Alachua County ARES®/NFARC
2024 FIELD DAY
JUNE 22/23, 2024

After Action Report/Improvement Plan

Expanded Version for Exercise Planners

WRITTEN JUNE 2024

Amended and Approved, July Meeting

APPROVED VERSION FOR DISTRIBUTION

HANDLING INSTRUCTIONS

1. Points of Contact:

Alachua County ARES®:

Name:	Gordon Gibby MD, Asst. Emergency Coordinator
FCC License:	KX4Z
SHARES License:	NCS521

Lineup of operators and stations in the Main Lodge at Cuscowilla

CONTENTS

Our visitor reception area, Cuscowilla Lodge. Welcome desk with many types of brochure.

EXECUTIVE SUMMARY

The Amateur Radio Emergency Service (ARES®) typically organizes at the County Level and upward. In Alachua County, multiple amateur radio clubs support the ARES® mission, including the Gainesville Amateur Radio Society, the North Florida Amateur Radio Club, and the Alachua County EOC Radio Club.

FIELD DAY is a long-standing American Radio Relay League activity, always carried out on the 4th full weekend of June, designed to test field preparation of amateur radio for service to the nation as mentioned in FCC Part 97.1.

This is the 5th year that the North Florida Amateur Radio Club/ARES(r) group has carried out a Field Day effort. This year we used yet another "new" facility, the lovely Cuscowilla Nature and Retreat Center.

We maintained our efforts at 4 transmitters, but in the much more difficult "A" Class and still added 29% to our contact result, reaching a new high of 1,643 contacts. We achieved even more success in digital modes including FT4 and FT8, reaching over 1,000 contacts, and also in voice, and in CW (much improved to over 300 contacts). We judged that a lot of our training is paying off, and that the radio maturity index of our group is growing.

Significant Advances as a Result of this Field Day Effort:

- First Field Day utilization of our 3-element triband YAGI and tower trailer system.
- First Field Day utilization of our six-band Antenna Multiplexer that significantly improves our capabilities.
- Continued interoperability with key communications asset and people -- the Region 3 MARC Unit & support personnel.
- Continued wide range of volunteers involved in Field Day - inclusion of at least one new volunteers.
- Further Validation of the refurbished 5 kW diesel generator.
- Greater utilization of the CW mode during the Field Day
- Near total success at MESH-microwave networking
- 100% success at GPS-based NTP server.
- Acquisition and fielding of significantly more computing assets.[1]

1 Privately acquired refurbished Windows 10 laptops perfectly suited to deployed situations.

Major Strengths

- Successful deployment of the new tower/trailer/beam antenna
- >70 dB antenna-to-antenna separation allowed "cabin" station to operate on same bands as lodge stations without need for specialized narrow receiver filters.
- Superb coordination with the MARC unit.
- Tear down was speedily and efficiently completed
- FT8/FT4 automated logging success
- MESH Networking and NTP server complete success.
- Success at even same-band operations with better grasp of receiver protection strategies.
- Much greater success of our innate membership at both voice and CW.
- Further Streamlined solar power charging experience

Primary Areas for Improvement

- Potentially increase effort on more effective outreach such as displays at community events rather than attempting to invite them to "our" events.
- Further reduce the "setup effort" by utilizing EOC facilities whenever possible.

Summary

Our effort this year was **more successful than even last year**, at a very spacious and indoor facility. A significant reason was our new tower/beam system and antenna multiplexer system that allowed multiple stations to operate (on different bands) on the same antenna -- dramatically reducing the setup/teardown antenna effort our older participants had to do under hot June Florida sun.

We made 29% more contacts than last year, reaching 1643 total contacts. Both digital and CW saw significant improvements in our skill levels. We are no longer dependent on outside experts for CW.

THIS DOCUMENT

This document is prepared to help the group improve its emergency communications, deployment abilities, and to assist those who will be planning the next year's event. As a consequence, it is lengthy and detailed as to what were our methods, what were our results, and how they compared to our previous Exercises.

Most groups have a variety of participants, ranging from those who are planners, "movers and shakers" and ranging toward those who, for reasons of limitations, other responsibilities, or disinterest, are only peripherally involved (at this particular time). This document is primarily addressed toward the former, rather than the latter group.

For those with more limited time for review, the most important sections are probably Section 3 (Analysis of Objectives/Results), and Appendix A (Improvement Plan)

SECTION 1: EXERCISE OVERVIEW

Exercise Name	**Field Day 2024**
Exercise Dates	22-23 JUN 2024
Scope	Full-scale exercise at the Alachua County Cuscowilla Nature and Retreat Center. Field Day is an American Radio Relay League (ARRL) sponsored national event.
Mission Area(s)	Response
Core Capabilities	Operational Communication, [2] Planning, Information Sharing, Public Information, and Community Resilience[3]
Objectives	• **Everyone stay SAFE.** • **Everyone have a GOOD TIME** • **Improve our RADIO ASSETS** • **Improve our CW, Phone and Digital performances** • **Gain more skill and resilience in our backup electrical power, backup antennas.** • **Improve our cohesiveness as a group**
Threat or Hazard	No threat or hazard. The goal is to contact as many other stations as possible and to learn to operate radio gears in abnormal situations and less than optimal conditions [4]
Scenario	No specific scenario
Sponsor	American Radio Relay League (ARRL)
Participating Organizations	Field Day is a US/Canada-wide event. This AAR reports on the specific details of NF4AC. NF4AC is the call sign of the Alachua County ARES Volunteers who support the Alachua County EOC. The Alachua County Fire Department / Region 3 MARC Unit joined NF4AC during Field Day.

2 https://www.fema.gov/sites/default/files/2020-07/fema_ESF_2_Communications.pdf
3 https://www.fema.gov/emergency-managers/national-preparedness/mission-core-capabilities
4 http://www.arrl.org/files/file/FieldDay/2021/2_1-%20FD%20Flier%20-%20What%20is%20FD%20generic.pdf

Point of Contact

Gordon Gibby, MD, DocVacuumTubes@gmail.com

Event Planning Team

Gordon L. Gibby KX4Z
Leland Gallup AA3YB
David Huckstep W4JIR

Number of Participants

1. David Huckstep W4JIR
2. Wendell Wright KN4TWS (in preparation; ill during event)
3. Leland Gallup AA3YB
4. Gordon Gibby KX4Z
5. Dan D'Andrea KF4OVJ
6. Jeff Capehart W4UFL
7. Mike Hasselbeck WB2FKO
8. Earl McDow K4ZSW
9. Mark McDow KN4POZ
10. Susan Halbert KG4VWI
12. Eric Pleace KO4ZSD
12. Rosemary Jones KI4QBZ
13. Manish Sahni KQ4KTE
14. Alice Huckstep W9ALI

SECTION 2: EVENT DESIGN SUMMARY

Event Purpose and Design[5]

For scores of years, the American Radio Relay League has sponsored an annual “Field Day”” event/contest on the 4th weekend of June, encouraging individuals and groups to practice emergency type communications in the setting of an amateur radio communications contest. The scoring is a combination of points for desirable planning and operations activities, plus points for every connection made (“contact”) to other participants at distant sites with successful bidirectional transfer of a simple message, giving the type of operation at each end, and the assigned “section” in the ARRL organization.

For this group, the exchange they had to transmit and receive acknowledgment for, was

4A NFL because they ran 4 transmitters at a non-EOC site (Category A) and are in the North Florida ARRL section.

Callsign utilized was **NF4AC** which is the callsign of the Alachua EOC Radio Club. Since they were operating as a Class 4A station they deemed it more appropriate this year and the last to use NF4AC (EOC Radio Club) callsign rather than NF4RC (North Florida Amateur Radio Club).

There was no "get on the air" station this year, since it was unproductive last year.

Incident Command System / Leadership

As they did in previous Field Day exercises, they organized their effort using Incident Command System principles, and primarily using a very elongated ICS-201 form. Volunteers were recruited by Gordon Gibby and others.

Documentation Unit Leaders: Gordon Gibby
Microwave Unit Leaders: Earl McDow, Mark McDow, Susan Halbert
Sustenance Unit Leader: Rosemary Jones

5 Much of the material of this AARIP repeats standard information nicely summarized by Brett Wallace NH2KW in the 2021 AARIP

Layout Constraint

Approximate 1000-foot diameter circle enclosing all operations and antennas of the event

By national Field Day Rules, the entire operation had to be carried out within a 1000-foot diameter circle. Satellite maps were used to guarantee compliance with this rule.

FM Radio Frequency Interference Issue

50 kW of FM power 1200 feet @ approximately 300 degrees. We had to assess how much of a risk to receivers or to operations this posed. Initial calculations based on their published antenna specifications, and the estimated angle of declination from their antenna (21o) suggested 97.3 MHz E-field of 2.5 Volts/meter in the park. At FM frequencies, a full size antenna has an antenna factor of approx. $9.72/\lambda = 3.16$,[6] and will therefore have have 2.5V/meter / 3.16 = 791 mV at the antenna terminals.[7] That's enough to completely forward bias and possibly damage a mixer diode. (And my MFJ antenna analyzer has *already been repaired once from front-end damage*....don't want to do that again....)

We had to know what a typical ham radio antenna would pick up -- either at 2 meters, or on HF frequencies. A field trip with measuring instrumentation showed:

6 This equation for AF comes from: https://en.wikipedia.org/wiki/Antenna_factor
7 See, for further information: https://en.wikipedia.org/wiki/Antenna_factor

Test or Measurement	Outcome
97.3 MHz signal received on VHF mag mount antenna	**-10 dBm** (about S9+ 60dB) **[within the realm of non-destructive for FM transceivers]** (for safety used 36 dB external pad and 20 dB internal, but turned out not needed)
VHF ICOM transceiver, truck roof mag-mount vertical	**No problem** hearing or reaching local VHF ham repeater **No problem** making WINLINK VARA-FM connection to local VHF RMS
97.3 MHz signal on 65-foot off center fed (Guanella FT-240-43 Balun) dipole, approx 100 feet of RG8X coax	**-4 dBm [enough to cause potential OVERFLOW of Icom 7300 IF not filtered out by external or internal filters]** (For safety used lots of internal and external attenuation here also, although this would have been OK) **Likely that ICOM filters will filter this out, but possible that some IMD might occur in a diode somewhere.**
ICOM 7300 via QuintPlexor port offering 40dB 97 MHz attenuation	Operation appeared completely normal on 20 meters. Copied signals without any difficulty.
Xiegu G90 operated on short wire antenna < 10 feet above ground (no additional attenuation)	20- and 40-meter operation appeared unaffected

I also measured the protection against 97.3 MHz offered by our QuintPlexor (alone, without external bandpass filters)

Band	Attenuation of 97.3 MHz	Comment
10 meters	-3 dB	10-meter port at the time of this measurement was only a high pass filter, so offers little protection; this was later changed to a true bandpass filter with excellent protection
15 meters	-24 dB	Bandpass filter

20 meters	-40 dB	Bandpass filter
40 meters	-35 dB	Bandpass filter
80/160 meters	-26 dB	Modest low-pass filter

In general, the antenna multiplexer offers STRONG protection against the interfering 97.2 MHz signal.

