NVIS-VHF GTMO Functional Exercise

After-Action Report & Improvement Plan

Alachua County ARES(R), Gainesville Amateur Radio Society,
Gainesville Area NVIS Net
Gainesville, FL
May 20, 2023

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ISBN:

DEDICATION

This text is dedicated to all amateur radio operators who wish to develop their skills and use them to help others.

CONTENTS

ACKNOWLEDGMENTS

Thanks to all the amateur radio operators who participated in this exercise. Special thanks to Dr. Gordon Gibby for helping me start to learn how to create and run a Functional Exercise.

1 EXERCISE OVERVIEW

EXERCISE DOCUMENTS

Document	Exercise Plan Template (qsl.net)
ICS-201	https://qsl.net/nf4rc/2023/NVIS-VHFGTMOFunctionalExercise.pdf
ICS-205	See page 21 of the document: https://qsl.net/nf4rc/2023/NVIS-VHFGTMOFunctionalExercise.pdf
ICS-205A	See Page 22-23 of this document:

INCIDENT RADIO COMMUNICATIONS PLAN ICS-205

INCIDENT RADIO COMMUNICATIONS PLAN (ICS-205)

1. Incident Name:	2. Date/Time Prepared:	3. Operational Period
NVIS-VHF GTMO	Date: Feb 14 Time: 1500 LOCAL	Date From: Date To: Time From: Time To:

4. Basic Radio Channel Use:

Zone Grp.	Function	Channel Name / Trunked Radio System Talkgroup	Assign-ment	RX FREQ N or W	RX TONE / NAC	TX FREQ N or W	TX TONE / NAC	Mode (A, D, or M)	Remarks
		HF Voice	Ham	3\970 LSB	N/A	3970 LSB	N/A	A	Primary voice net control 0900-1100 1300-1500 (possibly)
		HF Digital	Ham	3.555 USB	N/A	3.555 USB	N/A	D	Peer to peer digital, eg. winlink VARA or ARDOP or other technique 0900-1100 1300-1500 (possibly)
		HF Voice Alt.	Ham	7.255 LSB	N/A	7.255 LSB	N/A	A	Alternate voice frequency 1300-1500
		HF Digital Alt	Ham	7.055 USB	N//A	7.055 USB	N/A	D	Peer to peer digital eg. winlink VARA or ARDOP or other technique 1300-1500
		VHF Voice	Ham	146.55 W	N/A	146.55 W	N/A	A	VHF Simplex traffic 0900-1100 // 1300-1500
		VHF Data	Ham	146.65 W	N/A	146.65 W	N/A	D	VHF peer to peer data (FM) e.g. VARA-FM or AX.25 0900-1100 // 1300-1500
		HF RMS	Ham						Per software

5. Special Instructions

- Other than KO4ILJ, remain on voice when not sending/receiving winlink messages

6. Prepared By Reid Tillery K9RFT

ICS 205	IAP PAGE	Date / Time 17 Feb 2023 1042L

https://qsl.net/nf4rc/2023/NVIS-VHFGTMOFunctionalExercise.pdf

ICS-205A

1. Incident Name: GTMO NVIS DRILL	2. DATE / TIME PREPARED: Date: Time:	3. OPERATIONAL PERIOD Date From: Time From: Date TO: Time TO
3. Basic Local Communications Information:		
Incident Assigned Position	**Name (Alphabetized)**	**Method(s) of Contact (phone, pager, cell, etc.)**
Exercise Director	Reid Tillery K9RFT	3.970 / 7.255 LSB
Central Station K4GNV	Waldo Radio Room Shannon Boal K4GLM Dave Dockus KO4GCZ Mike Martell KK4KRZ Larry Rovak WB2SVB	3.970 / 7.255 LSB
Local Helper HF #1	Dave Huckstep W4JIR	frequencies above
Local Helper HF #2	Ron Lewis KN4ZUJ	frequencies above
Local Helper HF #3	Eric Pleace KO4ZSD	frequencies above
Local Helper HF #4	Leland Gallup AA3YB	frequencies above
Local Helper HF #5	???	
Local Helper HF #6	???	
Remote HF #1	Gordon Beatty W2TT	HF frequencies as above
Remote HF #2	Amy Woods WA4AMY	HF frequencies as above
Remote HF #3	K3COW??	
Remote HF #4		
Local HF/VHF relay	Earl McDow K4ZSW	HF frequencies above, and VHF frequencies per ICS-205
Local HF/VHF Relay	Lorilyn Roberts KO4LBS	HF frequencies above and VHF frequenices per ICS-205
Local HF/VHF Relay		
SHELTER #1	Rosemary Butler KI4QBZ	VHF frequencies per ICS-205

