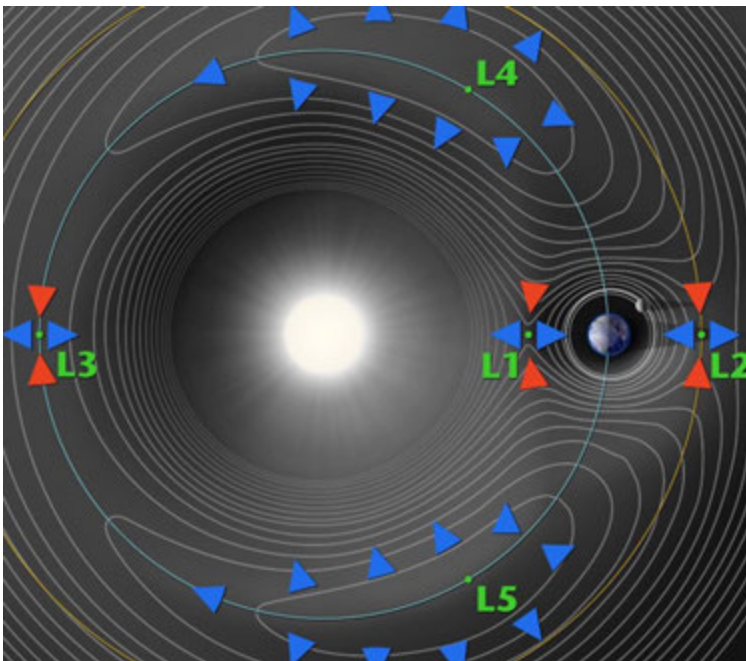
**ARAC Official Website <http://www.thearac.org>** 15

## Webb Telescope, continued from page 1

Since its launch on December 25th, 2021 the James Webb Space Telescope has consistently been exceeding expectations, thrilling NASA and the entire space science community. A 6 month period of deployment, cooling and calibration was originally planned after launch. The telescope performed the tasks much more quickly than anticipated and achieved calibration in only 4 months.

On April 28th, 2022 NASA reported JWST was fully calibrated, with each of its instruments precisely aligned and perfectly operational. Here are just a few factoids of JWST outperforming NASA's expectations from launch 'til now:

- ◆ To resounding cheers from the JWST team, the telescope's solar array deployed just 29 minutes after an absolutely perfect launch aboard an Ariane 5 rocket. The solar array deployment indicated that the telescope was receiving power and was fully operational. It also was 4 minutes ahead of the target time.
- ◆ After this, the telescope inserted itself into orbit at the Lagrange Point 2 (L2) on January 24th, 2022, ahead of schedule. See NASA's Lagrange illustration and description below.
- ◆ Early L2 orbit allowed the next phase to begin early: The mission operations team started carefully working through a the important sequential process of powering on all the science instruments, then turning off the heaters to begin a the cool-down process.
- ◆ In early February the telescope's Near Infrared Camera (NIRC) instrument detected the first photons of starlight. This crucial benchmark began the process of capturing images necessary to fine-tune the telescope's focus, step-by-step. In order to function as a single mirror, JWST's 18 primary mirror segments have to match each other precisely to a fraction of a wavelength of light. That's approximately 50 nanometers!



### About Lagrange Points

Every planet orbiting a star has five location points around it, Lagrange points, that co-orbit. An object precisely located at L1, L2, L3, L4, or L5 will continue to orbit the Sun with precisely the same period as Earth does, meaning that the Earth-spacecraft distance will be constant. L1, L2, and L3 are unstable points of equilibrium, requiring periodic course corrections to maintain a spacecraft's position there, while L4 and L5 are stable. Webb successfully inserted itself in orbit around L2, and must always face away from the Sun for cooling purposes.

In a web article posted April 28, 2022 on NASA's Webb Telescope blog page, Thaddeus Cesari of NASA Goddard writes:

"Alignment of NASA's James Webb Space Telescope is now complete. After full review, the observatory has been confirmed to be capable of capturing crisp, well-focused images with each of its four powerful onboard science instruments.