Antenna Plans

Now with a trailer mounted tower and beam, and help from the Region 3 MARC unit, we planned the following antennas:

- 3-element triband beam on our tower
- 6 meter 3 element beam on 14 foot mast lashed to a vertical member of the trailer
- 2 meter antenna on top of MARC unit tower
- 160meter EFHW antenna (MyAntennas low loss 2K+ Balun) from side of Lodge through pulley atop the MARC unit tower
- Near Vertical 65 foot off center fed dipole at Cabin

Tower Trailer/ Antenna

ANTENNA COUPLING

Importance

Antenna coupling considerations are a make-or-break issue for high performance multiple transmitter base operations in Field Day or in disaster communications base stations.

Powerful transmitters and sensitive receivers connected to antennas that are relatively close are a prescription for (a) receiver damage or at least (b) inability to operate normal reception. Our ICOM 7300 includes some bandpass filtering between bands, and some internal protection systems, but these are not perfect. A detailed analysis of the ICOM 7300 filtering, and the required antenna separation required to avoid damage, and to allow operation, is presented at: https://qsl.net/nf4rc/2023/FieldDay2023/HFAntennaInteractions.pdf

We judged that AT LEAST 30dB isolation was required to reduce the chance of DAMAGE and that 40 db or 50dB was considered the requirement for likely good performance, and 70dB would allow for excellent performance.

MEASUREMENT

In order to plan our Field Day, at our DRESS REHEARSAL, measurements were made between a simulated Cabin vertical antenna and the Beam antenna approximately end on (limited by failure of the rotator during the Dress Rehearsal)

Measurement indicated:

FCC REQUIRED RF EXPOSURE CALCULATIONS

RF Exposure Calculations were carried out and recorded here: https://qsl.net/nf4rc/2023/FieldDay2023/ElectromagneticExposure.pdf and are also presented in an Appendix

Emergency Power

For our 4A entry, we had to operate all transmitters from non-utility power. Our refurbished 5kW Diesel Pramac generator provided power for the main lodge transmitters. We were able to replace the carburetor of an older Coleman 900W gasoline generator to provide power for the Cabin.

Both of these generators are unique in that they use mechanical governors to set the speed (frequency) and voltage of their output power, and thus don't generate any radio frequency interference to our sensitive receivers.

5kW Diesel generator

Solar Power

Using a 20-A rated MPPT charge controller, we created a board that had the MC4 connectors for the solar panel, and also provided a 20A output current meter (1 mA meter measuring the voltage across 18" of #16 wire). This was paired with a 250W solar panel (36Voc) to charge two LIFEPO4 batteries quickly at 14A rate and we then were able to work the required 5+ stations to obtain bonus points.

The Incident Action Plan (IAP) included:

- Full explanation of the event and the location and equipment for each station.
- Satellite pictures to show placement.
- Time-scripted tasks to accomplish not only planning, but also a zoom dress rehearsal, media notification, the full-scale event, documentation and submission.
- Extensive use of links to more-detailed documents addressing specific issues of operations or setup.
- List of assets required for positioning

  The Full Incident Action Plan is available at:

  https://www.nf4rc.club/historical-exercises/2024-field-day-incident-action-plan-final/

Actions, Strategies, and Tactics [8]

Timeline Summary - Significant Events

Participants often were overwhelmed by the volume of development discussions that went on during the planning phase of the event. Some of this was related to the fact that dramatic new improvements and ideas were being developed and required significant discussion to bring to success. **Participants sometimes don't understand all of the development work that is going on, and for which significant discusses of possible solutions and discovered problems are required.** *However, making these details available allows the interested participant to become more involved in the development of the exercise.* This timeline shows that the development of the Exercise proceeded over 7 months.

No.	Date	Item
1	Feb 21	Initial discussion, prompted by EOC personnel, of using Cuscowilla as our Field Day site
2	March 1, 2024	Reconnaissance trip to Cuscowilla and electromagnetic field measurements using full size dipole at HF and spectrum analyzer as well as 7300 and G90 transceiver. Conclusion is that there are strong fields but manageable
3	March 25, 2024	Beginning of bite-sized tasks. 2nd Reconnaissance trip to study which cabin can be used and trees for antennas.
4	April 4, 2024 Tech Nite	Review of computer software
5	April 6, 2024	Completion of the triband Yagi refurbishment Request for volunteers
6	April 11, 2024	1st Request to discern interest in attending Field Day
7	April 13th	2nd Request to discern interest in attending Field Day
8	May 2, 2024 Tech Nite	WSJT-X review, and voice operations
9	May 9, 2024	Initiation of Scramble Planning since Bite-Sized Tasks had not gotten a successful result.
10	May 11	Adding 160m operation and bandpass filter to Antenna

8 These are taken from the 2020 IAP. Unfortunately, these objectives were not carefully reviewed in the planning for this year's event, but are generally still applicable.

	LabNLunch	Multiplexer. That filter required several iterations to make it able to handle the required power.
11	June 5, 2024 Tech Nite	Tech Nite on how to copy ARRL Bulletin
12	June 15, 2024	Dress Rehearsal 0700-1400
13	June 21	Antenna setup 5:30 PM - 8PM
14	June 22	Field Day* -- Briefing at 0700

Dr. Manish Sahni, KQ4KTE

EQUIPMENT Year Over Year

YEAR SUBJECT	2024	2023	2022	2021	2020
Radios	Five ICOM 7300s	Five ICOM 7300's	ICOM 7300 + test of Huckstep 7300 Go Box ICOM 7300 Elecraft K3	ICOM 7300 ICOM 7300	ICOM 7300 ICOM 746 Pro
Amplifiers	N/A this year	N/A this year	N/A this year	SB-200 x 2 derated to 150 W	SB-200 x 2 derated to 150 W
Antennas	Triband 3 element TA33Jr refurbished beam. 6meter 3element beam EFHW 160m antenna OCFD 65 foot 40m	#1 - 135 foot OCFD from MARC unit #2 -- 58' random center fed window line, slid 65' east #3 - 65' EFHW slid 120' west #4 135' EFHW north of building #5 65' vertical in oak tree approx 150 yds south of main building	160 M OCF, Backup 80M end fed (never used)	160M OCF with long end raised substantially to 50+ feet Backup 80M End-Fed Half Wave with wire raised to approx. 40 feet	160M OCF with long end dropping approx. 12-25 feet No backup
Computers	Approximately 10 Windows computers plus Raspberry Pi NTP server	Approximately 10 Windows 10 computers + Raspberry Pi 2 NTP server	Donated HP EliteBook running both logging and WSJT-X Wireless	Donated HP EliteBook running both logging and WSJT-X, 2 screens, donated monitor	EOC laptop & loaner laptop Wireless mice

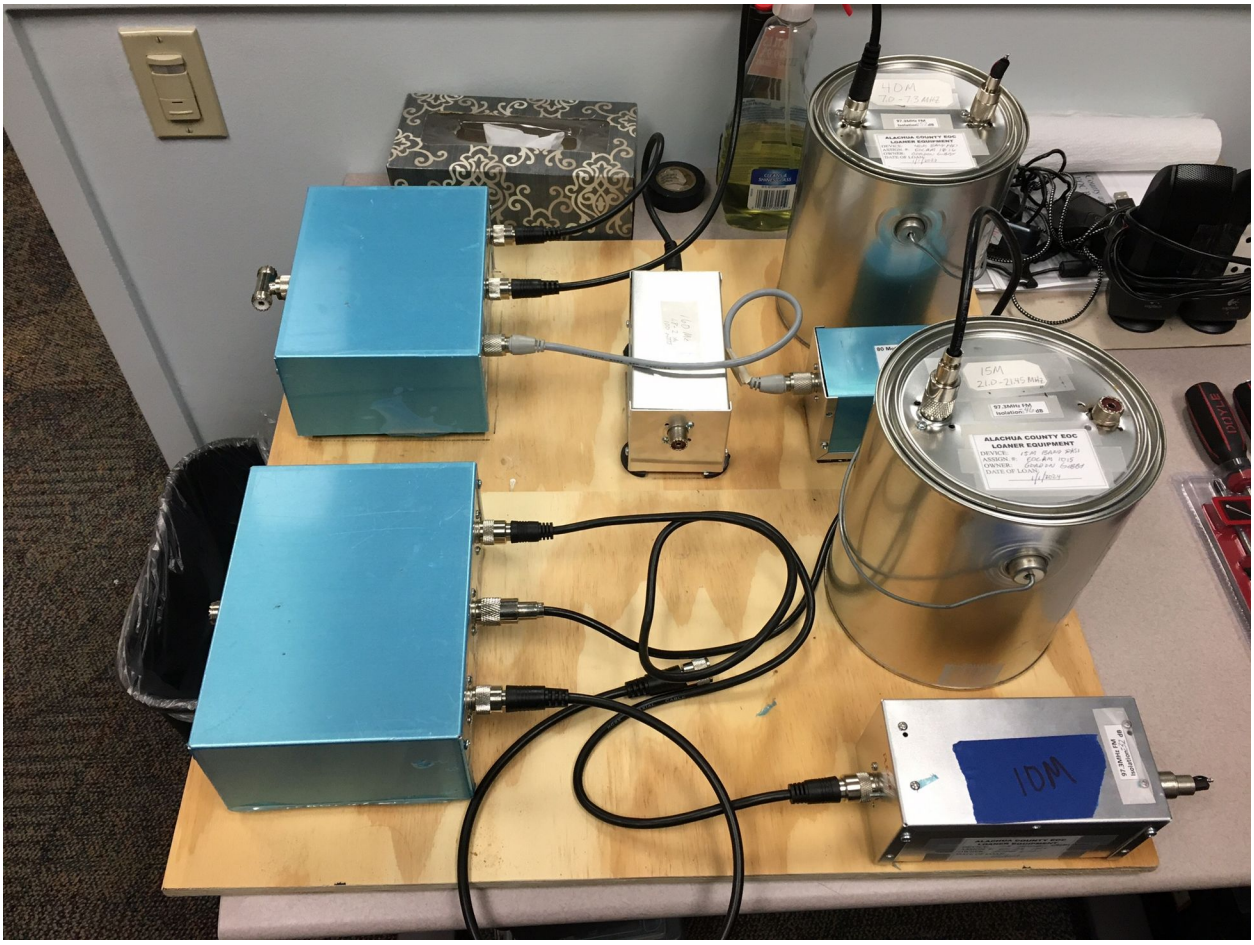
YEAR SUBJECT	2024	2023	2022	2021	2020
			mouse	Wireless mouse	
Power systems	5kW diesel mechanically governed 900 watt refurbished Coleman mechanically governed generator.	MARC Unit for available backup power; Newly refurbished 5kW PRAMAC Diesel Generator for Trailer	Using EOC wall power for station 1. MARC Unit 10 kW Generator Gordon's conventional 3.4 kW gas generator	Using EOC wall power for Station 1 Earl Sloan's 240V 5KW 2-leg generator, assisted by Gibby 3400-watt conventional 120V generator. No inverter generator No RFI filter; generators approx. 100 feet away.	Using 2kW sine-wave inverter driven by 3 parallel 12V 100Ahr batteries and 75A Power Pole connectors Switching between Champion inverter 4 kw and conventional 120V generator on utility trailer using RFI filter. Generators approx. 25 feet away
Trailer(s)	Tower Trailer No inhabited trailers	Gibby 24-foot for GOTA/Station 4	Gibby 24-foot Dave Fox popup camper with AC Amy Woods 26-foot Bret Wallace Winnebago (6m) Brett Wallace Sprinter for GOTA station	Brett Wallace Winnebago	None
Free VHF Transceiver	ICOM 7300	ICOM 7300	FT991 running 6-meter FT8 to	ICOM 7300 running 6 meters FT8,	Not really pursued

