Not Your Old PSK/RTTY

Advanced Digital Modes and their Application to Emergency/Disaster Communications

Bart Aronoff / WH6AA
Jackson Tsujimura / KH6DQ

HealthComm

2/12/11
KARC

Acknowledgement

Much of the information presented here is taken from
Introduction to NBEMS and ***Advanced NBEMS***

Powerpoint presentations by
Dave Kleber KB3FXI
O'Hara Twp EMA
kb3fxi@arrl.net

Harry Bloomberg W3YJ
Assistant SEC WPA ARRL Section
w3yj@arrl.net

Development of Digital Modulation

- Advantages over voice
  - Greater range under poor conditions
  - Potential for greater precision
  - May result in permanent record
- Evolution of Technology
  - CW
  - RTTY
  - Computer sound card DSP
- **N**arrow **B**and **E**mergency **M**essaging **S**ystem

Why Digital EmComm?

WH7WL Received

Amateur Radio Emergency Service/Radio Amateur Civil Emergency Service

OAHU ARES/RACES MESSAGE FORM

(For use with City/County Civil Defense, Fire, Police, State Sheriff, Red Cross, etc.)

MSG.# 1 PRECEDENCE: P (E = Emergency P = Priority R = Routine W - Welfare) TIME FILED: (LOCAL) 9:45 (AM) PM 24HR DATE 5/10

TO: ~~Stephanie~~ Tiffany (Receiving Official) LOCATION: BYU - Shelter

FROM: Director (Originating Official) LOCATION: DEM - EOC

Message: ☑ This is an exercise message.

Acknowledge	request	X	roads	all?
closed	at	this	time	X
will	send	when	roads	open
X	this	is	are	exercise
127 Meals &	Teddy Bears.			

Radio Location:

Radio Operator: WH7D

Received: 10:00 (24 hr.)

Sent: :

OCDA - 20 (11/06)

Why Digital EmComm

Clarification to Message #1

Amateur Radio Emergency Service/Radio Amateur Civil Emergency Service

OAHU ARES/RACES MESSAGE FORM

(For use with City/County Civil Defense, Fire, Police, State Sheriff, Red Cross, etc.)

MSG.# 1 PRECEDENCE: _____ TIME FILED: (LOCAL) ____ : ____ AM, PM 24HR DATE _____

(E = Emergency P = Priority R = Routine W - Welfare)

TO: Tiffany LOCATION: _____

(Receiving Official)

FROM: _____ LOCATION: _____

(Originating Official)

Message: ☐ This is an exercise message.

127	meals	+	Teddy	Bears

Radio Location: _____ Received: ____ : ____ (24 hr.)

Radio Operator: WH7D Sent: 10 : 08 (24 hr.)

OCDA - 20 (11/06)