3. Basic Local Communications Information:		
Incident Assigned Position	**Name (Alphabetized)**	**Method(s) of Contact (phone, pager, cell, etc.)**
SHELTER #2	Jeff Capehart W4UFL	VHF frequencies per ICS-205
SHELTER #3	Steve Panaghi KC2ASY (tentative)	VHF frequencies per ICS-205
Near Alachua County EOC HF/VHF backup		
Alachua County EOC NF4AC (Ham) NCS181 (SHARES)	Gordon Gibby KX4Z Susan Halbert KG4VWI	Monitoring VHF / UHF frequencies per ICS-205 Winlink VHF Peer-to-Peer HF as necessary (ham or SHARES as needed)
4. Prepared by: Name: Position/Title: _____ Signature: *s*		
ICS 205A	**IAP Page ____**	Date/Time: UPDATE 5/17/23

EXERCISE SCENARIO

An apparent computer malware attack affecting Alachua County, Florida and some nearby areas has eliminated internet connections, normal communications including trunked radio systems, and grid electrical power. All repeaters and digipeaters were considered non-operational.[1] It was primarily a test of the capabilities of local amateur radio operators to see how well they could take health-and-welfare messages from community members and deliver them to recipients outside of Alachua County, the supposed disaster zone. It did also allow for the delivery of messages of interest to the Alachua County Emergency Operations Center (EOC). Examples of such messages would be auto accidents, EMS emergencies, wildfires, and other incidents requiring a law-enforcement and/or Fire Department response. Owing to the work-load demands at the EOC, participants were instructed to refrain from sending health-and-welfare message there.

1 A specific artificiality was that digipeater NF4RC-7, which uses NO internet, and which has many hours of battery backup, was also considered "inoperative" -- and this is the major digipeater for VARA FM for the entire county. This forced peer to peer FM Simplex data transmission.

2 INITIAL TASKS

Team members were asked to take from friends and neighbors health-and-welfare messages, which the team could then attempt to successfully deliver to recipients out of the supposed disaster zone, either by Winlink radio email or by voice. While there were protocols for delivery in place, team members were instructed to ignore protocol when necessary and GET THE MESSAGE OUT in any way which made sense at the time.

3 EXERCISE INJECTS

There were no specific injects for this Functional Exercise. The initial assumptions regarding communications and power outages remained throughout the entire Exercise.

4 RESULTS

The main purpose of our Functional Exercise was to GET THE MESSAGE OUT. The results were excellent since the team managed to get out 512messages, the most in any Alachua County exercise, ever. Our goal was 500, so we were extremely pleased to have accomplished our objective. Moreover, this goal was met in spite of unusual solar activity which proved deleterious to our main communications bands—80 meters and 40 meters. Further, the critical frequency as determined by the Eglin Ionosonde never got above 7 MHz during our exercise, which took place from 0900-1100 and 1300-1500. For most of the time, it remained around 6 MHz. So, with the unusual solar activity combined with the normal daytime effects of the D-layer on high-frequency (HF) skywaves, voice communications via 80 and 40 meters were for the most part, poor to non-existent. In at least once case, however, an operator successfully sent a Winlink P2P message to another operator located about 10 miles out of the zone, still well within range of near-vertical-incicence-skywave (NVIS) communications, pointing up the ability of digital communications to get through when voice cannot.

SAFETY

All participants were briefed as to safety precautions, especially as to those dealing with the erecting of antennas.

HOTWASH EVALUATIONS

A hotwash via Zoom immediately followed the Functional Exercise. Operators reported the messages they origination or relayed. (See the Message Transfer data below.) At that point, it became obvious that the mantra for the Functional Exercise, GET THE MESSAGE OUT, had made an impact. Despite the challenges we had with band conditions, messages still got through. Moving traffic was our goal, and that's what we did.

Although the Functional Exercise had been scheduled for some time, and all were assumed to be aware of it, still it did slip up on some. Further, reminder notifications methods fell short, meaning some missed the

Exercise either partly or entirely. Still, this was a No-Fault Exercise, meaning that the entire team can use the experience gained to avoid such issues in the future.

Out of 504 total messages sent or received, only 26 were voice, meaning data transmissions played a critical role in this Exercise. Some operators found it difficult to connect with a Winlink Radio Message Server (RMS) in the afternoon, probably due mostly to a combination of a low critical frequency and the effects of the daytime D-layer on HF skywaves. Such difficulty may point up the advantage of getting one combined message (for example, "We're Okay. Safe and Sound") with numerous senders and recipients listed, out via Winlink peer-to-peer (P2P) to an out-of-area station. Such station can then send individual messages out via Winlink Telnet or any other internet email method.