YEAR SUBJECT	2024	2023	2022	2021	2020
			6 meter ground plane top of MARC unit tower	with homebrew vertical on basketball support	
Winlink Emails	From Huckstep G Kit via 2 meter antenna @ 50 feet	From Huckstep Go Kit via 2 meter antenna @ 50 feet	From EOC 2meter digital station using antennas at 60 feet to local Gainesville RMS	From EOC 2meter digital station using antennas at 60 feet to local Gainesville RMS	Using mesh link to cell-phone hot-spot provided mesh RMS Gateway (very complicated)
Incident Command Post	Main room, occasionally utilized	Main room, occasionally utilized	New for this year, 10x10 canopy with tables, chairs, computers and fans (VHF radio)		
Meal Support	EXCELLENT meal support by Rosemary including Hotdogs, Eggs, Spaghetti **AND SHE BROUGHT COMFORT-ABLE CHAIRS**	Saturday - Sandwiches & more / Rosemary Sunday - Full Buffet / Rosemary. Huge success!	Saturday - Sonny's FULL LUNCHEON by Emily on Sunday	FULL LUNCHEON by Emily both days	Not really planned

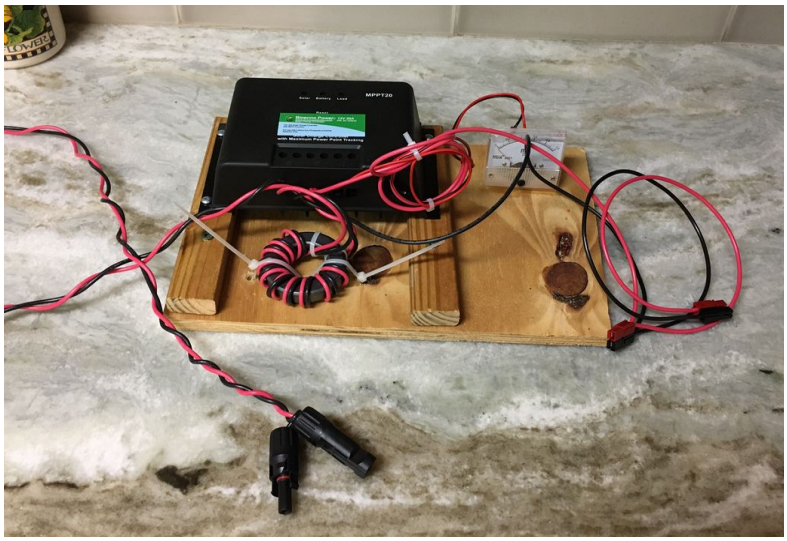
GPS-based NTP Server

EQUIPMENT & INFRASTRUCTURE IMPROVEMENTS MADE AS A RESULT OF 2024 FIELD DAY		
1	Refurbished G-800 Rotator, refurbished thrust bearing	Required complete disassembly, cleaning and greasing.
2	Refurbished TA33-Jr 3 element triband beam.	Required disassembly of all traps and cleaning.
3	Addition of separate bands for both 160 meters and 10 meters to Antenna Multiplexer	
4	Improvement and development of multiple new or improved band pass filters needed to work with Antenna multiplexer	160meter BPF 80meter BPF 20meter BPF 15meter BPF 10meter BPF
5	Refurbishment of camping generator	

6	Addition of fuel gauge to Diesel generator	
7	Mounting of MPPT charge controller	
8	Creation of relay-based external bypass systems to switch filters in or out	
9	Creation of matched pair of ultra-sharp 20 meter RX filters	
10	One new office chair	



Mounting of Antenna Multiplexers and Filters



Mounting of MPPT Charger with Current Meter

Technical Training Conducted @ Field Day

TIME / LOCATION	TOPIC	INSTRUCTOR
1130 MARC UNIT	Purpose, use & capabilities of the MARC Unit	District Fire Chief Kevin Rulapaugh KE4NVI NCS180

MARC Unit Chief Rulapaugh delivers explanatory talk of the unit's Mission and Capabilities

Antennas at dusk

SECTION 3: ANALYSIS OF OBJECTIVES / RESULTS

Aligning exercise objectives and core capabilities provides a consistent taxonomy for evaluation that transcends individual exercises to support preparedness reporting and trend analysis. Table 1 includes the exercise objectives, aligned core capabilities, and performance ratings for each core capability as observed during the exercise and determined by the evaluation team.

Objective	Core Capability	Performed without Challenges (P)	Performed with Some Challenges (S)	Performed with Major Challenges (M)	Unable to be Performed (U)
1. Everyone stay SAFE	Community Resilience	**P**			
2. Everyone have a GOOD TIME	Operational Coordination; Operational Communications		**S**		
3. Improve our RADIO ASSETS	Operational Coordination; Operational Communications	**P**			
4. Improve our CW, Phone and Digital performances	Operational Coordination; Operational Communications	**P**			
5. Gain more skill and resilience in our backup electrical power, backup antennas	Operational Coordination; Operational Communications	**P**			
6. Improve cohesiveness as a group	Operational Coordination; Operational Communications	**P**			

Ratings Definitions:

- Performed without Challenges (P): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s) and did not negatively impact the performance of other activities. Performance of this activity did not contribute to additional health and/or safety risks for the public or for emergency workers, and it was conducted in accordance with applicable plans, policies, procedures, regulations, and laws.
- Performed with Some Challenges (S): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s) and did not negatively impact the performance of other activities. Performance of this activity did not contribute to additional health and/or safety risks for the public or for emergency workers, and it was conducted in accordance with applicable plans, policies, procedures,

Objective	Core Capability	Performed without Challenges (P)	Performed with Some Challenges (S)	Performed with Major Challenges (M)	Unable to be Performed (U)

regulations, and laws. However, opportunities to enhance effectiveness and/or efficiency were identified.

- Performed with Major Challenges (M): The targets and critical tasks associated with the core capability were completed in a manner that achieved the objective(s), but some or all of the following were observed: demonstrated performance had a negative impact on the performance of other activities; contributed to additional health and/or safety risks for the public or for emergency workers; and/or was not conducted in accordance with applicable plans, policies, procedures, regulations, and laws.
- Unable to be Performed (U): The targets and critical tasks associated with the core capability were not performed in a manner that achieved the objective(s).

Table 1. Summary of Core Capability Performance

OBJECTIVE 1: EVERYONE STAY SAFE
CORE CAPABILITIES: COMMUNITY RESILIENCE

Strengths

Strength 1: *Significant planning efforts led to a fairly efficient setup, attempting to minimize the work or re-work required, with work broken into shorter segments, outdoor work in the late afternoon/evening, and early morning. The tower mounted beam cut out approximately 6 hours of antenna work.*

Strength 2: *Careful attention to keeping wires and cables away from the public and trip hazards minimized*

Strength 3: *Excellent provision of water and ice, and the availability of air conditioning provided chances for over-worked volunteers to cool off.*

Areas for Improvement

Area for Improvement: *Difficulty placing ground spirals into the baked Florida dirt with gravel mixed in. This was unexpected and a different technique will be needed.*

OBJECTIVE 2: EVERYONE HAVE A GOOD TIME!

CORE CAPABILITIES: OPERATIONAL COORDINATION, OPERATIONAL COMMUNICATIONS

Strengths

Strength 1: *Our teams worked hard but reported* ***comraderie and teamwork as high points of the effort*** *and generally were having a lot of fun.*

Strength 2: *Team digital performance was extraordinarily good, with many people making great strides.*

Areas for Improvement

Area for Improvement 1: *Volunteers still reported feeling overwhelmed by the quantity and intensiveness of our deployment exercises and requested lighter volunteer loads.*

One of the issues involved in overloading some of our volunteers is a disparity in engagement with the logistics process of bringing and connecting equipment required for such a 4A radio system. Some of this is unintentional -- some volunteers are newer and simply don't HAVE the same level of radio equipment and parts to be able to equally share in the burden of carrying equipment. However, with an elderly group, every trip to carry parts or equipment from the vehicle to the use point costs significant energy. Volunteers can be helped by proper management so that these loads are equally shared.