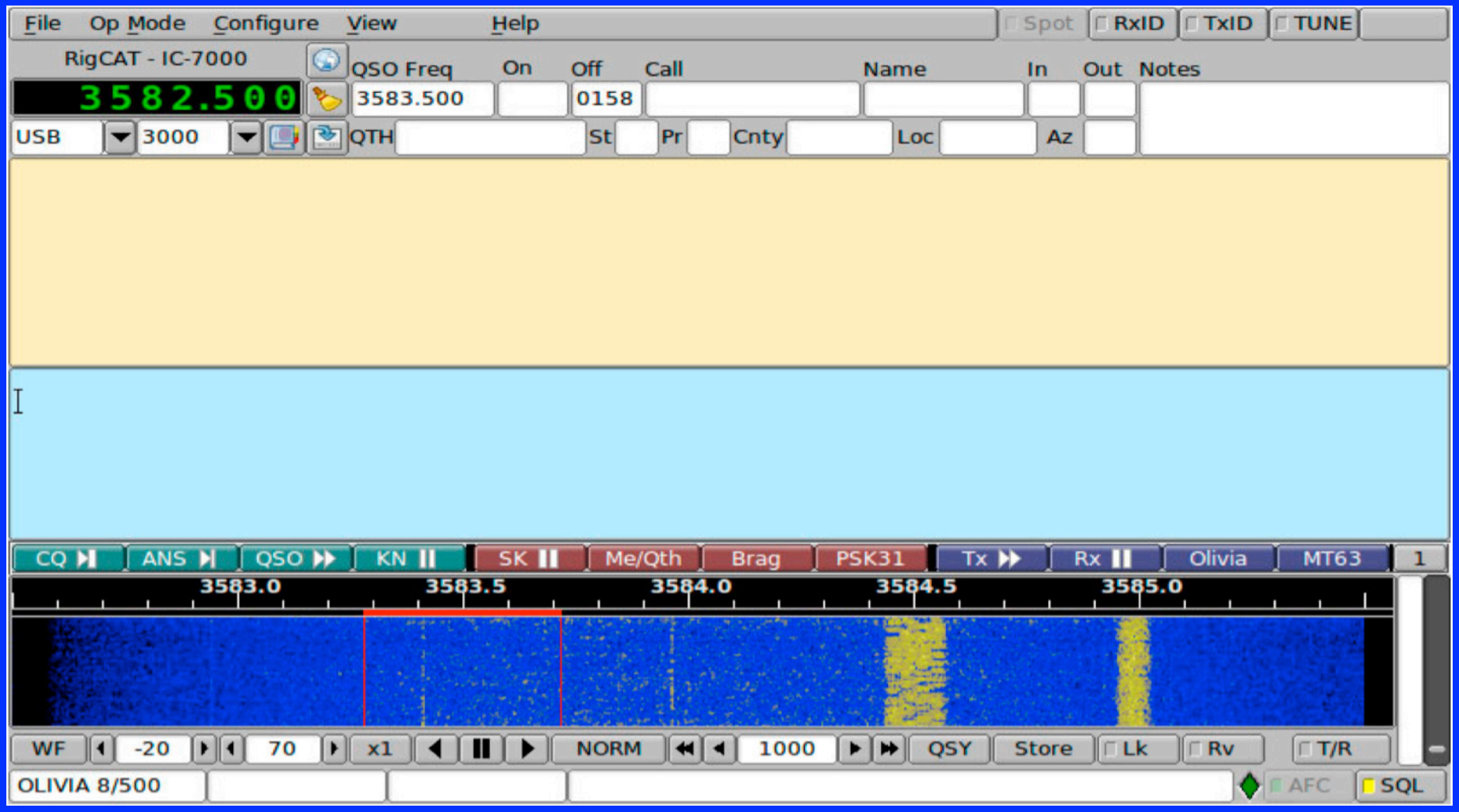
What is NBEMS?

- **N**arrow **B**and **E**mergency **M**essaging **S**ystem
- **Fldigi** – Fast Light Digital modem application
- **Flwrap** – embed a checksum in a file
- **Flmsg** – easily send ICS forms and Radiogram
- **Flarq** – Fast Light Automatic Repeat Request
- Runs on Windows, Linux, and Mac.
- Released under GNU Public License, so is completely FREE
- Can download from http://www.w1hkj.com/