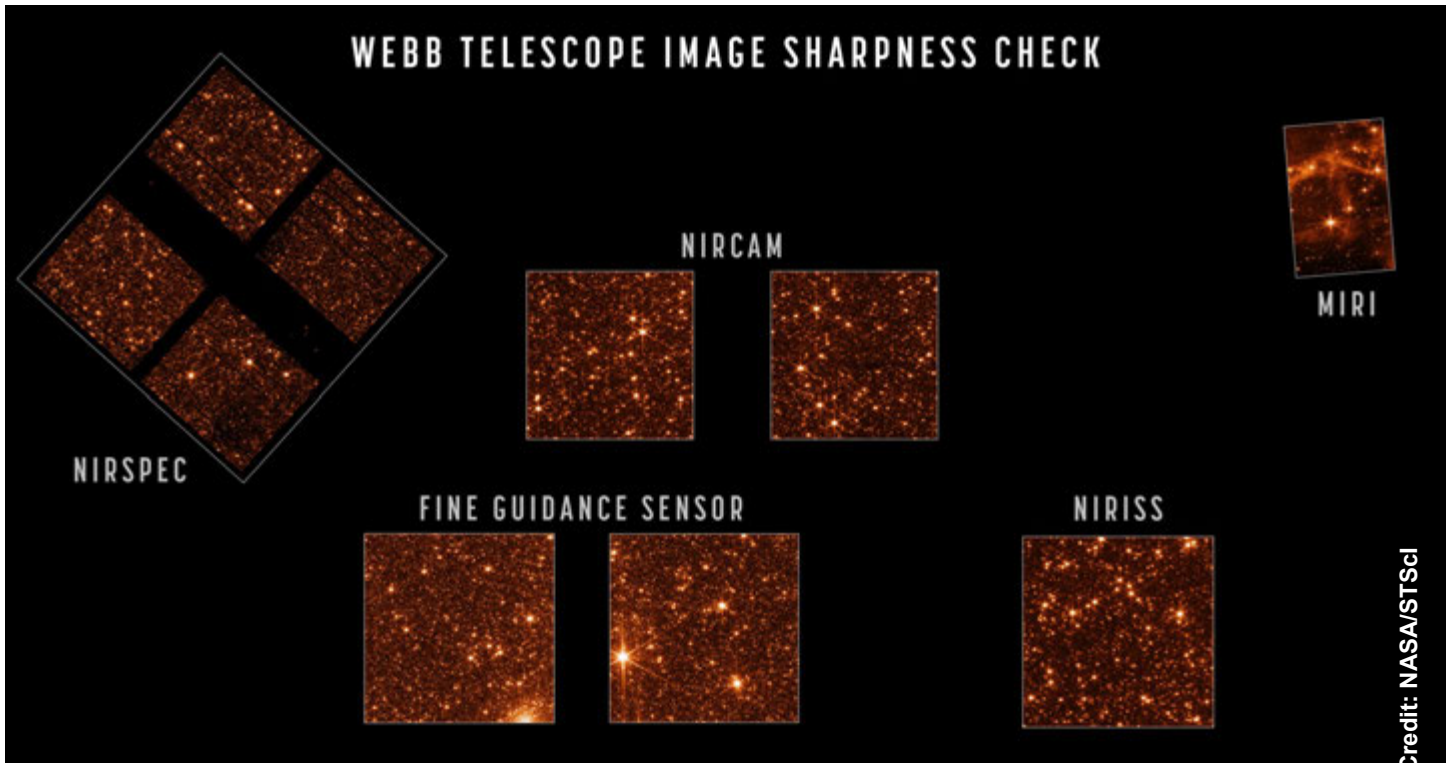
"Upon completing the seventh and final stage of telescope alignment, the team held a set of key decision meetings and unanimously agreed that Webb is ready to move forward into its next and final series of preparations, known as science instrument commissioning.

"This process will take about two months before scientific operations begin in the summer. The alignment of the telescope across all of Webb's instruments can be seen in a series of images that captures the observatory's full field of view."

As always, just a portion of the published images and JWST data NASA has furnished can be seen in this issue of *The Relay*, with detailed descriptions for each one. Visit the JWST blog page every day for the latest ones!