Groups can of course decide how many stations, how many antennas, what kind of meals they are going to plan, and thus adjust significantly the sum total of the "loads" that volunteers need to shoulder. The total can go up or down quite significantly from a 1D station (at home, already set up) to a 2F station (almost already setup) to a 4F setup with courier-delivered Pizza, to a 4A system with home cooking! The group as a whole has to make these choices. Once made, then the leadership (if anyone is willing to be leadership) must work to increase the equality of the logistics loads.

All volunteers can be encouraged to join in equally in the setup and teardown, even if their operating times are completely different. Volunteers can go back home if there is a significant interval and come back of course.

This is an attempt at a list of items that might be required for a 4A station with a Free VHF, and can be used to help understand how each of 15 volunteers might need to share the load of logistics. (A comparison to a possible 4F station at an existing EOC is provided in an Appendix and shows significantly less equipment has to be transported and emplaced.)

#	ITEM	#	ITEM	#	ITEM
	STATIONS	64	Tower Trailer	128	3 dozen eggs
1	Icom 7300 w/P.S.	65	Complement of wrenches	129	Spaghetti noodles
2	Icom 7300 w/P.S.	66	3x guy ropes (spooled)	130	Spaghetti sauce x 5
3	Icom 7300 w/P.S.	67	3x green ground cables (spooled)	131	3 loaves bread
4	Icom 7300 w/P.S.	68	3x green ground cables (spooled)	132	4 packages sliced cheese
5	Icom 7300 w/P.S.	69	6x ground rods	133	6 packages sliced meat
		70	Zip ties		
	COAXIAL CABLE (>20ft on spools if 8X)		BABY MARC UNIT	134	Dessert #1
6	100 ft thick cable	71	Electric Drill	135	Dessert #2
7	100 ft thick cable	72	7/8" socket/extension	136	Dessert #3
8	50 ft thick cable	73	8 foot folding ladder	137	Chips #1
9	50 ft thick cable	74	American Flag	138	Chips #2
10	100 foot RG8X	75	3 Element HF beam	139	Chips #3
11	100 foot RG8X	76	VHF beam	140	Chips #4
12	100 foot RG8X	77	EFHW antenna w/ Balun	141	Cookies #1
13	100 foot RG8X	78	OCF Dipole w/Balun	142	Cookies #2
14	25 feet RG8X				
15	25 feet RG8X	79	200 feet paracord		DOCUMENTATION
16	25 feet RG8X	80	200 feet paracord	143	Extra Paper
17	25 feet RG8X	81	200 feet paracord	144	Pens
18	25 feet RG8X	82	Sling shot tool chest	145	Laptop #1

19	3 foot jumper	83	Air powered launcher	146	Laptop #2
20	3 foot jumper	84	Electric air pump	147	Laptop #3
21	3 foot jumper		POWER SYSTEMS	148	Laptop #4
22	3 foot jumper	85	Generator Trailer	149	Laptop #5
23	Multiplex Board Low	86	Separate Generator	150	Laptop#6
24	Multiplex Board Hi	87	5 gal Diesel	151	Laptop##7
25	Power meter	88	5 gal Diesel	152	Logging Laptop
26	Power meter	89	5 gal Gasoline		
27	Antenna analyzer	90	Fire Extinguisher	153	Monitor #1
28	Antenna analyzer			154	Monitor #2
		91	First Aid station	155	Monitor #3
29	Barrel Connector			156	Monitor #4
30	Barrel Connector	92	100 ft power cable (spooled)	157	Monitor #5
31	Barrel Connector	93	100 ft power cable (spooled)	158	Monitor #6
32	Barrel Connector	94	25 ft power cable	159	AC choke #1
33	Barrel Connector	95	25 ft power cable	160	AC choke #2
34	Barrel Connector	96	25 ft power cable	161	AC choke #3
		97	25 ft power cable	162	AC choke #4
35	Wheel Chock set #1	98	Power Strip #1	163	AC choke #5
36	Wheel Chock set #2	99	Power Strip #2	164	Stn 1 paper packet
		100	Power Strip #3	165	Stn 2 paper packet
37	Extra oil for generator	101	Power Strip #4	166	Stn 3 paper packet
		102	Power Strip #5	167	Stn 4 paper packet
38	Loaner Headset #1	103	Power Strip #6	168	Stn 5 paper packet
39	Loaner Headset #2		FOOD PROVISIONS		NETWORK
40	Loaner Headset #3	104	Mayonnaise	169	Wifi/Mesh Stn #1
		105	Mustard	170	Wifi/Mesh Stn #2
41	Mouse #1	106	Catsup	171	NTP Server

42	Mouse #2	107	Pickles		
43	Mouse #3			172	UPS #1
44	Mouse #4	108	4 packages hot dogs	173	UPS #2
45	Mouse #5	109	4 packages buns		CW STATION
46	Mouse #6			174	CW paddle
		110	2 hotplate burners	175	CW Winkeyer
47	Tool kit #1	111	2 #10 cans chili		
48	Tool kit #2	112	2 #10 cans beans		MISCELLANEOUS
49	Soldering Iron	113	Crock pot	176	Duct Tape
		114	Crock pot	177	Painters' Tape
50	LiFePO4 battery #1	115	60 cups	178	Scissors
51	LiFePO4 battery #2	116	60 plates	179	Stapler
52	LiFePO4 battery #3	117	60 sets of forks	180	Printer
53	LiFePO4 battery #4	118	60 sets of knives	181	Card Table (if needed)
54	MPPT Controller	119	30 sets of spoons		
55	Solar Panel(s)	120	3 packages of napkins		
56	Brochure Pack #1-#4	121	20 water bottles		
57	Brochure Pack #4-#8	122	20 water bottles		
58	Brochure Pack #9-#12	123	20 water bottles		
59	ARES Banner #1	124	5 2-liters soft drinks		
60	ARES Banner #2				
61	Caution Tape #1	125	2 gallons tea		
62	Caution Tape #2	126	Coffee pot		
63	Caution Tape #3	127	Coffee		

The above list may be incomplete or in need of amendment, but what it demonstrates is that each member of a 12-15 person team needs to be on average, bringing 15 or more items to the "party"! It clearly isn't conducive to fun for 3 or 4 members to be bringing 25-30 items each, and others bringing 0-3 items, or very lightweight items that would fit in a modest box. Volunteers can volunteer to go pick up items from overloaded volunteers! And everyone can pitch in to get everything installed together.

An example of meeting and exceeding her share is Rosemary -- who not only brought ALL the food and drink, but also her RADIO (I had been afraid she would be offended if I told her we had a replacement) and ALSO CHAIRS!! She is amazing.

Finding ways for everyone to share all the workload is important for the longer term growth of the team. And as much as possible all members should be present for the time of WORK -- setup and teardown.

A lack of leadership in this area leads to double-work where the same item(s) are brought and transported by more than one person, needlessly. Thus the need for LOGISTICS Chief -- but our group could not muster one this year.

Analysis: *The primary mission of the Alachua County ARES (R) Volunteers, when serving as volunteers to the Emergency Management Department of Alachua County, is to serve as directed to augment communications that need backup or assistance. This supports continuity of governance and continuity of operations. This exercise demonstrated that the volunteers can come together and work through a 24-hour operational period without the need for infrastructure support, verifying that communication lifelines can be maintained after a major incident or disaster.*

OBJECTIVE 3: IMPROVE OUR RADIO ASSETS
CORE CAPABILITIES: OPERATIONAL COMMUNICATIONS

Strengths

Strength 1: *This exercise demonstrated that the Alachua County ARES(R) Volunteers can respond to an incident and maintain communications that is not reliant on the internet, cellular service, or any infrastructure.*

Strength 2: *This exercise demonstrated that the Alachua County ARES(R) Volunteers can power communications with gasoline, diesel, and solar generators.*

Strength 3: *This exercise demonstrated the interoperability of the Alachua County ARES(R) Volunteers with the Alachua County Fire MARC unit, with much better coordination and planning as well as execution.*

Strength 4: *Our new trailer/tower/Yagi worked perfectly and saved many hours of effort and allowed better isolation from the 4th station antenna, while providing support for a 6 meter antenna.*

Strength 5: *Our further-improved antenna multiplexer and bandpass filters systems worked extremely well and reduced our antenna effort while allowing more simultaneous transmitters on the air, whether in an exercise like this, or monitoring multiple nets in a disaster.*

Strength 5: *Our new Microwave and NTP go-boxes make deployment of these assets much easier!*

Areas for Improvement

Area for Improvement: *The 80-meter band pass filter needs to have somewhat more rejection of 160meter energy; we had "OVF" indications on the 80 meter receiver during 160meter operations.*

Area for Improvement: *The 10 meter filter needs to be returned to operate fully enclosed.*

OBJECTIVE 4: IMPROVE OUR CW, PHONE AND DIGITAL PERFORMANCES

CORE CAPABILITIES: COMMUNITY RESILIENCE

Strengths

Strength 1: *Both our Digital and CW performances were dramatically improved. At times we hit combined rates exceeding 150 contacts/hour, and we often were running at rates of 100 contacts per hours. Our CW operation was greatly improved with a new record of contacts.*

Strength 2: *Effective mentoring of a newer CW operator was carried out for almost an hour.*

Areas for Improvement

Area for Improvement: *Improve touch typing skills of newer CW operators*

OBJECTIVE 5: GAIN MORE SKILL AND RESILIENCE IN OUR BACKUP ELECTRICAL POWER, BACKUP ANTENNAS

CORE CAPABILITIES: COMMUNITY RESILIENCE

Strengths

Strength 1: *Our electrical power systems were flawless, and our solar power system worked extremely well. A new driver gained experience at towing the generator trailer.*

Strength 2: *Almost everyone in the group gained very significant experience in deploying and demobilizing the tower trailer and Yagi system.*

Strength 3: *The air-powered system quite easily installed a line for the vertical antenna over an Oak tree.*