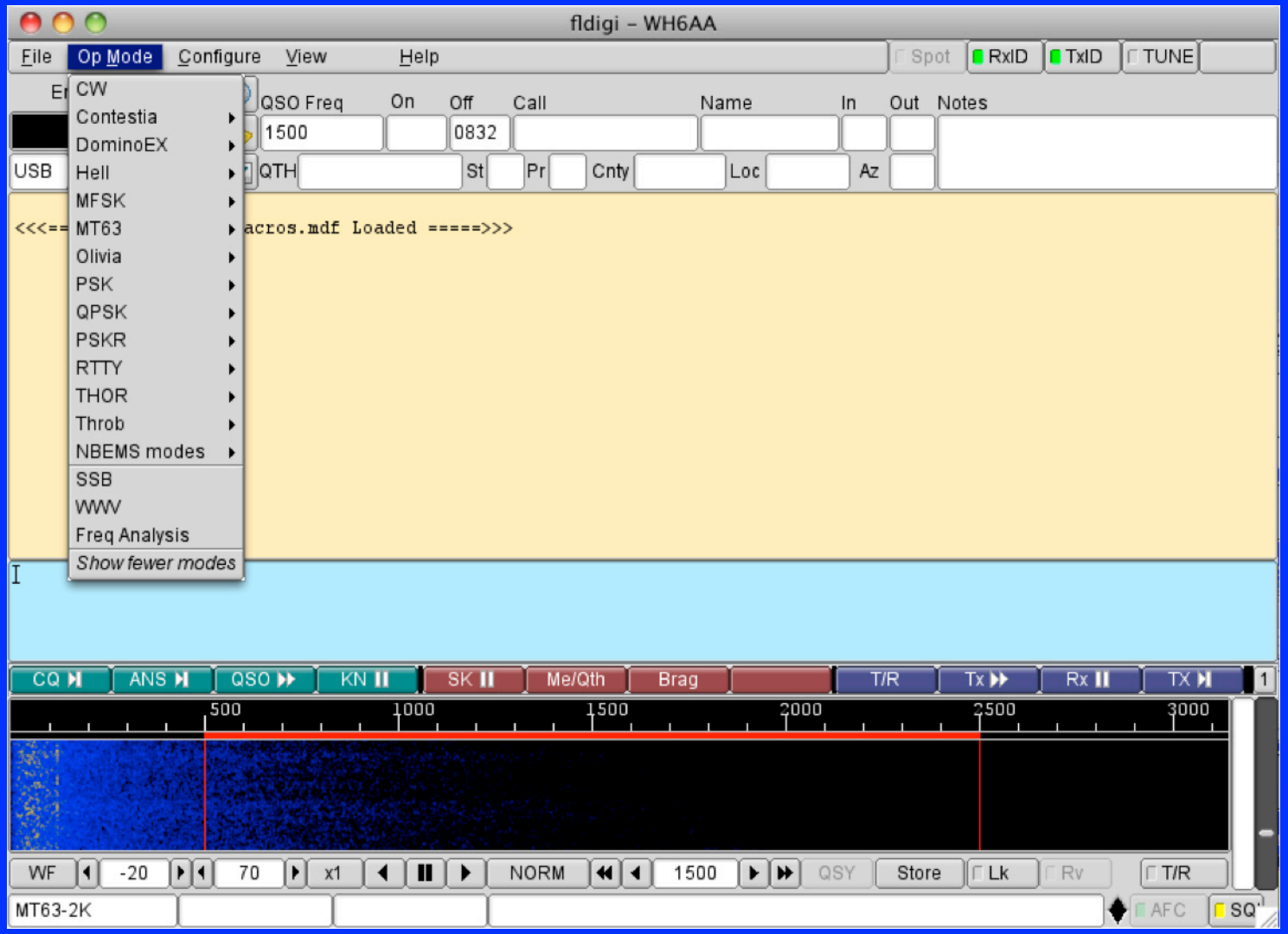
NBEMS Philosophy

- Keep it cheap.
- Keep it simple.
- Use Open Source software.
- Don't depend upon infrastructure.
- Make it fun to use between drills and disasters.
- Any computer, any radio.