*Continued on Page 17*

## Webb Telescope, continued from page 16



### JWST Image Sharpness Check

for an even more stunning view of the above slide, visit

<https://blogs.nasa.gov/webb/2022/04/28/nasas-webb-in-full-focus-ready-for-instrument-commissioning/>

Engineering images of sharply focused stars in the field of view of each instrument demonstrate that the telescope is fully aligned and in focus. For this test, Webb pointed at part of the Large Magellanic Cloud, a small satellite galaxy of the Milky Way, providing a dense field of hundreds of thousands of stars across all the observatory's sensors. The sizes and positions of the images shown here depict the relative arrangement of each of Webb's instruments in the telescope's focal plane, each pointing at a slightly offset part of the sky relative to one another. Webb's three imaging instruments are NIRCAM (images shown here at a wavelength of 2 microns), NIRISS (image shown here at 1.5 microns), and MIRI (shown at 7.7 microns, a longer wavelength revealing emission from interstellar clouds as well as starlight). NIRSpec is a spectrograph rather than imager but can take images, such as the 1.1 micron image shown here, for calibrations and target acquisition. The dark regions visible in parts of the NIRSpec data are due to structures of its microshutter array, which has several hundred thousand controllable shutters that can be opened or shut to select which light is sent into the spectrograph. Lastly, Webb's Fine Guidance Sensor tracks guide stars to point the observatory accurately and precisely; its two sensors are not generally used for scientific imaging but can take calibration images such as those shown here. This image data is used not just to assess image sharpness but also to precisely measure and calibrate subtle image distortions and alignments between sensors as part of Webb's overall instrument calibration process.

Image caption credit: NASA/STScI

Continued from page 16

Cesari also quotes an elated Lee Feinber, Webb optical telescope element manager at NASA's Goddard Space Flight Center: "These remarkable test images from a successfully aligned telescope demonstrate what people across countries and continents can achieve when there is a bold scientific vision to explore the universe.

"The optical performance of the telescope continues to be better than the engineering team's most optimistic predictions. Webb's mirrors are now directing fully focused light collected from space down into each instrument, and each instrument is successfully capturing images with the light being

*Continued on Page 18*



## Webb Telescope, continued from page 17

delivered to them. The image quality delivered to all instruments is “diffraction-limited,” meaning that the fineness of detail that can be seen is as good as physically possible given the size of the telescope. From this point forward the only changes to the mirrors will be very small, periodic adjustments to the primary mirror segments.”

Cesari concludes: “Now, the Webb team will turn its attention to science instrument commissioning. Each instrument is a highly sophisticated set of detectors equipped with unique lenses, masks, filters, and customized equipment that helps it perform the science it was designed to achieve. The specialized characteristics of these instruments will be configured and operated in various combinations during the instrument commissioning phase to fully confirm their readiness for science. With the formal conclusion of telescope alignment, key personnel involved with the commissioning of each instrument have arrived at the Mission Operations Center at the Space Telescope Science Institute in Baltimore, and some personnel involved with telescope

*Continued on Page 19*



### Webb Space Telescope Instruments Team

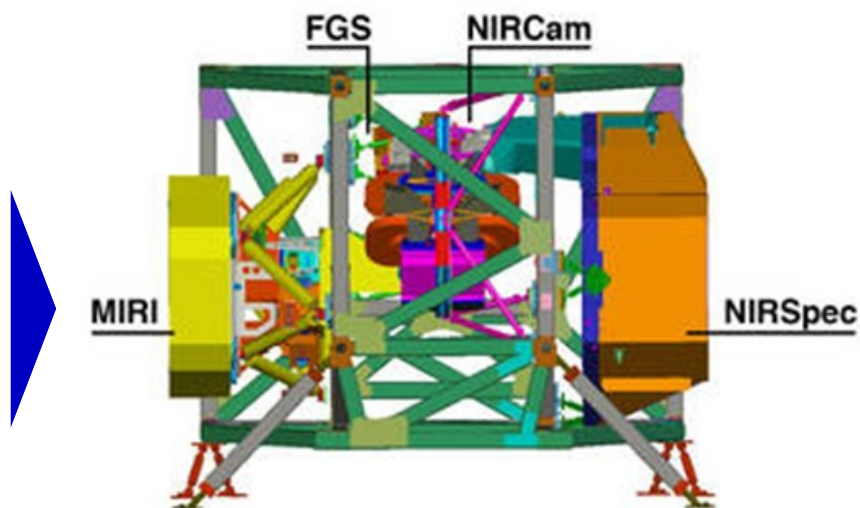
Group photo of JWST project members with the complete Integrated Science Instrument Module.