Problems with HF-skywave transmissions (there was unusual solar activity which prevented good HF communications) pointed up the need for better line-of-sight, very-high-frequency (VHF) communications. Under normal circumstances, when the K4GNV 146.82 repeater is in service, VHF communications work well. In this Exercise, however, that repeater was considered out of service, meaning line-of-sight, non-repeater communications was the only method available to communicate via VHF waves. Several operators became aware of the need for a higher antenna and during the Exercise raised theirs to be heard. One operator in Melrose abandoned his 25-foot high antenna and hastily strung up a Slim Jim higher in an oak tree to achieve better communications with the EOC. It worked. With VHF, height matters. Emergency communications can be largely a team effort. To this end, the team should encourage individual members to erect the highest and most efficient VHF antenna possible, keeping in mind the end goal of County-wide line-of-sight communications, even though such communications might necessarily involve relaying messages from one operator to another to help get the message to its destination. Multiple, well-spaced antennas of sufficient height in our County can help accomplish this goal. Perhaps some antennas parties are in order.

The need for amplifiers for emergency HF communications was discussed. While an amplifier can certainly help in voice delivery, amplifiers do use a lot battery power. Balancing smart use of batteries with sufficient amplification of signal is a judgment call each operator can make depending on the individual circumstances.

The possibility of using 60 meters was discussed. Many operators are not thoroughly familiar with 60 meters and its special rules, such as channelization and no more than 100w peak envelope power.

In this Exercise, digital communications saved the day, with Winlink being the premier digital program. The success of Winlink points up the need for nearly all of us who consider ourselves to be emergency communicators to become highly proficient with this software, which can move a lot of traffic, fast. For instance, one properly executed Information.txt form from the Winlink Standard Templates can show a generic "We're okay" message and list numerous recipients. One good P2P connection to an out-of-area station can solve the problem of getting those messages out of the disaster zone. Once out of the zone, the remote operator can send them out by internet, with no need to fuss with connecting with an RMS. In the case of those recipients for whom only a phone number is listed, the out-of-area station can simply make phone calls. Specific Winlink training of members not proficient with this software can be helpful in future drills and in the case of a real disaster. One advantage of Winlink (specifically VHF VARA-FM) is that it allows an operator to easily turn his or her station into a digipeater for sending VARA FM Winlink traffic. Even one well-situated digipeater-operator could be a significant conduit for VARA FM traffic, allowing that traffic to flow to KX4Z, which in the absence of internet is capable of routing that traffic out of the zone over HF. Of course, in the event that NF4RC-7 is operational, VARA FM traffic can be easily relayed to an

RMS from just about any location in the County. One excellent application of Winlink is to be able to submit position reports along with a 148-character message. Other operators can then see at a glance who's operating and what their status is—they are operating as an ad hoc digipeater, for example.

Also, with regard to Winlink, it might be a good idea to always use the CENTER frequency when giving out a specific frequency. When dial frequency is used the word DIAL should be plainly expressed. Otherwise, the frequency will be assumed to be CENTER frequency.

Also, we discovered it's important for operators to keep their software up to date in case of an emergency. In the event of an expected emergency, such as a hurricane, it's especially important. VARA, for example, is not backwards compatible, meaning it won't work if there's a new version out and an operator is working with an older version. Flash drive backups of the download files for Winlink, VARA HF, VARA FM, and an operator's RMS Express folder would be a good idea. This way an operator could use any computer. Or if another operator needed Winlink, the proper files could be transferred to that operator's computer to be installed, and subsequently put to use.

The possibility of a digital net was discussed, including using JS8Call and/or PSK 31. It may be beneficial for members to train on the use of either or both of these programs since these signals can often get through when voice cannot. There can be problems switching from one software to another, say from Winlink to FLDigi and back again. Practice doing this, however, can make the operator aware of how to avoid or fix those problems.

There were some issues with regard to selected frequencies. Although no one owns a frequency, we hams strive to be courteous operators. As it turned out, the ECARS net was operating on 7255, meaning we had QRM on that frequency.

The good folks at GARS are working on improving their VHF capability at the Waldo EOC, including the installation of an antenna that can easily communicate with the Alachua County EOC. Such connectivity would be a huge asset to emergency communications within the County.

We need more out-of-area stations who consider themselves part of our local team. These stations might be hundreds of miles away and easily reachable by HF waves when local HF commuications fail us. They can take traffic and perhaps relay local voice traffic, if necessary.

Finally, it's important that each of us considers ourselves not just individual operators who belong to a club, but vital members of a highly competent disaster-communications team. In that regard, we'll all want to develop our stations and skills to the best of our abilities because others will be depending on us. Our skills can be diverse. There can be specialties in EOC operations, shelter operations, net control operations, local helper stations, point-of-distribution stations, and out-of-area stations, and perhaps others as needed. The more we practice, the better we will be.