Fldigi Interface



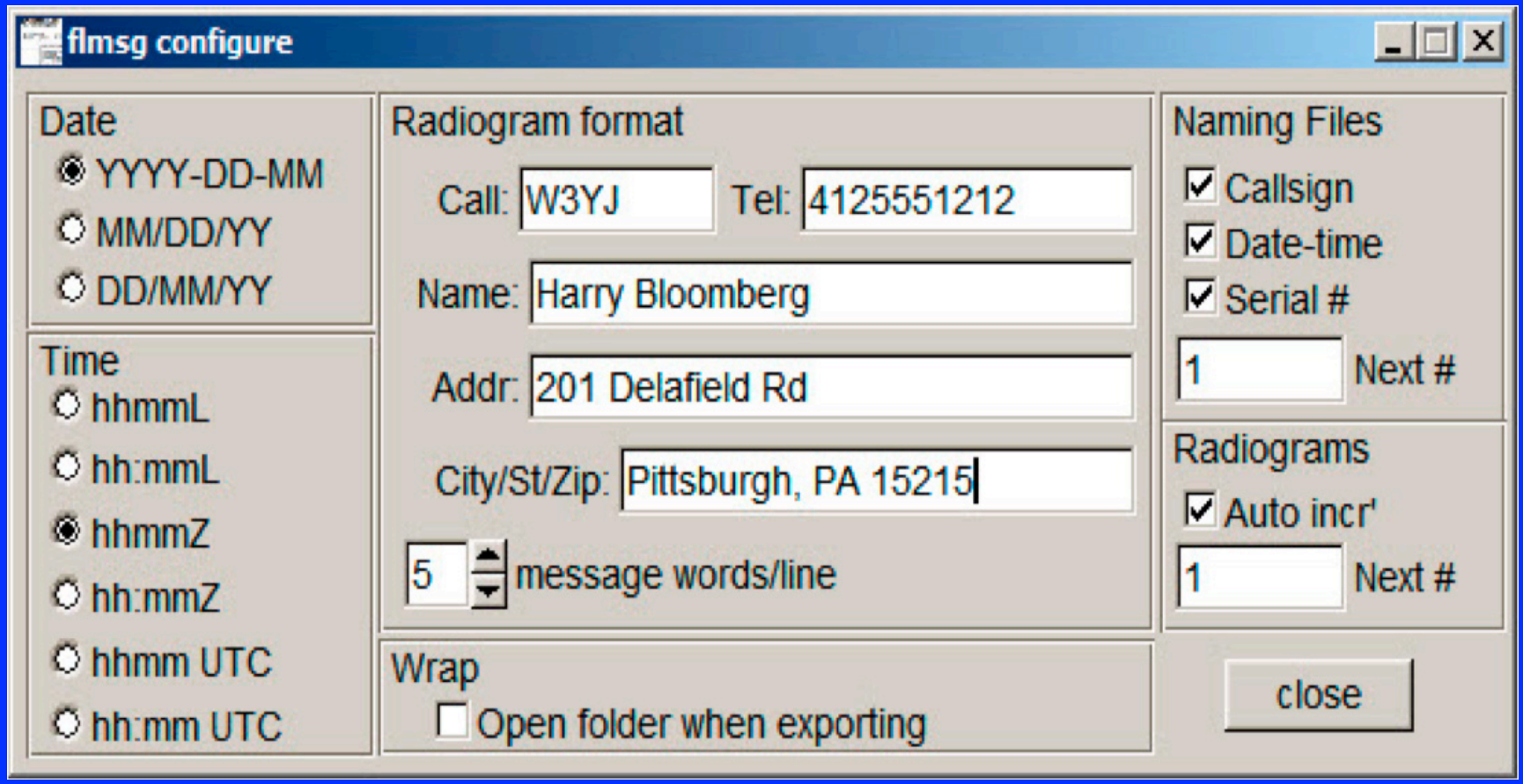
Fldigi Digital Modes



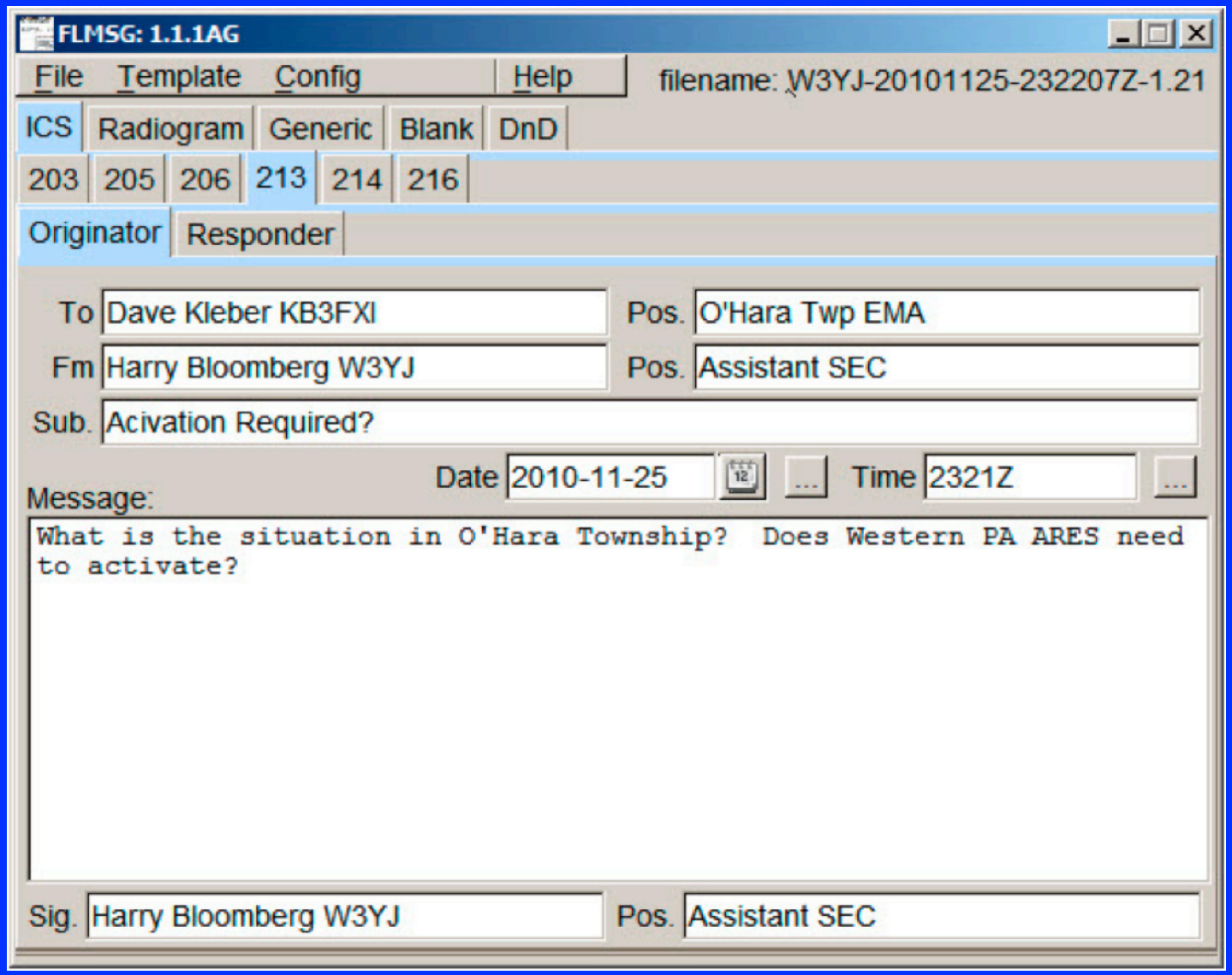
Flmsg – Sends ICS Standard Forms and ARRL Radiogram