The Near Infrared Spectrograph was just added, completing the package of four instruments including a Near Infrared Camera, a Mid Infrared Instrument, a Fine Guidance Sensor and two different Near Infrared Spectrographs.

Credits: NASA/Chris Gunn

### The Integrated Science Instrument Module (ISIM) includes the following instruments:

- ◆ **Near-Infrared Camera**, or NIRC*am* - provided by the University of Arizona
- ◆ **Near-Infrared Spectrograph**, or NIRS*pec* - provided by ESA, with components provided by NASA/GSFC.
- ◆ **Mid-Infrared Instrument**, or MIRI - provided by the European Consortium with the European Space Agency (ESA), and by the NASA Jet Propulsion Laboratory (JPL)
- ◆ **Fine Guidance Sensor/Near Infrared Imager and Slitless Spectrograph**, or FGS/NIRS*ISS*- provided by the Canadian Space Agency



Labeled schematic of the ISIM for the James Webb Space Telescope, showing instrument locations.

## Webb Telescope *continued from page 18*

alignment have concluded their duties.

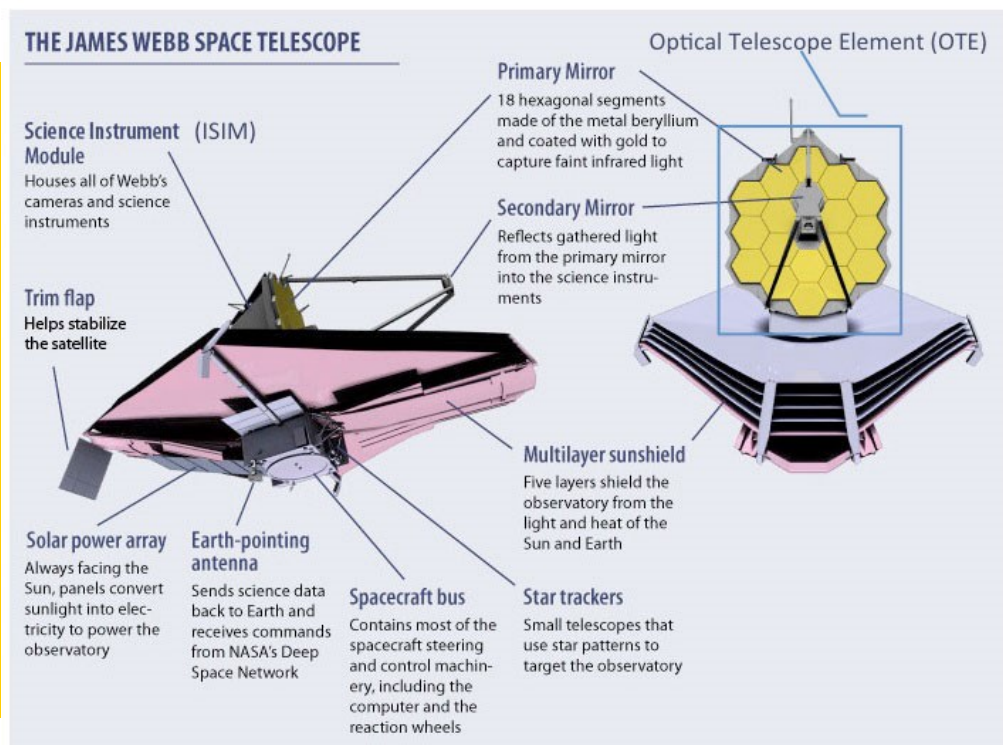
“Though telescope alignment is complete, some telescope calibration activities remain: As part of scientific instrument commissioning, the telescope will be commanded to point to different areas in the sky where the total amount of solar radiation hitting the observatory will vary to confirm thermal stability when changing targets. Furthermore, ongoing maintenance observations every two days will monitor the mirror alignment and, when needed, apply corrections to keep the mirrors in their aligned locations.”