MESSAGE TRANSFER

TRAFFIC COUNTS	ORIGINATIONS	REC'D	RELAYS	TOTAL
VOICE	**8**	**2**	**16**	**26**
DIGITAL	**283**	**40**	**163**	**486**
Totals	**291**	**42**	**179**	**512**

Total Message Count	
Percent by Voice	5.1%
Percent by Digital	94.90%

5 EXERCISE CATEGORIZATION

Exercise Name	NVIS-VHF GTMO FUNCTIONAL EXERCISE
Exercise Dates	05/20/23
Scope	This exercise is a non-**deployment, functional exercise**[2], planned for 4 hours at multiple locations throughout Alachua County and northern Florida. (0900-1100 to test mid morning NVIS characteristics and 1300-1500 to evaluate the worst of the D-layer impact.) Exercise play is open to a very wide array of volunteers including: – members of GARS, GARC, Loften, ARES(R), NFARC or just licensed amateurs interested in gaining skills --volunteers from the local NVIS net, or any other amateur with HF NVIS capabilities.
Mission Area(s)	Response
Core Capabilities	MASS CARE SERVICES OPERATIONAL COMMUNICATIONS
Objectives	1.0 Evaluate success of NVIS voice & data communications in the mid- to late-morning time in Florida, particularly noting optimal bands 2.0 Gain familiarity with catchment of Health and Welfare messages 3.0 Move traffic via a variety of Peer to Peer methods as indicated, using distant RMS server stations where appropriate as well. 4.0 Evaluate techniques for providing two concurrent NVIS HF operations at and in the vicinity of the Waldo EOC radio room 5.0 Allow participants to gain familiarity with additional techniques and with the extant volunteer Communications Plan[3]
Threat or Hazard	As of yet unidentified computer malware
Scenario	Alachua County has been hit with an apparent computer malware attack, knocking out traditional communications means--including trunked radio systems--and the electrical power grid.

2 An HSEEP Functional Exercise is an operations-based exercise designed to test and evaluate capabilities and functions while in a realistic, real-time enviornment; however, movement of resources is usually simulated. Se https://www.fema.gov/sites/default/files/2020-04/Homeland-Security-Exercise-and-Evaluation-Program-Doctrine-2020-Revision-2-2-25.pdf Table 2-8

3 See latest version of Alachua County Communications Volunteers Backup Communications Plan at: https://qsl.net/nf4rc/AlachuaCountyCommsPlan2022.pdf

Exercise Name	NVIS-VHF GTMO FUNCTIONAL EXERCISE
Sponsor	Reid Tillery, NVIS HF Net & Gainesville Amateur Radio Societ
Participating Organizations	Gainesville Area NVIS Net The Gainesville Amateur Radio Society (GARS) Alachua County ARES(R)/NFARC
Point of Contact	Reid Tillery (352) 494 5134 reidtillery@gmail.com

6 ANALYSIS OF CORE CAPABILITIES

OBJECTIVES

1.0 - Evaluate success of NVIS voice and data capabilities in the mid-to-late-morning time in Florida, particularly noting optimal bands.

WEAKNESS

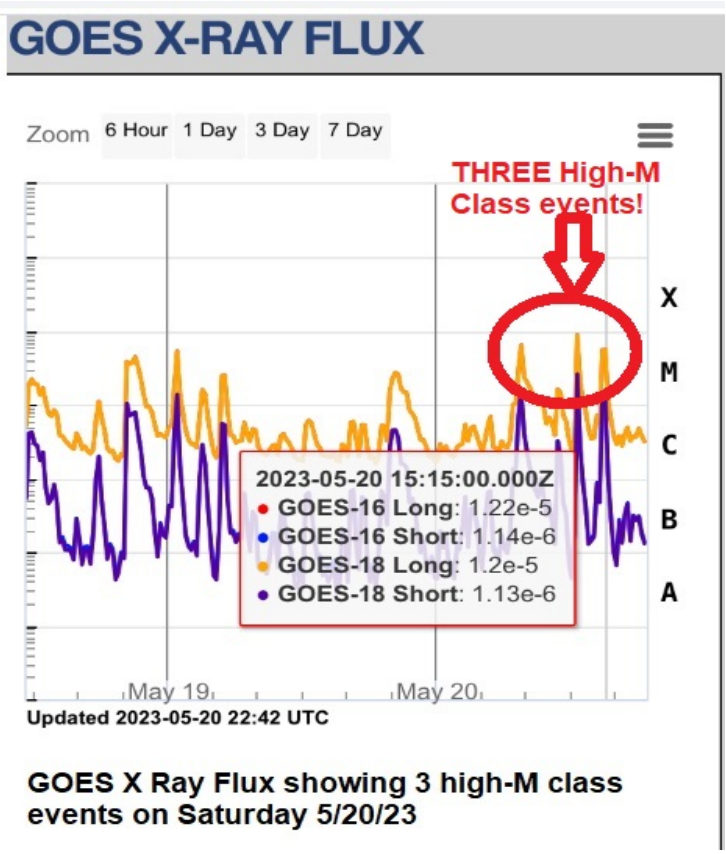
NVIS *voice capability* came up short with difficulty hearing Net Control during the morning and inability for the regular scheduled Net Control to function in the afternoon, **due in large part to extraordinarily unusual solar activity** combined with D-layer activity deleterious to these bands. Data capabilities were not as adversely affected. More experimentation needs to be done with regard to sending Winlink P2P traffic locally during midday hours.

