Exercise Evaluation Report
Radio Relay International – REACT International Joint Exercise
24 February 2018

On February 24, 2018, Radio Relay International (RRI) and REACT International conducted a joint exercise designed to test emergency communications preparedness. This exercise was both administrative and operational in scope. Details of the REACT International component are included in a separate section of this document.

Scope of RRI Component:

The RRI component was designed to simulate a widespread communications outage. Emphasis was placed on long-haul communications capabilities. Four widely dispersed REACT units were linked via High Frequency Radio Networks. Locations linked were:

- Glendale, CA.
- Louisville, KY.
- Brockton, MA.
- Dallas, TX.

An initial book of four "radiogram" messages addressed to each of these four locations were originated from REACT training in Glen Allen, Virginia. These messages were originated on an Internet enabled "Zello" network, which simulates a two-way radio circuit. A Radio Relay International control station located in Michigan then transferred the message traffic to a survivable High Frequency radio network and transmitted the messages to the four locations. This initial origination was designed to trigger reply messages from each unit.

The scope of the exercise was limited to a relatively small quantity of messages. This is the first in a planned series of exercises of increasing complexity designed to test common-denominator communications methods as well as the RRI Digital Traffic Network (DTN), a modified hybrid mesh network designed to serve North America, Europe and other points overseas.

Goals of Exercise:

1. Examine/confirm compatibility between REACT network procedures and RRI network procedures, particularly with respect to message formats and procedural techniques.

2. Ensure that reliable connectivity can be established at a randomly scheduled time, regardless of radio frequency conditions.

3. Measure message propagation time through the network.

4. Examine administrative burden and network overhead impact.

5. Measure message accuracy.

Liaison to REACT Training:

Liaison to REACT Training was established at 1130 EST (241630Z Feb 2018). The initial book of four radiogram messages was transmitted to the RRI liaison station at 1136 EST.

The exercise design called for activation of RRI facilities at 1201 EST (1701Z). Therefore, the delay of approximately 21 minutes is not included in the calculation of message propagation times.

The message exchange process requirements were defined as follows:

1. The REACT National Training Officer would originate the four initial messages.
2. The messages would be transferred to survivable RRI high frequency networks.
3. The messages would propagate through the RRI system and delivery to the addressee would occur.
4. The delivering station would report time and date of delivery (handling instruction HXC) to the originator.
5. The delivering station would also solicit a reply and originate the reply to REACT training.

In other words, each originated radiogram message would trigger, at a minimum, one reply reporting date and time of delivery as well as a possible reply message from the original addressee.

Definitions:

Message Propagation Time:

For the purposes of this exercise, “message propagation time” is defined as the length of time from when the the message is injected into the network to the time the message is delivered at its destination.

Accuracy percentage:

Accuracy percentage is determined by comparing the data points within a delivered message (essentially each letter, figure or punctuation in the preamble, address, text and signature) to those in the message as originated (injected) into the network.

Percent fatal errors:

For the purposes of this exercise, a fatal error is any message in which a word is missing, illegible or in which more than four errors occur at data points within a single message.

Results:

Message Propagation Time:

MSG	ORIGINATOR	INJECT TIME	DELIVERY TIME	PROPAGATION TIME
45	N0WGG	1701Z	1701Z	4 MINS
46	N0WGG	1701Z	1705Z	4 MINS
47	N0WGG	1701Z	1702Z	3 MINS
48	N0WGG	1701Z	1715Z	14 MINS
51	WB8SIW	1710Z	1740Z	20 MINS
52	WB8SIW	1719Z	1740Z	21 MINS
50	K6YR	1710Z	1740Z	30 MINS
1	K6YR	1710Z	1740Z	30 MINS
45	N9SE	1706Z	1740Z	34 MINS
18553	WC1EOC	1710Z	1740Z	30 MINS
		Average Propagation Time		**19 MINS**

Message Accuracy and Fatal Errors:

MSG	DATA PTS	ERRORS	FATAL ERRORS	% ACCURACY
45	159	0	0	100
46	154	0	0	100
47	159	0	0	100
48	153	0	0	100
51	119	0	0	100
52	75	0	0	100
50	103	0	0	100
1	148	0	0	100
45	112	0	0	100
18553	167	0	0	100
TOTAL DATA PTS		**1349**	**FATAL ERRORS**	**0**
ACCURACY		**100%**		

Frequency Management:

Three frequencies were utilized for the exercise:

14115 kHz
7115 kHz
5404 kHz

Frequency flexibility was essential to the operation due to the variations in distance between the REACT units involved. Of note is the use of the 5-mHz frequency for regional coverage between the control station in Michigan and the Louisville, Kentucky REACT Unit.