In addition, NASA recently stated they're confident that the useful life of the Webb Space Telescope will far exceed their original estimate of 10 years, so JWST is expected to remain perfectly viable for at least 20 years and even beyond. Your children & grandchildren will likely witness amazing new discoveries about the universe you never thought possible. Wow. It will be fun to watch the JWST blog for all the latest news and stellar images in the next few months. We'll keep you posted every once in a while in *The Relay*. ★

### The James Webb Space Telescope Observatory

The Observatory of the James Webb Space Telescope is comprised of three elements:

- ◆ the Integrated Science Instrument Module (ISIM),
- ◆ the Optical Telescope Element (OTE), which includes the mirrors and backplane, and
- ◆ the Spacecraft Element, which includes the Spacecraft Bus and Sunshield



The **Integrated Science Instrument Module (ISIM)** includes Webb's science instruments. The **OTE** is the eye of the Observatory and it gathers the light coming from space and provides it to the science instruments located in the ISIM. The backplane is like the Webb's "spine". It supports the mirrors.

The **sunshield subsystem** separates the observatory into a warm sun-facing side (spacecraft bus) and a cold anti-sun side (OTE and ISIM). The sunshield keeps the heat of the Sun, Earth, and spacecraft bus electronics away from the OTE and ISIM so that these pieces of the Observatory can be kept very cold (The operating temperature has to be kept under 50 kelvins or -370 deg F).

The **Spacecraft Bus** provides the support functions for the operation of the Observatory. The bus houses the six major subsystems needed to operate the spacecraft: the Electrical Power Subsystem, the Attitude Control Subsystem, the Communication Subsystem, the Command and Data Handling Subsystem, the Propulsion Subsystem, and the Thermal Control Subsystem.

The momentum flap balances the solar pressure on the sunshield, like a trim flap in sailing. It's not adjustable on orbit, but it is while it's on the ground.



# Contest Calendar - May 2022

<a href="#">+ AGCW QRP/QRP Party</a>	1300Z-1900Z, May 1
<a href="#">+ K1USN Slow Speed Test</a>	0000Z-0100Z, May 2
<a href="#">+ ICWC Medium Speed Test</a>	1300Z-1400Z, May 2
<a href="#">+ OK1WC Memorial</a>	1630Z-1729Z, May 2
<a href="#">+ ICWC Medium Speed Test</a>	1900Z-2000Z, May 2
<a href="#">+ Worldwide Sideband Activity Contest</a>	0100Z-0159Z, May 3
<a href="#">+ ARS Spartan Sprint</a>	0100Z-0300Z, May 3
<a href="#">+ ICWC Medium Speed Test</a>	0300Z-0400Z, May 3
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 3
<a href="#">+ Phone Weekly Test</a>	0230Z-0300Z, May 4
<a href="#">+ A1Club AWT</a>	1200Z-1300Z, May 4
<a href="#">+ CWops Test</a>	1300Z-1400Z, May 4
<a href="#">+ VHF-UHF FT8 Activity Contest</a>	1700Z-2000Z, May 4
<a href="#">+ Mini-Test 40</a>	1700Z-1759Z, May 4
<a href="#">+ Mini-Test 80</a>	1800Z-1859Z, May 4
<a href="#">+ CWops Test</a>	1900Z-2000Z, May 4
<a href="#">+ MIE 33 Contest</a>	2300Z, May 4 to 0300Z, May 5
<a href="#">+ Walk for the Bacon QRP Contest</a>	0000Z-0100Z, May 5 and 0200Z-0300Z, May 6
<a href="#">+ CWops Test</a>	0300Z-0400Z, May 5
<a href="#">+ CWops Test</a>	0700Z-0800Z, May 5
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 5
<a href="#">+ NRAU 10m Activity Contest</a>	1700Z-1800Z, May 5 (CW) and 1800Z-1900Z, May 5 (SSB) and 1900Z-2000Z, May 5 (FM) and 2000Z-2100Z, May 5 (Dig)
<a href="#">+ EACW Meeting</a>	1900Z-2000Z, May 5
<a href="#">+ SKCC Sprint Europe</a>	1900Z-2100Z, May 5
<a href="#">+ NCCC RTTY Sprint</a>	0145Z-0215Z, May 6