Multiple high-M class solar flares occurred in the morning hours as documented by the GOES (Geostationary Operational Environment Satellites.

> The GOES-R Extreme Ultraviolet and X-Ray Irradiance Sensors (EXIS) measures light from the sun. The NOAA Space Weather Prediction Center (SWPC) relies on this product to issue warnings when there are large increases in solar X-ray output from solar flares. These X-ray flares cause changes in the ionosphere and are used by SWPC to give warnings of radio blackouts of terrestrial high frequency (HF) radio communications.

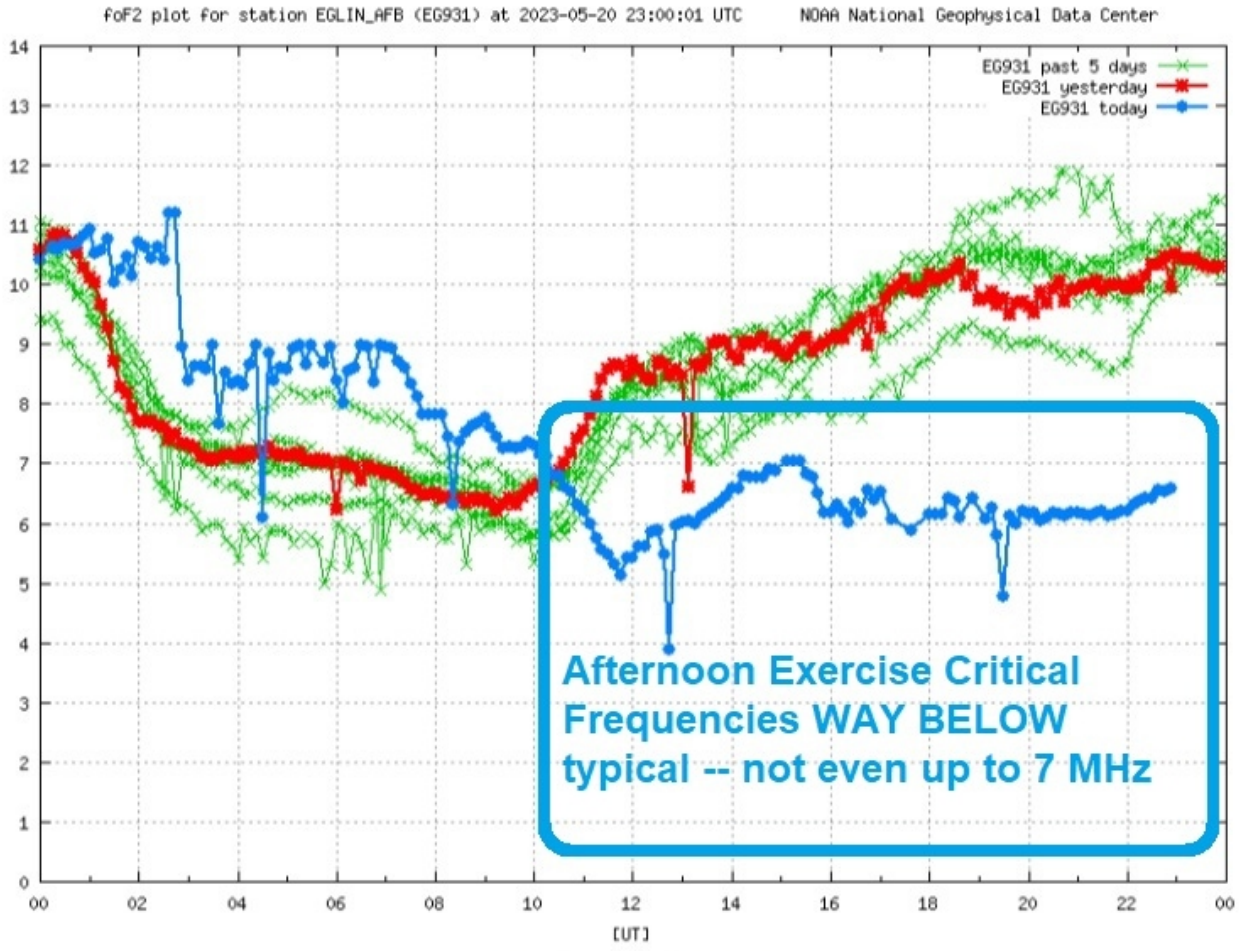
M Class solar flares are considered capable of blacking out HF communications to some extent. The Flares experienced around and during our exercise here high-M strength, and almost X-strength (the highest strength category). These were very significant factors in shortwave/HF propagation, creating additional D-layer loss of signals

NOTE: This level of difficulty would be potentially magnified many times over by a nuclear attack scenario, and the difficulty might persist for many more hours. VHF communications and space- or ground-wave communications are considered one of the remaining techniques when the ionosphere is altered by radiation from a nuclear attack.