The 14-mHz and 7-mHz frequencies are utilized daily for traffic exchange between Radio Relay International operational areas. Therefore, both fixed and portable stations are generally optimized for these frequencies.

Conclusions:

The exercise can be considered successful:

- Communications was established quickly, and signal strength and readability were more than sufficient to clear all message traffic without error or excessive "fills" (retries).

- Message transmission techniques and formats are highly compatible between the two organizations, thereby ensuring excellent interoperability.

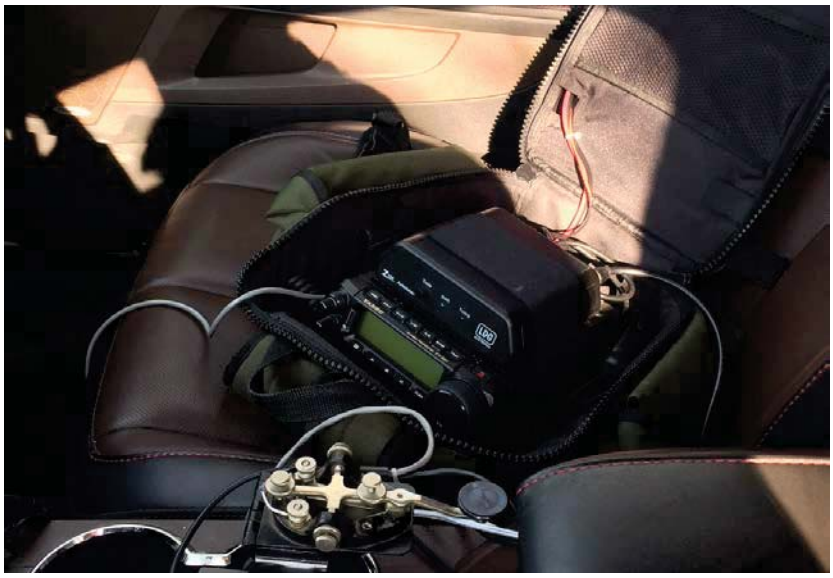
- Message propagation times were excellent. Most time was spent in the administrative tasks of logging and formatting service messages to report date and time of delivery. Even with this net overhead, average message propagation time through the network was approximately 19 minutes.

- Accuracy was excellent, being confirmed at 100-percent with no fatal errors.

Items of Note:

1. All RRI operators were part of the Inter-Area Traffic Network operations team. These highly skilled operators demonstrated excellent efficiency, utilizing the minimum language and efficient procedures to clear the required record message traffic.

2. The Dallas, Texas message traffic was exchanged with Michigan using a simple High Frequency mobile arrangement. This mobile unit provided a traffic quality signal running relatively low power (75 watts) and a mobile whip antenna. The narrow bandwidth of the CW signal again proved advantageous



This simple HF mobile unit provided a traffic quality circuit between Michigan and Texas during the exercise

Recommendations:

While the exercise was successful, there are some recommended areas of improvement:

1. It is recommended that local time be converted to UTC (Zulu) when a message is transferred from REACT networks to RRI networks, particularly when multiple time-zones are involved.

2. RRI operators should be in the habit of recording the time a message was received and/or transmitted and to whom. At the minimum, this would greatly simplify the process of determining message propagation times in an exercise environment. Such information can also prove useful when investigating message delays in a NIMS/ICS operational environment.

3. A future exercise could emphasize local VHF or UHF GMRS or Amateur Service interface with a Radio Relay International gateway for those REACT organizations so equipped. This would allow for frequency multiplexing (QNY procedure) and decrease message propagation times under some circumstances.

4. Future joint exercises are planned. RRI circuits should be loaded with additional message traffic and stress alternate routings via voice and data circuits on occasion to better understand the ability of RRI operators and systems to respond dynamically to a larger scale event.

Summary:

Radio Relay International considers this first joint REACT/RRI exercise a solid success. We would like to thank REACT national leadership as well as the local REACT units for the opportunity to participate in this exercise.

Questions about this document or the exercise may be directed to:

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