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## Contest Calendar - May 2022, Continued

<a href="#">+ NCCC Sprint</a>	0230Z-0300Z, May 6
<a href="#">+ K1USN Slow Speed Test</a>	2000Z-2100Z, May 6
<a href="#">+ 10-10 Int. Spring Contest, CW</a>	0001Z, May 7 to 2359Z, May 8
<a href="#">+ RCC Cup</a>	0300Z-0859Z, May 7
<a href="#">+ Microwave Spring Sprint</a>	0800-1400 local, May 7
<a href="#">+ F9AA Cup, Digi</a>	1200Z, May 7 to 1200Z, May 8
<a href="#">+ ARI International DX Contest</a>	1200Z, May 7 to 1159Z, May 8
<a href="#">+ SKCC Weekend Sprintathon</a>	1200Z, May 7 to 2400Z, May 8
<a href="#">+ 7th Call Area QSO Party</a>	1300Z, May 7 to 0700Z, May 8
<a href="#">+ Indiana QSO Party</a>	1500Z, May 7 to 0300Z, May 8
<a href="#">+ Delaware QSO Party</a>	1700Z, May 7 to 2359Z, May 8
<a href="#">+ New England QSO Party</a>	2000Z, May 7 to 0500Z, May 8 and 1300Z-2400Z, May 8
<a href="#">+ WAB 7 MHz Phone</a>	1000Z-1400Z, May 8
<a href="#">+ K1USN Slow Speed Test</a>	0000Z-0100Z, May 9
<a href="#">+ 4 States QRP Group Second Sunday Sprint</a>	0000Z-0200Z, May 9
<a href="#">+ ICWC Medium Speed Test</a>	1300Z-1400Z, May 9
<a href="#">+ OK1WC Memorial</a>	1630Z-1729Z, May 9
<a href="#">+ ICWC Medium Speed Test</a>	1900Z-2000Z, May 9
<a href="#">+ RSGB 80m Club Championship, SSB</a>	1900Z-2030Z, May 9
<a href="#">+ Worldwide Sideband Activity Contest</a>	0100Z-0159Z, May 10
<a href="#">+ ICWC Medium Speed Test</a>	0300Z-0400Z, May 10
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 10
<a href="#">+ Phone Weekly Test</a>	0230Z-0300Z, May 11
<a href="#">+ A1Club AWT</a>	1200Z-1300Z, May 11
<a href="#">+ CWops Test</a>	1300Z-1400Z, May 11
<a href="#">+ Mini-Test 40</a>	1700Z-1759Z, May 11
<a href="#">+ VHF-UHF FT8 Activity Contest</a>	1700Z-2000Z, May 11
<a href="#">+ Mini-Test 80</a>	1800Z-1859Z, May 11

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## Contest Calendar - May 2022, Continued