Strength 4: *The refurbished 900 watt camping generator worked extremely well and is very quiet and could be used in a close-in residential deployment*

Strength 5: *Members of our team gained significant expertise at the EFHW 160meter antenna development and deployment.*

Strength 6: *An added "sidearm" on our tower would all establishment of an inverted V HF antenna even without trees available.*

Areas for Improvement

Area for Improvement: *The diesel generator is audibly LOUD and not suitable for close-in residential usage.*

OBJECTIVE 6: IMPROVE COHESIVENESS AS A GROUP
CORE CAPABILITIES: COMMUNITY RESILIENCE

Strengths

Strength 1: *There was a notable improvement in cohesiveness of those who participated, with excellent results; very few sharp words!*

Strength 2: *More effective mentoring went on.*

Strength 3: *Specific experts easily crossed traditional lines and helped out in areas needing assistance.*

Strength 4: *I noted more willingness for volunteers to get needed rest.*

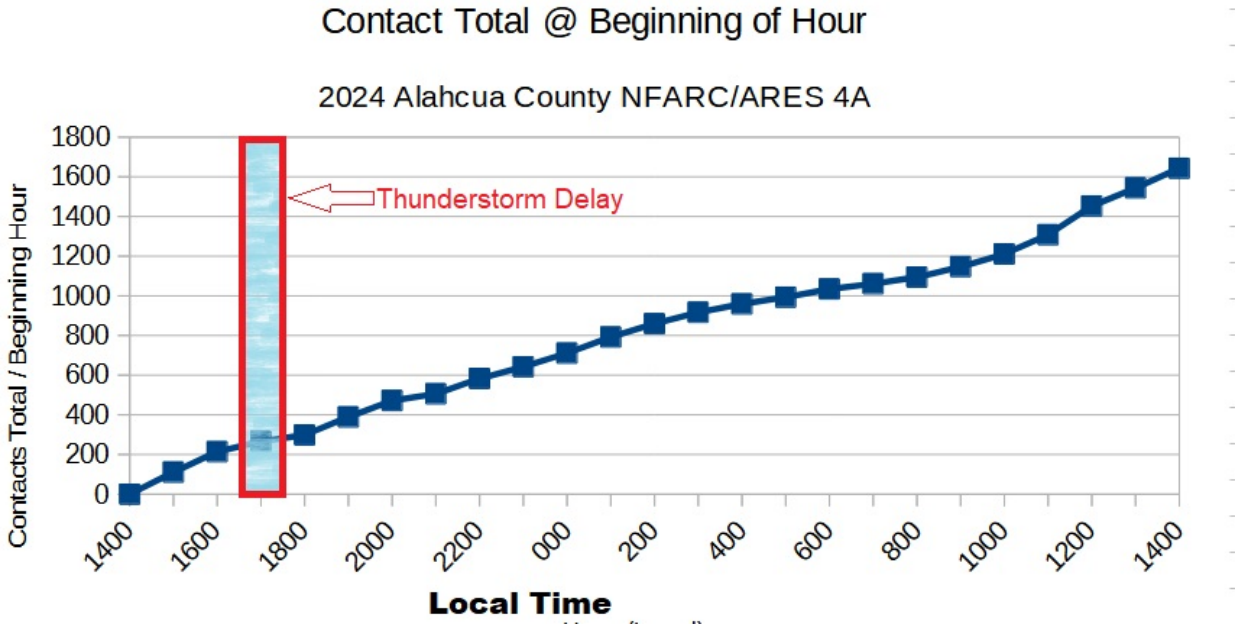
Areas for Improvement

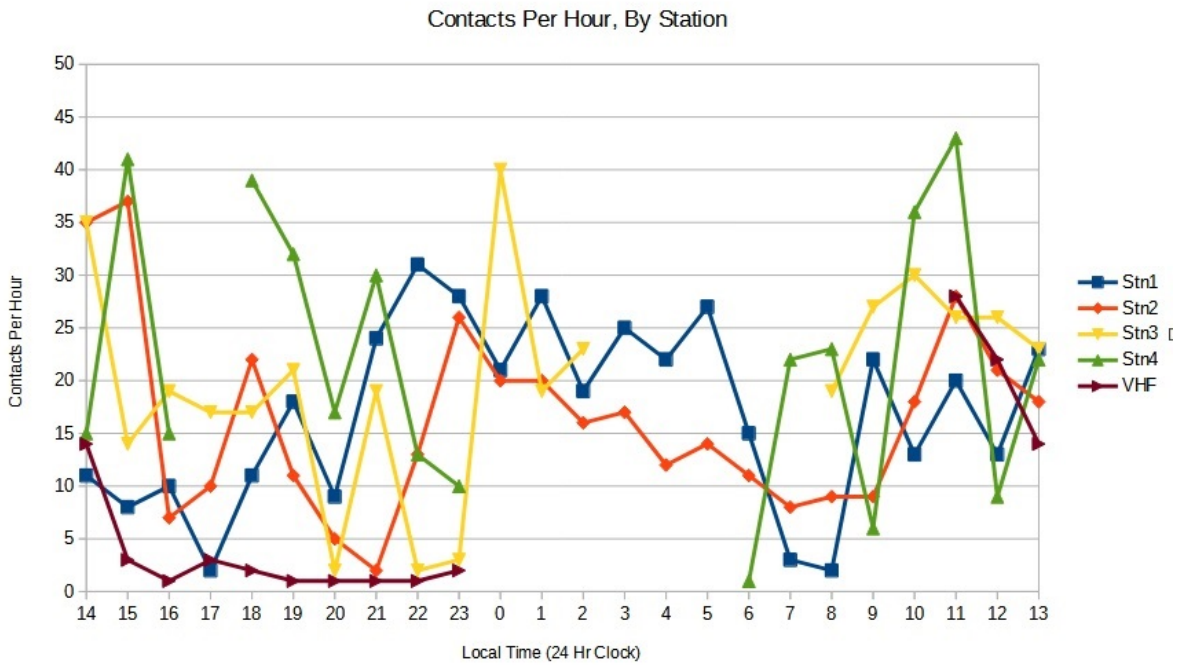
Area for Improvement: *The load on the nutritional team was probably excessive and should have included more support from more volunteers.*

TECHNICAL CHALLENGES ENCOUNTERED AT EVENT

No.	Item	Resolution
1	20-meter bandpass filter SWR unstable with mechanical movement (Detected during morning SWR checks)	Pavel board does not include ground plane; providing ground wires to SO-239 sockets and a jumper from one end of the board to the other solved the issue.
2	10-meter bandpass filter SWR unstable with mechanical movement. (Detected during morning SWR checks)	Pavel board does not include ground plane; providing ground wires to SO-239 sockets and a jumper from one end of the board to the other stabilized the issue, but two air-core coils then had to be re-tuned by hand, using an SWR bridge.
3	Accidental fuse blows on LIFEPO4 batteries when connecting directly to rotator motor while CONTROLLER connected (relays in controller shorting out battery)	Moved direct connections to different area. Need to be capped with tape to make less likely to use them.
4	Intermittent extreme SWR failure on Station #4, erroneously attributed to coaxial cable connections.	Actual problem was a relay bad contact connection in LDG AT-600. **This was not figured out for 20 hours of problems.** I should have asked for another pair of eyes much earlier and might have figured it out earlier. The antenna actually had reasonable SWR by itself; using the Icom 7300 internal tuner sufficed and the problem vanished.
5	Frequent (at times) buffering and reloading of the entire database.	Appears to be related to slow I/O speeds of the database computer or connection. Going to wired Ethernet seemed to solve it at one point. A similar problem was seen several years back and thought to result from RF overloading by nearby antennas. A similar problem was observed with very similar symptoms, at Columbia County group.

NF4AC's Contest Summary Report for ARRL-FIELD-DAY





Contacts per hour by station -- data analysis by Jeff Capehart, converted to local time to run from beginning to end of Field Day.

COMPARISON YEAR OVER YEAR

Item	2024	2023	2022	2021	2020
Class	**4A**	4F	2F	2F	2F
Total Contacts	**1643**	1269	702	513	249
Total Points	**7,890**	6,342	4,172	3,290	2,322
Operators / Contacts[9]	Operator Contacts KX4Z 352 WB2FKO 332 KQ4KTE 234 W4JIR 188 KI4OXD 175 KF4OJV 107 KI4QBZ 68 W4UFL 51 AA3YB 48 KG4VWI 48 KO4ZSD 37 W9ALI 3	Operator Contacts **W4JIR** **376** **KN4TWS** **169** **KE4NVI** **146** K0OO 113 KC2ASY 94 AA3YB 92 KX4Z 82 KF4OJV 69 KK4INZ 43 W4UFL 26 KO4LBS 24 WB2FKO 13 KN4ZUJ 12 KG4VWI 9 GOTA STA- TION Alex	Operator Contacts **NN4DF** **209** **KF4OJV** **70** **KN4TWS** **70** W4JIR 56 WB2FKO 47 KX4Z 46 KG4VWI 34 WA4AMY 33 KK4INZ 25 "W4XYZ" 24 KI4QBZ 13 N4IU 11 KE4NVI 9 NH2KW 8 KG5FHU 4 KO4JWC 4	Operator Contacts **KN4TWS 57** **KX4Z 95** **AA3YB 30** W4JIR 55 KO4IDO 86 KK4INZ 61 K9RFT 30 NH2KW 20 WB2FKO 20 KI4OXD 20 KV4RL 12 K1CE 8 KG5FHU 8 W1GLV 7 KN4POZ 4 Total = 15	Operator Contacts **KN4TWS 62** **KX4Z 60** **AA3YB 59** W4UFL 18 K4DF 16 KN4WIQ 13 W4JIR 11 K4ZSW 8 KM4EVZ 1 Total = 9

9 These numbers are only approximate because many operators don't insert their name/initials at the start of their operation, and many contacts are also mentored, etc. So just an approximation

	12operators	2 14 opera- tors + 1 GOTA (visi- tor)	KO4LBS 2 GOTA STATION Eric Pleace Duke Bailes W4XYZ		
CONTACTS (non GOTA)	**1,643**	1269	665	513	249
CW	**374**	153	231	22	0
PHONE	**116**	101	13	16	12
DIGITAL	**1153**	1,015	421	475	237

The group's estimated operating time was from 2 PM - 2PM with 45 minutes out for the initial thunderstorm

TOP THREE ACES THIS YEAR	
Gordon Gibby KX4Z	352
Mike HasselbeckWB2FKO	332
Manish Sahni KQ4KTE	234

TECHNICAL DATA MEASURED @ FIELD DAY

SWR MEASUREMENTS CABIN ANTENNA

ANTENNA:	OCFD 65 feet @ CABIN		
Indicate SWR at all applicable frequencies.			
BAND	SWR @ Bottom Edge GENERAL CLASS	SWR @ Bottom of Phone Band GENERAL CLASS	SWR @ Top of Band
40 meters	7.025MHz: 1.6	7.175MHz: 1.4	7.3MHz: 1.4
20 meters	14.025MHz: 1.0	14.225MHz: 1.2	14.350MHz: 1.3
15 meters	21.025MHz: 3.6	21.275MHz: 3.9	21.450MHz: 4.2

10 meters	28.0 MHz: 2.5	28.300MHz: 2.4	N/A
6 meters	50.0 MHz 3.0	N/A	54.0 MHz 3.8

SWR Measurements on YAGI made at Dress Rehearsal
(Measurements at Cuscowilla were difficult unless one worked through a filter because the 97.3MHz energy would cause the MFJ-259B to read high SWR with no visible 0 reactance point.)