GOES X Ray Flux showing 3 high-M class events on Saturday 5/20/23

In the 2nd session of the Exercise, our group faced different but even worse HF adversity: the ionization of the F layer in conjunction with other layers would not support critical frequenciy develop even to the range of 7.0 MHz. The blue trace (operational day) demonstrates how unusual this was compared to the previous 5 days (green and red traces):



Critical Freq, Eglin AFB (Florida), BLUE = 5/20/2023

STRENGTH

IN SPITE OF THESE extremely difficult and unusual circumstances, and without most of the existing infrastructure developed by amateur radio operators in our area, our team still managed to move > 500 pieces of formal traffic. This suggests very significant flexibility and adaptability due to the training and experience of our team members.

2.0 - Gain familiarity with catchment of Health and Welfare messages

Any amateur operator equipped with an HF rig can be a valuable asset to his/her friends and neighbors in times of communications outages. Those friends and neighbors need to know of a place they can go to deliver a message to be sent out of the area.

WEAKNESS
The only catchment area officially established was Fire Station 24 in Melrose. More work needs to be done establishing catchment areas and publicizing them so people will know where to go to get messages out.

STRENGTH
Despite limited official catchment area creation, multiple simulated H&W traffic were originated by participants in this exercise.

3.0 - Move traffic via a variety of P2P methods as indicated, using distant RMS server stations where appropriate as well.

STRENGTHS
Distant Winlink HF RMS stations were used very effectively by the Alachua County EOC to send scores of notification messages in accordance with the Emergency Communications Protocol -- but this occurred using distant stations and skirted the times of significant ionospheric interference. Station W2TTT reported success using 30-meter distant RMS stations in the North Carolina and Virginia tidewater areas, during the morning session, despite the ionospheric impacts.

Peer to Peer winlink was also utilized successfully in multiple cases to send messages across the County, such as by W2JIR relaying messages.

A particularly unique strengh was the institution of TWO VARA-FM digipeaters at the EOC, with its high-mounted antennas. Although the usage of these was limited to apparently only ONE local ham, K4ZSW originated roughly 20 H&W messages via this digipeater to the remaining KX4Z-12 VARA-FM RMS-- which has automatted outflow via HF. Over half of these went out over HF and the remainder were found stuck on the server at the end of the exercise because the automated system could not find suitable distant RMS's given the unusual propagation. These were forwarded via TELNET at the conclusion of the exercise.

Additional Digipeaters could easily be established at highly placed locations, based on the topography of Alachua County, in a longer effort.

WEAKNESS
As the day wore on, RMS servers were increasingly difficult to establish connections with. due to the unexpected and unusual decrement in the Critical Frequency and result changes in the MUF (maximum usable frequency) for various distances.

This is where more out-of-area human-operated stations functioning as members of our team can serve well. If they're far enough away, we don't have to rely on NVIS and can get messages out regardless of the current status of the critical frequency. Once those messages

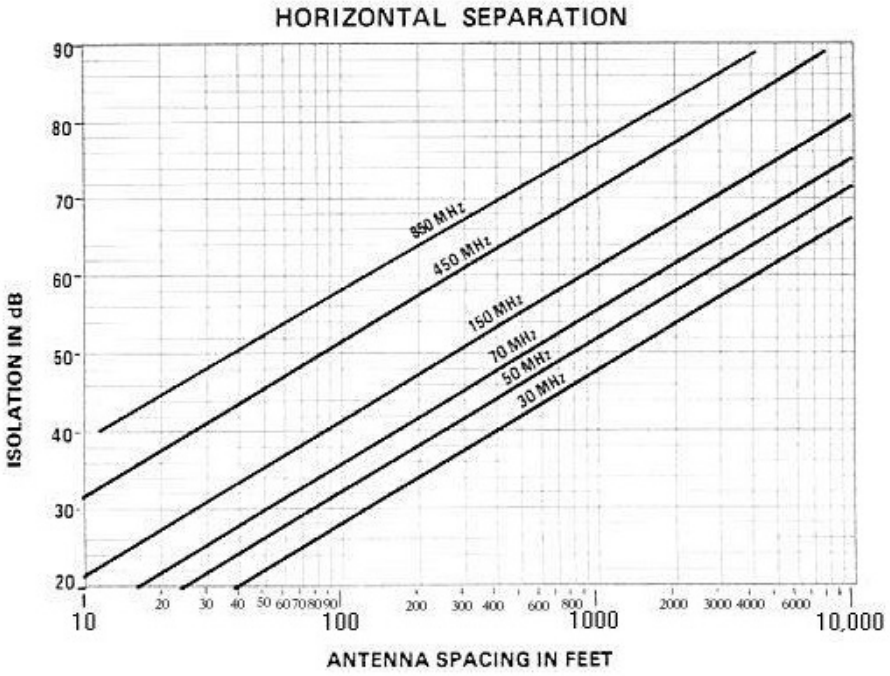
are out of the disaster zone, the out-of-area stations can send them out via internet or telephone.