<a href="#">+ CWops Test</a>	1900Z-2000Z, May 11
<a href="#">+ CWops Test</a>	0300Z-0400Z, May 12
<a href="#">+ CWops Test</a>	0700Z-0800Z, May 12
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 12
<a href="#">+ EACW Meeting</a>	1900Z-2000Z, May 12
<a href="#">+ NCCC RTTY Sprint</a>	0145Z-0215Z, May 13
<a href="#">+ NCCC Sprint</a>	0230Z-0300Z, May 13
<a href="#">+ K1USN Slow Speed Test</a>	2000Z-2100Z, May 13
<a href="#">+ Portuguese Navy Day Contest - CT1DBS Memorial</a>	0900Z, May 14 to 0900Z, May 15
<a href="#">+ CQ-M International DX Contest</a>	1200Z, May 14 to 1159Z, May 15
<a href="#">+ VOLTA WW RTTY Contest</a>	1200Z, May 14 to 1200Z, May 15
<a href="#">+ Canadian Prairies QSO Party</a>	1700Z, May 14 to 0300Z, May 15
<a href="#">+ 50 MHz Spring Sprint</a>	2300Z, May 14 to 0300Z, May 15
<a href="#">+ Run for the Bacon QRP Contest</a>	2300Z, May 15 to 0100Z, May 16
<a href="#">+ K1USN Slow Speed Test</a>	0000Z-0100Z, May 16
<a href="#">+ ICWC Medium Speed Test</a>	1300Z-1400Z, May 16
<a href="#">+ OK1WC Memorial</a>	1630Z-1729Z, May 16
<a href="#">+ ICWC Medium Speed Test</a>	1900Z-2000Z, May 16
<a href="#">+ Worldwide Sideband Activity Contest</a>	0100Z-0159Z, May 17
<a href="#">+ ICWC Medium Speed Test</a>	0300Z-0400Z, May 17
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 17
<a href="#">+ Phone Weekly Test</a>	0230Z-0300Z, May 18
<a href="#">+ A1Club AWT</a>	1200Z-1300Z, May 18
<a href="#">+ CWops Test</a>	1300Z-1400Z, May 18
<a href="#">+ VHF-UHF FT8 Activity Contest</a>	1700Z-2000Z, May 18
<a href="#">+ Mini-Test 40</a>	1700Z-1759Z, May 18
<a href="#">+ Mini-Test 80</a>	1800Z-1859Z, May 18
<a href="#">+ CWops Test</a>	1900Z-2000Z, May 18

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## Contest Calendar - May 2022, Continued

<a href="#">+ RSGB 80m Club Championship, Data</a>	1900Z-2030Z, May 18
<a href="#">+ Walk for the Bacon QRP Contest</a>	0000Z-0100Z, May 19 and 0200Z-0300Z, May 20
<a href="#">+ NAQCC CW Sprint</a>	0030Z-0230Z, May 19
<a href="#">+ CWops Test</a>	0300Z-0400Z, May 19
<a href="#">+ CWops Test</a>	0700Z-0800Z, May 19
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 19
<a href="#">+ NTC QSO Party</a>	1900Z-2000Z, May 19
<a href="#">+ EACW Meeting</a>	1900Z-2000Z, May 19
<a href="#">+ NCCC RTTY Sprint</a>	0145Z-0215Z, May 20
<a href="#">+ NCCC Sprint</a>	0230Z-0300Z, May 20
<a href="#">+ K1USN Slow Speed Test</a>	2000Z-2100Z, May 20
<a href="#">+ SARL VHF/UHF Digital Contest</a>	0300Z-0500Z, May 21 (6m) and 0500Z-0700Z, May 21 (2m) and 0700Z-0900Z, May 21 (70cm) and 0300Z-0500Z, May 22 (6m) and 0500Z-0700Z, May 22 (2m) and 0700Z-0900Z, May 22 (70cm)
<a href="#">+ UN DX Contest</a>	0600Z-2100Z, May 21
<a href="#">+ YOTA Contest</a>	0800Z-1959Z, May 21
<a href="#">+ NZART Sangster Shield Contest</a>	0800Z-1100Z, May 21 and 0800Z-1100Z, May 22
<a href="#">+ EU PSK DX Contest</a>	1200Z, May 21 to 1200Z, May 22
<a href="#">+ His Maj. King of Spain Contest, CW</a>	1200Z, May 21 to 1200Z, May 22
<a href="#">+ Arkansas QSO Party</a>	1400Z, May 21 to 0200Z, May 22
<a href="#">+ Feld Hell Sprint</a>	1600Z-1759Z, May 21 and 2000Z-2159Z, May 21
<a href="#">+ Baltic Contest</a>	2100Z, May 21 to 0200Z, May 22