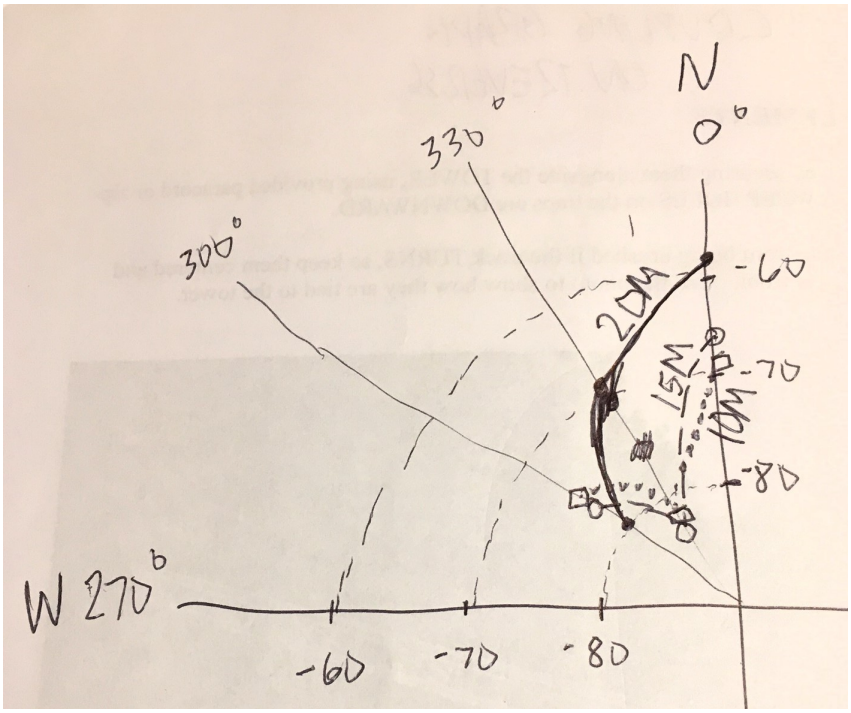
ANTENNA:	**YAGI; Dress Rehearsal; thru 200 feet RG8X Coax**		
Indicate SWR at all applicable frequencies.			
BAND	SWR @ Bottom Edge GENERAL CLASS	SWR @ Bottom of Phone Band GENERAL CLASS	SWR @ Top of Band
20 meters	14.025MHz: **1.5**	14.225MHz: **1.2**	14.350MHz: **1.6**
15 meters	21.025MHz: **1.5**	21.275MHz: **1.3**	21.450MHz: **1.2**
10 meters	28.0 MHz: **1.7**	28.300MHz: **1.4**	N/A

SWR Measurements on 160meter EFHW
(Conducted at Dress Rehearsal)

ANTENNA:	**160meter EFHW; Dress Rehearsal; through ~100 ft RG8X coax after adjustment of length**		
Indicate SWR at all applicable frequencies.			
BAND	SWR @ Bottom Edge GENERAL CLASS	SWR @ Bottom of Phone Band GENERAL CLASS	SWR @ Top of Band
160 meters	1.8MHz: **2.5**	N/A	2.0MHz **2.3**
80 meters	3.525MHz: **1.8**	3.8MHz **1.9**	4.0MHz: **2.8**
40 meters	7.025MHz: **2.3**	7.175MHz: **1.9**	7.3MHz: **1.4**
20 meters	14.025MHz: **2.1**	14.225MHz: **2.0**	14.350MHz: **1.9**
15 meters	21.025MHz: **1.5**	21.275MHz: **1.6**	21.450MHz: **1.6**

ISOLATION/COUPLING YAGI --> CABIN VERTICAL
TRANSMIT on YAGI; Spectrum Analyzer on Cabin Vertical

YAGI BEARING	FREQ	POWER (	CABIN SIGNAL dBm	Calculated Isolation
0º North	14-14.35 (20m)	5watt (36dBm)	-26 dBm	62 dB
	21-21.45(15m)	5watt (36dBm)	-38 dBm	74 dB
	28.0-29.7 (10m)	5watt (36dBm)	-31 dBm	67 dB
330º	14-14.35 (20m)	5watt (36dBm)	-36 dBm	72 dB
	21-21.45(15m)	5watt (36dBm)	-48 dBm	84 dB
	28.0-29.7 (10m)	5watt (36dBm)	-46 dBm	82 dB
300º	14-14.35 (20m)	5watt (36dBm)	-45 dBm	81 dB
	21-21.45(15m)	5watt (36dBm)	-41 dBm	77 dB
	28.0-29.7 (10m)	5watt (36dBm)	-40 dBm	76 dB



Polar Graph of Coupling, Yagi @ Heading to OCFD Cabin Antenna

ISOLATION/COUPLING EFHW --> CABIN VERTICAL
(Transmit on EFHW, spectrum analyzer (with 20 dB attenuator) on Cabin OCFD)

	FREQ	POWER	EFHW Signal dBm	Calculated Isolation
	7-7.3 (40m)	5watt (36dBm)	-17 dBm	53 dB

Comment: 53 dB isolation between the 160m EFHW and Cabin Vertical is not sufficient for same-band-operation by itself; however, if combined with 20dB ultra-sharp receiver filtering, this could succeed. For future Field Day's, this gives an idea of the path to success on 40 meters.

TIME AND FUEL ESTIMATES

ESTIMATED FUEL USAGE			
MARC Unit	0		
Diesel Generator	12 gal		
VOL HOURS ESTIMATED			
Multiple site prep	Only 1 site planned this year.	30 vol hours	Multiple visitations by reconnaissance teams
Preparation	Equip. Creation	100 vol hours	Filters, Multiplexers, Antenna
	Training Events	70 vol hrs	Tech Nites
	Go Box creations	30 vol hours	
Dress Rehearsal		40 vol hours	
Field Day: Fri Tower Raising	Friday effort	18 vol hours	
Field Day: Sat/Sun		180 vol hours	
Documentation/ Review	Field Day Submission	2 vol hours	
AARIP	Draft Creation	8 vol hours	
TOTAL		**478 vol hrs.**	

VISITORS TO SITE

- Approximately 12 visitors to site.

MODE SPECIFIC LEARNING POINTS

SPECIFIC TECHNIQUE LEARNING POINTS		
CW	A slightly less clipped and streamlined communications technique was known in advance by our team. We had one WINKEYER and very effectively used Function Keys and canned text. For the second year in a row, Gordon felt very comfortable "running CQ" on 20 meters and achieved strings of contacts often. Achieving > 300 contacts was a huge success; he can now hunt and pounce or run CQ at will and with high contact rates either way. The paradigm that Gordon followed looked like this: CQ FD NF4AC NF4AC FD *K4AAA* K4AAA 4F 4F NFL NFL BK *R 1A TN* QSL TU QRZ NF4AC FD See: CW portion of https://qsl.net/nf4rc/2023/NetworkingCheatSheet.pdf	The CW operator forgot to have the "cheat sheet" ready at the beginning of the Exercise, and discovered "4F" was still in canned texts by accident. The ability to copy 25 wpm+ callsign with RUfzxp made for a much nicer time. FAR less stress
PHONE	Dan D'Andrea was extremely dogged and very successful. Our other phone op was ill. See: Phone portion of https://qsl.net/nf4rc/2023/NetworkingCheatSheet.pdf	
Digital	We were even more effective at FT4 this	Their easiest and most

	year than last, on standard frequencies and jumped back and forth between FT4 and FT8. Trained operators tended to maintain rates that were in the 30's. Having a 4A operation allowed for rates up to 150 QSO/hr this year.	productive technique for MOST volunteers.

WINLINK MESSAGING

We get 100 points for sending a message to the Section Manager or SEC with specific information, and 10 points each for up to 10 other messages sent out (or received, or relayed) -- all have to be either in NTS or ICS format or equivalent.

We have often done these using the RRI Radiogram format, routing through a "human." This year we were TIRED and Leland and I just plopped them into the ICS-213 format which is VERY easy to do and outputs a very readable message even by email to a non-ham. Our crew wrote messages to friends and family during Lunch. So that is how we got al the messages.

SECTION 4: CONCLUSION

In 2024, our team carried out a remarkable achievement for our modest group of largely elderly and predominantly non-technical members. Accomplishing a 4A deployment ARRL Summer Field Day with a fifth "freebie" station, using three HF antennas, a 6-meter beam, and a 2 meter vertical, with 600 feet of separation between two stations and an extensive HF antenna multiplexer system, all powered by our own generators, **is quite an effort**. We showed extraordinary preparation with almost all stations performing flawlessly *right at the beginning* of the Exercise. The one laggard (CW) station was operational within the hour and contact rates above 100 QSO/hour have been achieved, maintained, and even eclipsed at times, in a show of competence that our group has never before achieved. We raised our contact total by 29% from last year.