4.0 - Evaluate techniques for providing two concurrent NVIS HF operations at and in the vicinity of the Waldo EOC radio room

STRENGTH

Shannon Boal, K4GLM of the Gainesville Amateur Radio Society successfully established two antennas about 200 yards apart that can work without interference, one with the other.

A charge of potential isolation versus horizontal separation suggests that 30-40 dB of isolation may be achieved in this situation: (REF: https://www.repeater-builder.com/antenna/separation.html)



These curves are based on the use of half-wave dipole antennas. The curves will also provide acceptable results for gain type antennas if (1) the indicated isolation is reduced by the sum of the antenna gains and if (2) the spacing between the gain antennas is greater than 50 feet.

5.0 - Allow participants to gain familiarity with additional techniques and with the extant volunteer Communications Plan

STRENGTH

The Local Helper Stations included in the Communications Plan were emphasized in this exercise.

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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)
Evaluate NVIS voice and data capabilities			S		
Gain familiarity with catchment of H&W messages					U
Move traffic via a variety of methods		P			
Evaluate two concurrent NVIS antennas at Waldo EOC		P			
Allow participants to gain familiarity with additional techniques and with the extant volunteer communications plan			S		

Table 1. Summary of Core Capability Performance

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, 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).

The following sections provide an overview of the performance related to each exercise objective and associated core capability, highlighting strengths and areas for improvement.

7 IMPROVEMENT PLAN

Item	Core Capability/ Objective	Area For Improvement	Corrective Action	Suggested Primary Organ-ization / Point of Contact	Outcome (FILL IN AS REPORTED)
1	Mass Care Services / Operatonal Communications: Evaluate the success of NVIS voice and data capabilities in the mid-to-late morning and early afternoon.	Unexpected events (solar activity, for example) can all but wipe out NVIS voice, meaning there needs to be some other way to communicate.	Our team has room to improve overall capabilities with digital communications methods, including Winlink, JS8Call, and PSK31. Such improvement can come about via those needing help enrolling in The Winlink Academy (TWA) Classes. Specific instruction in FLDigi and JS8Call would also be helpful. Our members should be as comfortable with data comms as with voice comms. Along these lines, team members need to be familiar with NVIS. A one-hour training session on NVIS could include the nature of NVIS, the most appropriate antennas for NVIS use, the Critical Frequency, and the Eglin Ionosonde.	TBD	
2	Mass Care Services:	More Catchment areas need to be	Select Catchment locations well-spaced	ARES(R) NFARC:	

	Gain familiarity with a Catchment of Health and Welfare Messages	established and publicized.	around the County, speak with the management of each location to get buy-in to function as a Catchment area, both for Exercises and for real disasters. Perhaps a newspaper article explaining what a Catchment is and which locations are official Catchments would be helpful in serving the public.	Gordon Gibby	
3	Mass Care Services / Operational Communications: Move traffic via a variety of P2P methods as indicated, using distant RMS server stations where appropriate as well.	Make sure all members are familiar with the Information.txt form which can be used to send multiple homogenous messages (We're Okay) in a single contact, either P2P or with an RMS. Also, help team members understand how best to select an RMS when sending out messages.	Encourage team members to enroll in classes offered by TWA. These classes include instruction in P2P contacts as well as instruction in using knowledge of radio in general and Winlink in particular to help select an RMS.	ARES(R) / NFARC: Reid Tillery	
4	Operational commmunications: Evaluate the success of NVIS voice and data capabilities in the mid-to-	Become more familiar with 60-meters for voice/data transmissions.	Have training on the legalities of the 60-meter band, followed up with several practice nets on 60-meter channels.	ARES(R) / NFARC: Reid Tillery	

	late morning and early afternoon				
5	Mass Care Services / Operational Communications: Move traffic	VHF antennas of group members	Encourage members to erect higher VHF antennas for increased connectivity within the County. If necessary, have antenna parties to help erect them.	TBD	
6	Mass Care Services/ Operational Communications: Move traffic	QRM on selected frequencies. Select appropriate VHF channels.	Select frequencies that don't have established nets during the time of the exercise. Separate VHF channels by 30 KHz.	ARES(R) / NFARC: Reid Tillery	
7	Mass Care Services / Operational Communications: Move traffic	The ability of members to establish, recognize, or use ad hoc digipeaters.	1) Encourage members to check their Winlink email to see if ad hoc digipeaters are functional. 2) Encourage those running ad hoc digipeaters to post a position report letting other operators know their status. 3) Encourage operators to check position reports.	ARES(R) NFARC: Reid Tillery	
8	Mass Care Services / Operational Communications: Move traffic	Team coordination	Encourage all members to consider themselves not just members of a radio club, but vital members of an emergency communications team. As such, we must all do our part to function within the team, and not let the team down.	TBD	
9	Mass Care	We need more	Consider using willing	TBD	