*Continued on Page 24*





## Contest Calendar - May 2022, Continued

<a href="#"><u>+ K1USN Slow Speed Test</u></a>	0000Z-0100Z, May 23
<a href="#"><u>+ QRP ARCI Hootowl Sprint</u></a>	0000Z-0100Z, May 23
<a href="#"><u>+ ICWC Medium Speed Test</u></a>	1300Z-1400Z, May 23
<a href="#"><u>+ OK1WC Memorial</u></a>	1630Z-1729Z, May 23
<a href="#"><u>+ ICWC Medium Speed Test</u></a>	1900Z-2000Z, May 23
<a href="#"><u>+ Worldwide Sideband Activity Contest</u></a>	0100Z-0159Z, May 24
<a href="#"><u>+ ICWC Medium Speed Test</u></a>	0300Z-0400Z, May 24
<a href="#"><u>+ RTTYOPS Weeksprint</u></a>	1700Z-1900Z, May 24
<a href="#"><u>+ SKCC Sprint</u></a>	0000Z-0200Z, May 25
<a href="#"><u>+ Phone Weekly Test</u></a>	0230Z-0300Z, May 25
<a href="#"><u>+ A1Club AWT</u></a>	1200Z-1300Z, May 25
<a href="#"><u>+ CWops Test</u></a>	1300Z-1400Z, May 25
<a href="#"><u>+ Mini-Test 40</u></a>	1700Z-1759Z, May 25
<a href="#"><u>+ Mini-Test 80</u></a>	1800Z-1859Z, May 25
<a href="#"><u>+ CWops Test</u></a>	1900Z-2000Z, May 25
<a href="#"><u>+ CWops Test</u></a>	0300Z-0400Z, May 26
<a href="#"><u>+ CWops Test</u></a>	0700Z-0800Z, May 26
<a href="#"><u>+ QRP Minimal Art Session</u></a>	1400Z-2200Z, May 26
<a href="#"><u>+ RTTYOPS Weeksprint</u></a>	1700Z-1900Z, May 26
<a href="#"><u>+ RSGB 80m Club Championship, CW</u></a>	1900Z-2030Z, May 26
<a href="#"><u>+ EACW Meeting</u></a>	1900Z-2000Z, May 26
<a href="#"><u>+ NCCC RTTY Sprint</u></a>	0145Z-0215Z, May 27
<a href="#"><u>+ NCCC Sprint</u></a>	0230Z-0300Z, May 27
<a href="#"><u>+ K1USN Slow Speed Test</u></a>	2000Z-2100Z, May 27
<a href="#"><u>+ CQ WW WPX Contest, CW</u></a>	0000Z, May 28 to 2359Z, May 29
<a href="#"><u>+ K1USN Slow Speed Test</u></a>	0000Z-0100Z, May 30
<a href="#"><u>+ ICWC Medium Speed Test</u></a>	1300Z-1400Z, May 30

*Continued on Page 25*



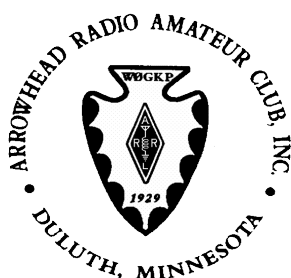
## Contest Calendar - May 2022, Continued

<a href="#">+ QCX Challenge</a>	1300Z-1400Z, May 30
<a href="#">+ OK1WC Memorial</a>	1630Z-1729Z, May 30
<a href="#">+ RSGB FT4 Contest</a>	1900Z-2030Z, May 30
<a href="#">+ ICWC Medium Speed Test</a>	1900Z-2000Z, May 30
<a href="#">+ QCX Challenge</a>	1900Z-2000Z, May 30
<a href="#">+ Worldwide Sideband Activity Contest</a>	0100Z-0159Z, May 31
<a href="#">+ ICWC Medium Speed Test</a>	0300Z-0400Z, May 31
<a href="#">+ QCX Challenge</a>	0300Z-0400Z, May 31
<a href="#">+ RTTYOPS Weeksprint</a>	1700Z-1900Z, May 31

Our thanks to **Bruce Horn, WA7BNM**  
for use of this calendar!

Please visit Bruce's site at  
[www.contestcalendar.com/contestcal.html](http://www.contestcalendar.com/contestcal.html)  
for many other helpful contest calendar formats.

### The ARAC RELAY



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