The Cost

But this came at a cost. We didn't realize the true size of the effort to bring about a 4A deployment effort with such a small team. While the most obvious difference between a 4A and our previous F-class efforts is the need to provide electrical power, that alone isn't such an obstacle. It required a utility trailer of generators and one relatively lightweight camping generator, two grounds, two sets of extension cords to buildings, two sets of backup fuel, and one separate fire extinguisher (since the utility trailer includes one already).

While those items are significant, the analysis completed in this AARIP shows there is another, potentially larger difference between a 4A and 4F operation: *the extra ham radio stations and supporting equipment that have to be delivered and positioned within a small period of time*. Typically at a 4F operation, 2 of the 5 total stations may already be present, and at least 1 of the required HF antennas, plus potentially VHF antennas, may already be in place. Thus the required provision of radio gear is significantly increased by running a 4A operation, over a 4F.

The time crunch makes it even worse. For an EOC station, the required material can be slowly transported and likely pre-positioned; for a 4A operation at a location that is also used as a day-camp, everything has to be moved after the youngsters have left Friday afternoon -- so not even the full ARRL Rules' allowed transport window can be utilized!

Despite all these obstacles, our group did succeed -- but we may not wish to repeat that effort!

It required months of work to create significantly more sophisticated antennas. Last year we used about 7 distinct HF/VHF antennas. This year we spent many hours and

multiple meetings refurbishing a 3-element triband beam and creating a portable "Baby MARC Unit" that can set up a significant antenna asset in a matter of a couple of hours or less.

Starting well before even January, we began to develop an Antenna Multiplexer, starting with a 3-band kit from VA6AM. We then expanded that using our own designs and construction to a 4-band system, then 5-bands, and finally to a full 6-band antenna multiplexer with 70-dB isolation from every band to every other. We utilized intermediate states of this system in Winter Field Day at our existing Emergency Operations Center as a real-world test, and it performed well.

Reduced Heat Exposure

Building these two significant assets meant that our "outside in the heat" antenna work was remarkably reduced. While last year we had to spend an entire day in the heat installing every conceivable version of a wire antenna, this year we just assembled and rotated the Yagi in late afternoon/early evening, alongside a 3-element 6 meter beam attached to the same trailer structure. An entire day of work became only 2.5 hours in a more favorable portion of the day. Then we added a vertical OCFD over an oak tree in relative shady conditions the next morning, and our MARC unit crew pulled up an end-fed-half-wave 260 length of wire and our 2-meter antenna and all our antennas were in place!

FIVE Stations....

But we still had to set up FIVE complete ham radio stations in a new location and two computers for logging and overall command and control and microwave and wifi communications systems. These activities, plus an extensive on-site feeding program, required **upwards of 200 separate items** to be transported and emplaced. It is a huge task.

The SPACE of our chosen site provided us with a unique advantage -- we had 600 feet of separation between our YAGI antenna and our farthest station. This translated into over 80 dB of radio separation on several bands. This is impressive separation and it gave us considerable freedom to operate two stations on several bands without any need for special filters at all! We had a similar advantage several years back when we measured similar isolation between antennas behind the existing EOC and those in the overflow parking grassy field.

Separation At New EOC

The largest diagonal distance at the proposed new EOC site on 8th Avenue is only 400 feet. This will allow significant separation (more even than at our 2024 Dress Rehearsal), but not quite what we have achieved in larger settings. Applying the inverse squared law, we may be able to achieve separations within single-digits of the 70-80 dB separation we achieved at Cuscowilla and the possibility appears to be

adequate, but some experimentation and validation will be necessary. There is a large parking lot 900 feet away at the 225th Battalion offices which might offer a landing spot for a remote trailer if we need it-- *but that entails a lot more effort.*

Biggest Advantage

The biggest advantage of a 4F operation at an existing EOC is the ability to utilize already emplaced assets, and to spread out the timeline of logistics of additional assets. This should make an equivalent 4-level operation much, much easier in the future.

Summary: This Year's Achievements

The achievements of this year's operation are very impressive, despite the effort.

1. Nearly all stations operating at full efficiency from the start
2. Very successful microwave and WIFI/wired computer connections and database
3. Very successful antenna multiplexing
4. Very successful 6-meter Es contact capture
5. Impressive digital performance by large numbers of our team
6. Wonderful meal support with "home cooked" meals at every turn!
7. Plenty of team conversation in the same room and without too much impact on our operation
8. Lots of individual operational triumphs in both digital and CW realms
9. Continued high level of voice efforts
10. Quick discovery of bandpass filter issues and mitigation
11. Flawless electrical power generation throughout
12. Successful solar power charging.

And best of all, our participants reported excellent cooperation and comraderie. Equipment is nice, but PEOPLE in our team are where it is at!

We look forward to building even further on these radio skills that we are developing.

How 2024 Field Day Exercise Improved ARES Volunteer Response Capabilities	
No.	Item
1	Far better Antenna Capabilities in the tower trailer
2	Far better antenna multiplexer capabilities allowing multiple nets to be monitored simultaneously
3	Better inter personal relationships among the volunteers, learning how to work together in stressful situations.

4	Far better technical grasp of operating multiple powerful radio systems in proximity of a base camp.
5	Better understanding of operations in the presence of a high power FM transmitter.
6	Much better understanding of how to create isolation between antennas.
7	More volunteers familiar with towing procedures.
8	Better operational skills for many participants

APPENDIX A
IMPROVEMENT PLAN

2024 IMPROVEMENT PLAN

No.	Item	Comment / Assignment / Completion
1	Need a Logistics Chief to coordinate and divide transport	
2	Better division of equipment transport, setup and labor effort as discussed above.	This will increase the "fun" for all by avoiding significant overload of some members (the "80/20 Rule")
3	Be more careful not to disrupt "sets" of radio + computer + mouse + external display that have been set up to work together.	We have ended up with confusion about what works with what, and a lot of wireless mice with no matching USB dongle. AVOID blindly disconnecting everything and mixing things up. Keep working setups TOGETHER.
4	When one person has volunteered to take care of stations XYZ, be very careful NOT to accidentally encroach on equipment sets they are watching over and transporting.	Probably need a better way to mark who is taking responsibility for what. Something for Logistics to work on!
5	If possible plan an "F" class field day more aligned with an available EOC location, preferably the one we are moving into if at all possible.	This will better align our efforts with our group mission and reduce unnecessary efforts
6	Find an alternative grounding technique for really hard-packed soil.	
7.	Double-check the CW canned text, PRIOR to the event	Gordon had overlooked a "4F" on his own computer!
8	Consider replacing the rotator center screw with a "pin" with dual keepers to increase speed of application.	
9	Diagnose and fix the problem with Gordon's Antenna Tuner relays	

10	Improve the 160meter rejection of the 80-meter bandpass filter system, possibly by adding one additional series trap	
11	Increase the number of participants	
12	Obtain buy-in for leadership earlier in the cycle	
13	Obtain Amateur Radio Week proclamation > 60 days in advance	We missed this because their deadline is like 45 days out and no one was following
14	Have a formal PIO officer	
15	Continue issuing only a minimum number of Incident Action Plans	This year only 3 were issued, at approximately 30-day intervals as the plan matured.
16	Continue providing more "hands-on" training on new equipment	This works better than "bite sized" or other paperwork reduction
17	Provide a LIGHT for the top of the tower to illuminate the flag	Simple DC LED system without any switching components
18	Provide more 150-foot, 50-foot and 25-foot lengths of coaxial cable	
19	*Mask off the direct power poles to the rotator to reduce blowing fuses when the controller is connected*	
20	Obtain better connector for the rotator controller	I had trouble identifying the connector properly. A bit more work and this should be done.
21	Investigate whether the entire rotator controller can be DC powered, by finding out what its internal DC power supply is.	Turns out there are two different internal DC voltages developed. Maybe be easier to just use the modified sine wave inverter that we found worked this year.
22	Investigate whether the rotator controller can be WIFI controlled. There appear to be several wifi controller systems on the market.	
23	Investigate whether a rotator can be obtained for the 6 meter antenna. This shouldn't be very expensive.	

24	Come up with an improved diesel generator shutdown system so it isn't locked out during a cool down.	The way to do this, is probably to put in a different fuel switch, getting it AWAY from the hot engine and test that first. See: https://www.amazon.com/SNS-2W025-08-DC12V-NPT-Electric/dp/B0794XJGBF
25	Investigate an easily assembled shroud for noise reduction of the diesel generator	While making something sturdy enough for interstate travel may be difficult, it may be possible "assemble" a shroud around the system with soundproofing fireproof fiberglass insulation. (Commercial versions run $1000) NOTE: There are currently no volunteers to work on this project.
26	Improve the orderliness/ tracking of logistics transport of equipment.	
27	Replace old threaded insulators and screws on TA33Jr for better reliability	
28	Install SO-239 at Driven Element of TA33Jr for better modularization and integration with coaxial cables.	Use pre-tinned marine wire for the connections to the SO-239
29	Use a white board to better know what things need to be done immediately	Suggestion from Earl Sloan
30	Each station should have a LIST of exactly which components, items go with it. (Keep correct computer, monitor etc WITH the station)	
31	Reduce the logistical complexity by "outsourcing" food at the next Field Day	

APPENDIX B
ICS Planning Documentation

see:
https://www.nf4rc.club/field-day-pages/2024-field-day-main-iap/

https://www.nf4rc.club/field-day-pages/2024-field-day-iap-appendices/

https://www.nf4rc.club/field-day-pages/incident-commander-suggestions/

https://www.nf4rc.club/field-day-pages/tower-trailer-instructions-yagi/

This year we had a more limited identified team of leadership preceding the event. During the event these roles somewhat continued but the "Command Post" was much more loosely applied

Post	Volunteer
Incident Commander	Gordon Gibby KX4Z - until 2 PM
PIO	none
Operations	none
Logistics	none
Networking	Earl McDow K4ZSW
Documentation	Gordon Gibby KX4Z
Solar Power	none
Sustenance	Rosemary Jones KI4QBZ

APPENDIX C
POSSIBLE REDUCTION IN LOGISTICS FOR EOC-BASED 4F

ASSUMPTIONS

1. Two stations already existing at Emergency Operations Center
2. Existing Antennas at EOC available to be used
3. Possible remote station (to achieve >70dB isolation) either on premises, or at 257th Bttn Headquarters (900 feet away)
4. Ability to transport equipment over a period of days in advance.[10]
5. Simpler meal setup as food available nearby

RESULTS

Reduction of transported items from 181 to 113, approximately a 39% reduction in items having to be transported

10 ***There are a lot of assumptions built into this count***, which is only APPROXIMATE and would change depending on exactly how the Class F effort is planned. This serves only as an approximate estimate of the reduction in complexity of logistics. It assumes two stations and their antennas ALREADY EXIST at the operations center, and that there is a remote station potentially in a trailer to allow operation on same bands.