- ICS-203 Organization Assignment List
- ICS-205 Incident Radio Communications Plan
- ICS-206 Medical Plan
- ICS-213 General Message (most common)
- ICS-214 Unit Log
- ICS-216 Radio Requirements Worksheet

Flmsg - Configuration



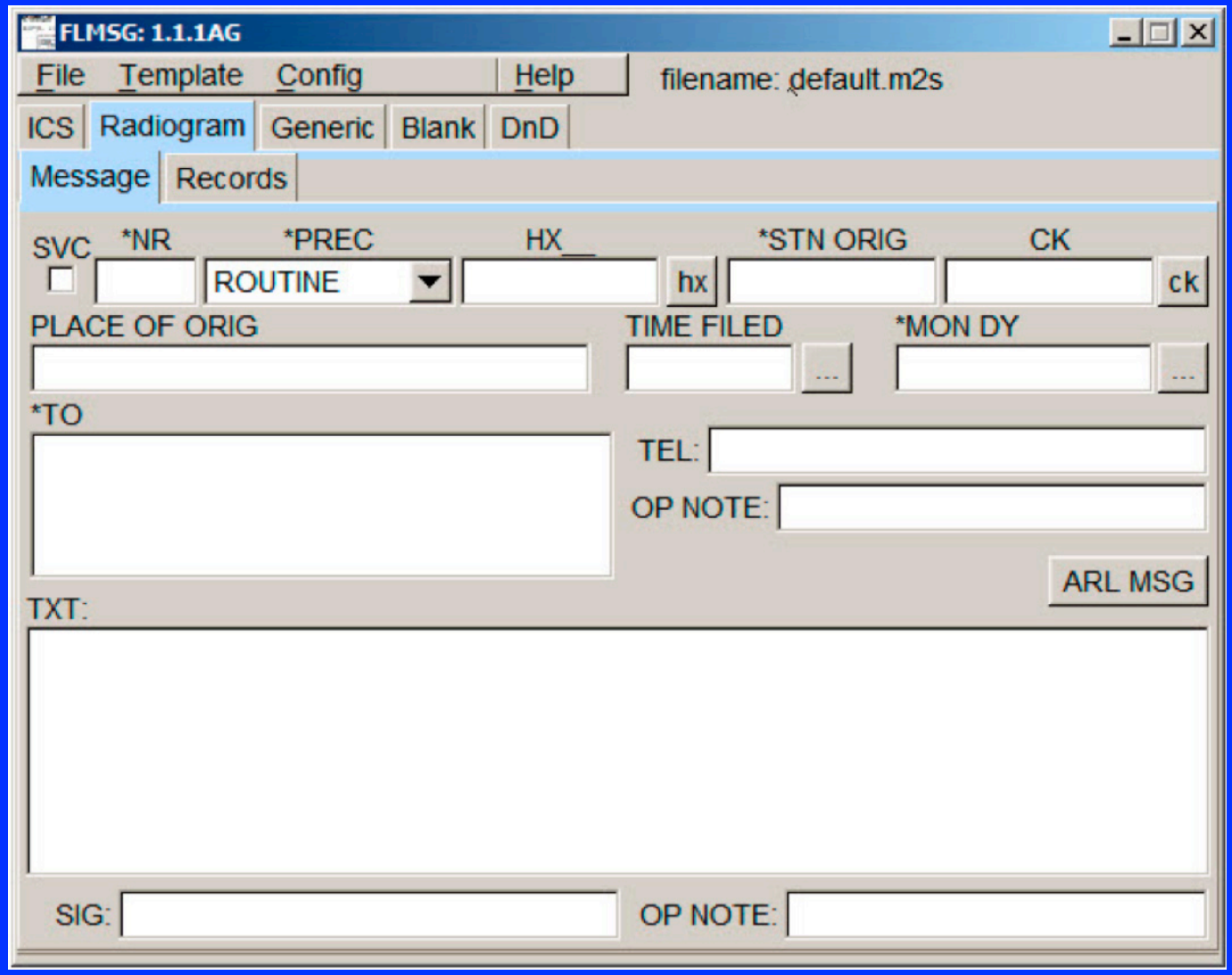
Flmsg ICS-213 Screen



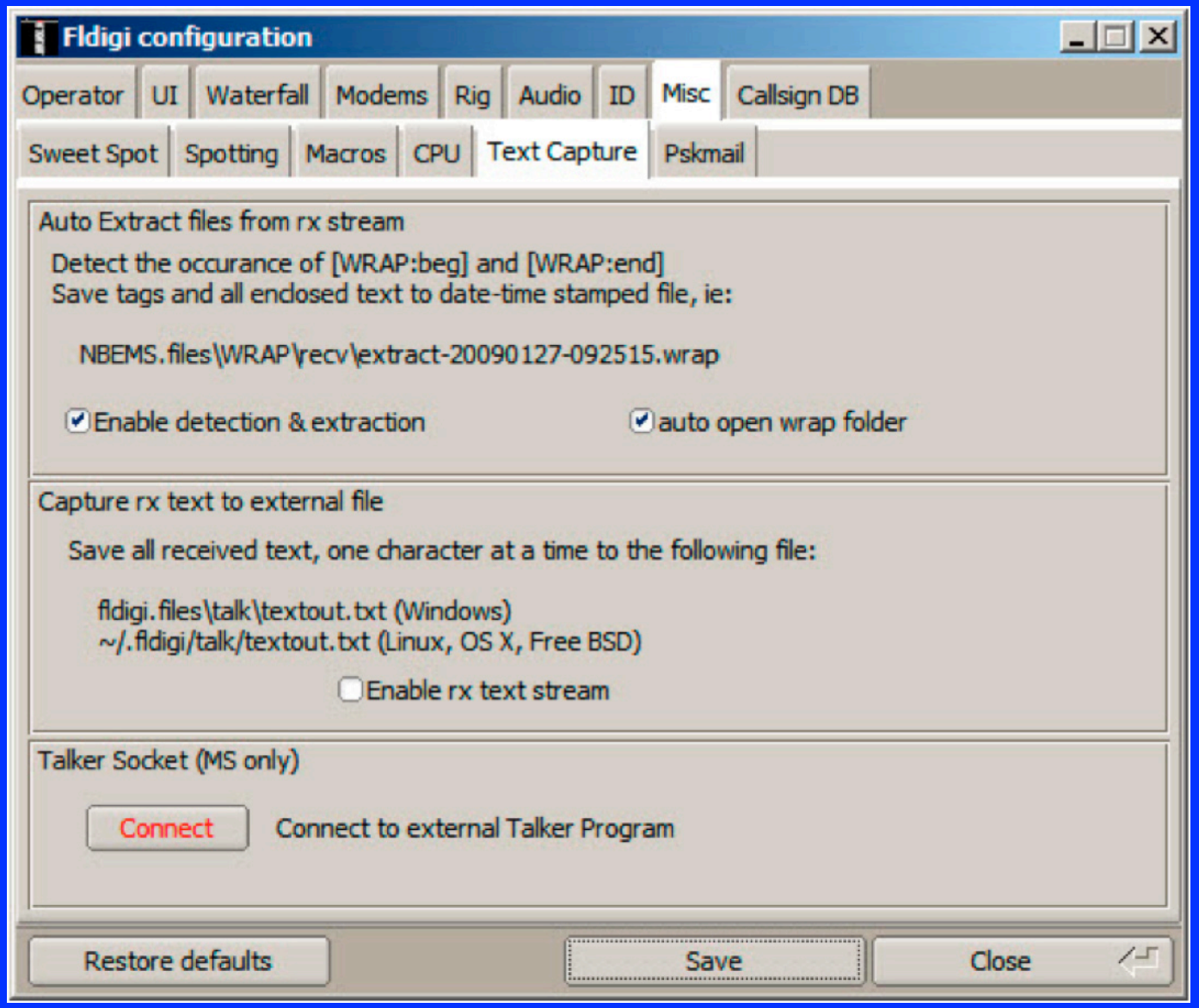
GENERAL MESSAGE
(ics-213)