	Services / Operational Communications: Evaluate the success of NVIS voice and data capabilities in the mid-to-late morning and early afternoon	out-of-area operators willing to participate in our Exercises, as relayers of Winlink P2P messages, and local voice relayers.	friends or ARRL Section Coordinators for these positions.		
10	Mass Care Services / Operational Communications	Difficulty understanding HF propagation conditions in setting of public switched systems failures	1) Investigate existing Winlink Catalog and other resources 2) Seek out of area volunteers who would be willing to provide insights from areas still with communications.	ARES(NFARC) Gordon Gibby	

APPENDIX: HOTWASH COMMENTS

Hotwash comments including as many oral or written input as possible.

1. Bulletin notifications better separated if each had a defining number or letter ("alpha" "bravo" etc)
2. Notifications & scheduling didn't work for some participants.
3. Very difficult to reach distant RMS's in afternoon (critical frequency down to 6 MHz & D-layer significant)
4. Several participants had to raise their VHF antenna in order to be heard on Simplex point to point -- significantly more difficult than using repeaters
5. Surprising larger number of messages moved on HF Digital than VHF digital Easier?
6. Voice comms were very difficult under these conditions on HF unless you were CLOSE or had an AMPLIFIER. Having BOTH was much nicer. (Normally we would have expected Waldo to work FINE)
7. Some participants were unfamiliar with the frequencies listed on the ICS-205
8. 146.65/146.75 not standard frequency spacing
9. 7.255 was on top of ECARS net -- try different frequency next time
10. Try 30m or 60m for data
11. Use BCC for book traffic [Ah...I finally understand this point! Great idea!]
12. Shannon - 40 meters quit after 1:15. (sure did!)
13. Leland - amps help (and having a critical frequency above net also helps!)
14. Leland - heard about 8 stations on 40 meters. power was very helpful
15. Possible serial port conflicts running multiple different types of programs back and forth

16. Difficult to know when actual end of exercise [typically under control of Exercise Director, not participants]
17. Digital "the way to go" per some participants
18. QRM on 7.255 until 2:15 PM
19. ECARS stations NJ/Delaware coming in on 7.255 (So skip WAS working--but only past the skip zone)
20. "could have done VHF " 146.55
21. Reminder: amplification not allow above 100W on 60m
22. RMS in Virginia and SC were reachable on 30meters
23. Difficult to change back and forth between programs
24. Possibility of using "tower trailer" to position temporary digipeater!
25. Comment from Barry (my handwriting difficult) "short distance"
26. Power out? Real event easier to recognize than planned exercise
27. Waldo -- working on improving VHF capabilities, weak @ current time
28. VARA -- often NOT BACKWARDS COMPATIBLE -- both Huckstep & Gibby have run into problems where different versions won't talk.
29. Wonder if JS8 -- even fast or turbo speeds -- might not have worked for much of our group even to Waldo, and possibly on both 80 and 40 meters? Might be worth trying a different way of running the command net on a subsequent exercise. We have not succeeded in getting more people to learn how to use CW-decoder software, but waveforms such as psk31, MFSK-8 (only 250 Hz) can also offer significant gains over voice SSB. The difficulty is getting volunteers facile at switching back and forth. VAR-AC offers both file and broadcast transfers in one package! Working on both HF and VHF, it also provides an alternative.
30. I don't think the Winlink propagation predictions were able to take into account the fast changing solar storms?? Stations that were ranked as very high probabilities -- I could not connect to, at noon. Connections had been EASY at 0730.
31. A LOT of our traffic appeared to go out by WINLINK. Connecting to established VHF (KX4Z-12) or HF RMS's (here or distant) is easy if you have adequate propagation, and message transfer is quick compared to voice. That may account for the high prevalence of DATA transfers in our

results.

32. By contrast to RMS transfers, doing **peer to peer** HF winlink requires stations to confront the difference between "center" and "dial" frequencies. (This does not exist on VHF FM peer to peer.) I observed stations having some confusion dealing with that for the first time, undersanding that on upper side band, "center" is considered 1500 Hz higher than "dial." Worth going over.

33. Very impressive improvements in our group capabilities over where we were several years back!