#	ITEM	#	ITEM	#	ITEM
	STATIONS	32	Tower Trailer		~~3 dozen eggs~~
	~~Icom 7300 w/P.S.~~ (already present)	33	Complement of wrenches		~~Spaghetti noodles~~
	~~Icom 7300 w/P.S.~~ (already present)	34	3x guy ropes (spooled)		~~Spaghetti sauce x 5~~
1	Icom 7300 w/P.S.	35	3x green ground cables (spooled)		~~3 loaves bread~~
2	Icom 7300 w/P.S.		~~3x green ground cables~~ (spooled)		~~4 packages sliced cheese~~
3	Icom 7300 w/P.S.	36	6x ground rods		~~6 packages sliced meat~~
		37	Zip ties		
	COAXIAL CABLE (>20ft on spools if 8X)		BABY MARC UNIT	81	Dessert #1
4	100 ft thick cable	38	Electric Drill		~~Dessert #2~~
5	100 ft thick cable	39	7/8" socket/extension		~~Dessert #3~~
6	50 ft thick cable	40	8 foot folding ladder	82	Chips #1
7	50 ft thick cable	41	American Flag	83	Chips #2
	~~100 foot RG8X~~	42	3 Element HF beam	84	Chips #3
	~~100 foot RG8X~~	44	VHF beam	85	Chips #4
	~~100 foot RG8X~~		~~EFHW antenna w/ Balun~~	86	Cookies #1
8	100 foot RG8X		~~OCF Dipole w/Balun~~	87	Cookies #2
	~~25 feet RG8X~~				
	~~25 feet RG8X~~	45	200 feet paracord		DOCUMENTATION
9	25 feet RG8X		~~200 feet paracord~~		~~Extra Paper~~
10	25 feet RG8X		~~200 feet paracord~~		~~Pens~~
11	25 feet RG8X		~~Sling shot tool chest~~		~~Laptop #1~~
	~~3 foot jumper~~	46	Air powered launcher		~~Laptop #2~~
	~~3 foot jumper~~	47	Electric air pump		~~Laptop #3~~
12	3 foot jumper		POWER SYSTEMS	88	Laptop #4

#	ITEM	#	ITEM	#	ITEM
13	3 foot jumper	48	Generator Trailer	89	Laptop #5
	~~Multiplex Board Low~~ (present)		~~Separate Generator~~	90	Laptop#6
	~~Multiplex Board Hi~~ (present)	49	5 gal Diesel	91	Laptop#7
	~~Power meter~~ (present)	50	5 gal Diesel	92	Logging Laptop
14	Power meter		~~5 gal Gasoline~~		
	~~Antenna analyzer~~		~~Fire Extinguisher~~		~~Monitor #1~~
15	Antenna analyzer				~~Monitor #2~~
		51	First Aid station	93	Monitor #3
	~~Barrel Connector~~			94	Monitor #4
	~~Barrel Connector~~	52	100 ft power cable (spooled)	95	Monitor #5
	~~Barrel Connector~~		~~100 ft power cable (spooled)~~	96	Monitor #6
16	Barrel Connector		~~25 ft power cable~~		~~AC choke #1~~
17	Barrel Connector		~~25 ft power cable~~		~~AC choke #2~~
18	Barrel Connector	53	25 ft power cable	97	AC choke #3
		54	25 ft power cable	98	AC choke #4
	~~Wheel Chock set #1~~		~~Power Strip #1~~	99	AC choke #5
	~~Wheel Chock set #2~~		~~Power Strip #2~~	100	Stn 1 paper packet
		55	Power Strip #3	101	Stn 2 paper packet
19	Extra oil for generator	56	Power Strip #4	102	Stn 3 paper packet
		57	Power Strip #5	103	Stn 4 paper packet
	~~Loaner Headset #1~~	58	Power Strip #6	104	Stn 5 paper packet
	~~Loaner Headset #2~~		FOOD PROVISIONS		NETWORK
	~~Loaner Headset #3~~	59	Mayonnaise	105	Wifi/Mesh Stn #1
		60	Mustard	106	Wifi/Mesh Stn #2
	~~Mouse #1~~	61	Catsup	107	NTP Server
	~~Mouse #2~~	62	Pickles		
	~~Mouse #3~~			108	UPS #1

#	ITEM	#	ITEM	#	ITEM
20	Mouse #4	63	4 packages hot dogs	109	UPS #2
21	Mouse #5	64	4 packages buns		CW STATION
22	Mouse #6			110	CW paddle
		65	2 hotplate burners	111	CW Winkeyer
23	Tool kit #1		~~2 #10 cans chili~~		
	~~Tool kit #2~~		~~2 #10 cans beans~~		MISCELLANEOUS
	~~Soldering Iron~~	66	Crock pot	112	Duct Tape
		67	Crock pot	113	Painters' Tape
	~~LiFePO4 battery #1~~	68	60 cups		~~Scissors~~
	~~LiFePO4 battery #2~~	69	60 plates		~~Stapler~~
	~~LiFePO4 battery #3~~	70	60 sets of forks		~~Printer~~
	~~LiFePO4 battery #4~~	71	60 sets of knives		~~Card Table (if needed)~~
24	MPPT Controller	72	30 sets of spoons		
25	Solar Panel(s)	73	3 packages of napkins		
26	Brochure Pack #1-#4	74	20 water bottles		
27	Brochure Pack #4-#8	75	20 water bottles		
28	Brochure Pack #9-#12	76	20 water bottles		
29	ARES Banner #1	77	5 2-liters soft drinks		
30	ARES Banner #2				
31	Caution Tape #1	78	2 gallons tea		
	~~Caution Tape #2~~	79	Coffee pot		
	~~Caution Tape #3~~	80	Coffee		

APPENDIX D

ICOM INTERNAL FILTERS

This information is difficult to come by and very important for planning operations on nearby bands, so it is included here for completeness. Icom 7300 has internal bandpass filters with the following characteristics:

BPF Insertion Loss

RECEIVER BAND	BPF 160M	BPF 80M	BPF 60M	BPF 40M	BPF 30M	BPF 20M	BPF 17M	BPF 15M	BPF 12M	BPF 10M
160M	1.7 db	15 db	27 db	38 db	46 db	56 db	62 db	67 db	71 db	74 db
80M	24 db	1.4 db	12 db	28 db	40 db	50 db	57 db	61 db	65 db	69 db
60M	41 db	9 db	1.2 db	15 db	25db	37 db	45 db	50 db	55 db	59 db
40M	46 db	19 db	0.9 db	0.9 db	12 db	27 db	39 db	42 db	47 db	51 db
30M	58 db	35 db	26 db	11 db	0.4 db	0.4 db	10 db	21 db	28 db	34 db
20M	58 db	35 db	26 db	11 db	0.4 db	0.4 db	10 db	21 db	28 db	34 db
17M	72 db	54 db	39 db	32 db	17 db	0.5 db	0.5 db	0.5 db	4 db	14 db
15M	72 db	54 db	39 db	32 db	17 db	0.5 db	0.5 db	0.5 db	4 db	14 db
12M	77 db	59 db	49 db	38 db	25 db	11 db	0.5 db	0.9 db	0.2 db	0.2 db
10M	77 db	59 db	49 db	37 db	24 db	10 db	0.5 db	0.9 db	0.2 db	0.2 db

NOTES:

Red text is insertion loss from Elsie simulation minus 2 db

Green text is insertion loss from Elsie simulation

Black text is actual measured insertion using OVF trip points

Chart: W7KEC

APPENDIX E

RF EXPOSURE CALCULATIONS

*Th*is information *is included for completeness.*
Calculations performed via ARRL Exposure Calculator: http://arrl.org/rf-exposure-calculator

BAND	POWER (watts)	SIGNAL (DIGITAL is the worst case)	DUTY CYCLE (Contest operation)	Antenna GAIN	Ground Reflection Included	Minimum Distance Separation (Uncontrolled Environment)[11]	Verdict on our proposed antennas[12]
2M	50	FM	33%	6 dBi	YES	8.6 feet	Antenna will be 20-50 feet above us so exposure is VERY MINIMAL
6M	100	Dig	50%	2.2dBi	YES	9.5 feet	Antenna will be 20 feet above anyone so exposure is VERY MINIMAL
10M	100	Dig	50%	2.2 dBi	YES	8.9 feet	OCFD will be 20-50 feet above ground hence meets this requirement even if operator is standing continuously.
15M	100	Dig	50%	2.2 dBi	YES	6.7 feet	Minimal exposure
20M	100	Dig	50%	2.2 dBi	YES	4.5 feet	Minimal exposure
40M	100	Dig	50%	2.2 dBi	YES	2.2 feet	Minimal exposure
80M	100	Dig	50%	2.2 dBi	YES	1.1 feet	Minimal exposure

11 Uncontrolled Environment is the most demanding and most conservative environment to protect unsuspecting individuals.
12 Conclusions are based on Grassy Field installation of antennas

NOTE

Rather than using the condensed AAR/IP template found on the FEMA preptoolkit for HSEEP (See: https://preptoolkit.fema.gov/web/hseep-resources) this report follows more closely the previous, more all-inclusive version so that the reader can have a fuller understanding of the entire Exercise, its outcome, and improvements suggested for subsequent exercises of its type. This is in keeping with previous AAR/IP's for Alachua County ARES®/North Florida Amateur Radio Club, such as: our 2021 Field Day AAR/IP (https://qsl.net/nf4rc/2021/AlachuaCountyARES2021FIELDDAYAfterActionReport.pdf) and our 2020 Field Day AAR/IP (https://qsl.net/nf4rc/2020/AlachuaCountyARES2020FIELDDAYAfterActionReport.pdf