TO: Dave	POSITION: O'Hara TWP	
FROM:	POSITION:	
SUBJ:	DATE:	TIME:
MESSAGE:		
What is the situation in O'Hara Townshio? Does Western WPA ARES need to activate?		
SIGNATURE:	POSITION:	
REPLY:		
DATE: TIME:	SIGNATURE/POSITION:	

Flmsg ARRL Radiogram screen



Automatic Extraction of Data



Data Verification with Flwrap

- Flwrap allows you to be 100% sure your message was received accurately.
- Checksum is inserted into a file.
- Receiving station computes the checksum on the incoming file and if identical, the file was received without error.
- Allows multiple stations to receive and confirm data 100%.
- Great for bulletins like situation updates, weather reports, road closures, lists of contact info.

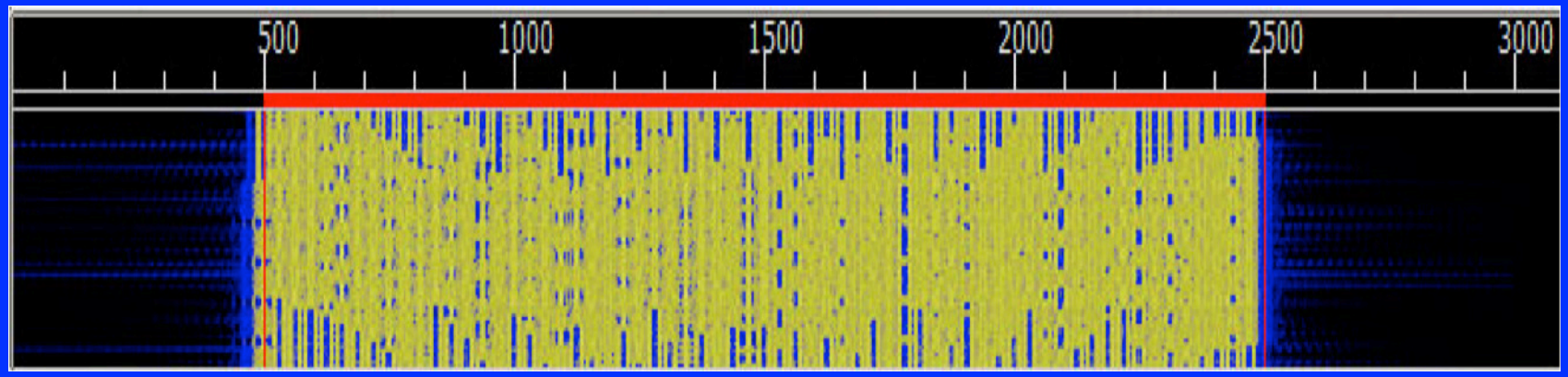
Modulation Modes

- Lots of modes, most popular ones are...
- MT63 (500, 1000, 2000)
- Olivia
- “R” PSK modes...fast with FEC
- PSK31 OK for making non-emcomm contacts, but has no error correction.

MT63 – King of EmComm modes

- Best choice for FM EmComm
- Fast – less than 2 min to send 2kb text file
- Data redundancy in time and in frequency
- Used by MARS
- Very resistant to noise – can lose up to 25% of signal and still copy
- Works well with holding mike up to speaker
- See instructional video Youtube

MT-63 Waterfall



- 64 tones sent at same time
- Signal width is 2000 Hz
- Offset frequency is always fixed at 1500 Hz
- Fixed low frequency eliminates tuning errors
- Sounds like a giant buzzsaw

Local Messaging – How it Works

- Fldigi uses your computer's sound card to generate and decode digital signals.
- All work is done by your computer, don't need an external Terminal Node Controller (TNC).
- Audio from your computer speakers go into your radio's mike input for transmission.
- Audio from your radio goes into your computer's mike or line-in for decoding.
- Don't need an extremely powerful new computer, older machines work just fine, especially with linux.

Inter-Island, HF Modes

- Preferred HF mode is Olivia.
- Solid copy though QRM, QRN, and QSB even with weak signals Can make contacts below noise floor!
- Does not require precise tuning.
- We use 8/500 when possible – 8 tones in a 500 Hz bandwidth.
- When conditions are poor, we go to 16/500 – 16 tones in a 500 Hz bandwidth.
- 16/500 is slower, but will get through.
- http://www.oliviamode.com/

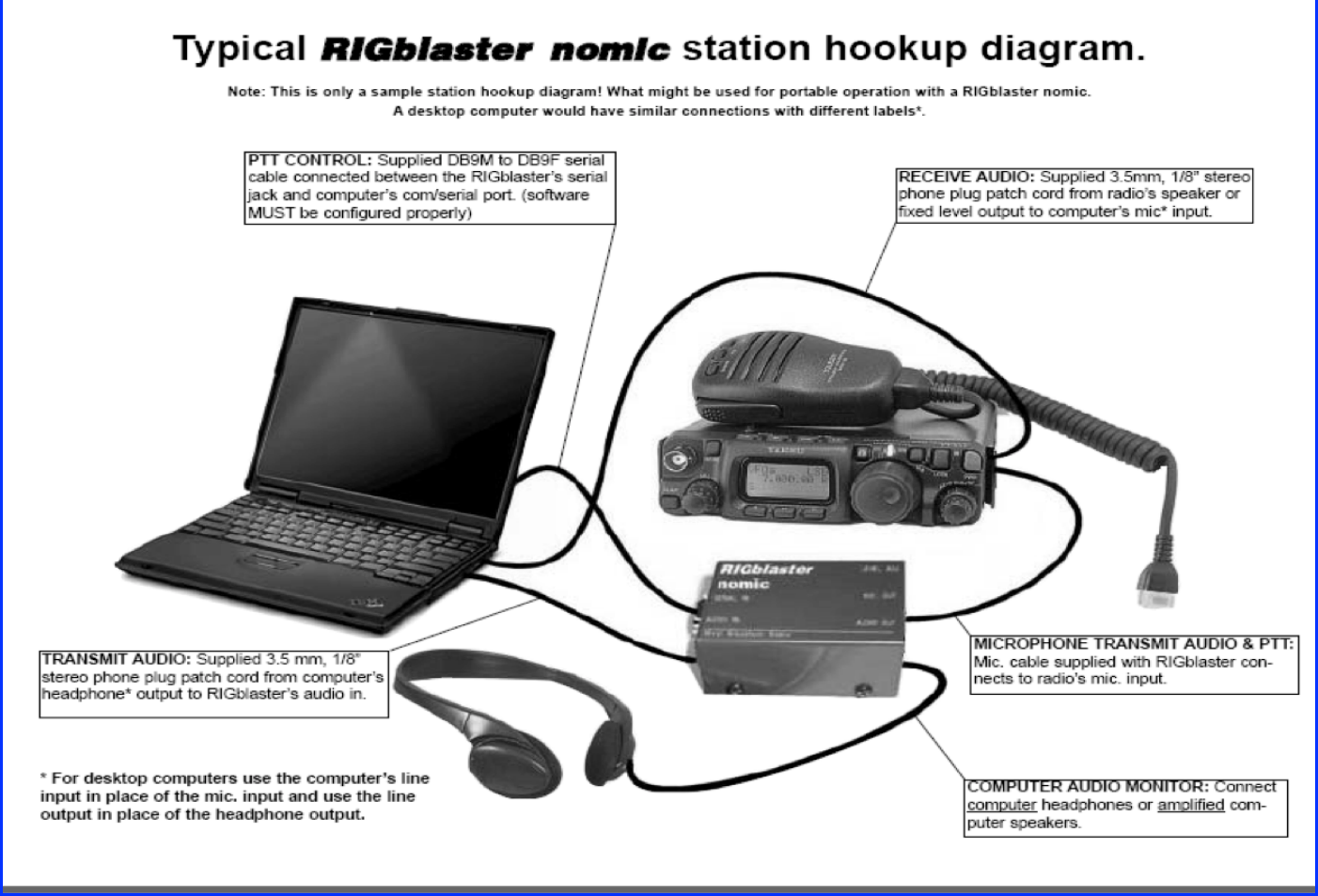
Olivia Modes: Sensitivity vs. Speed

Olivia QSO Formats

Format Bandwidth/Tones	*Audio Center Marker (Hz)*	*Baud*	*Decode S/N Ratio (dB)*	*Speed WPM*
500/16*	750	31.25	–13	19.5
1000/32*	1000	31.25	–12	24.4
500/8	750	62.5	–11	29.3
1000/16	1000	62.5	–10	39.1
500/4	750	125	–10	39.1
250/8	625	31.25	–14	14.6

*The most common Olivia formats in use at this time.

Connecting to Transceiver for HF



Connecting to Transceiver for HF

HF Operating Practices

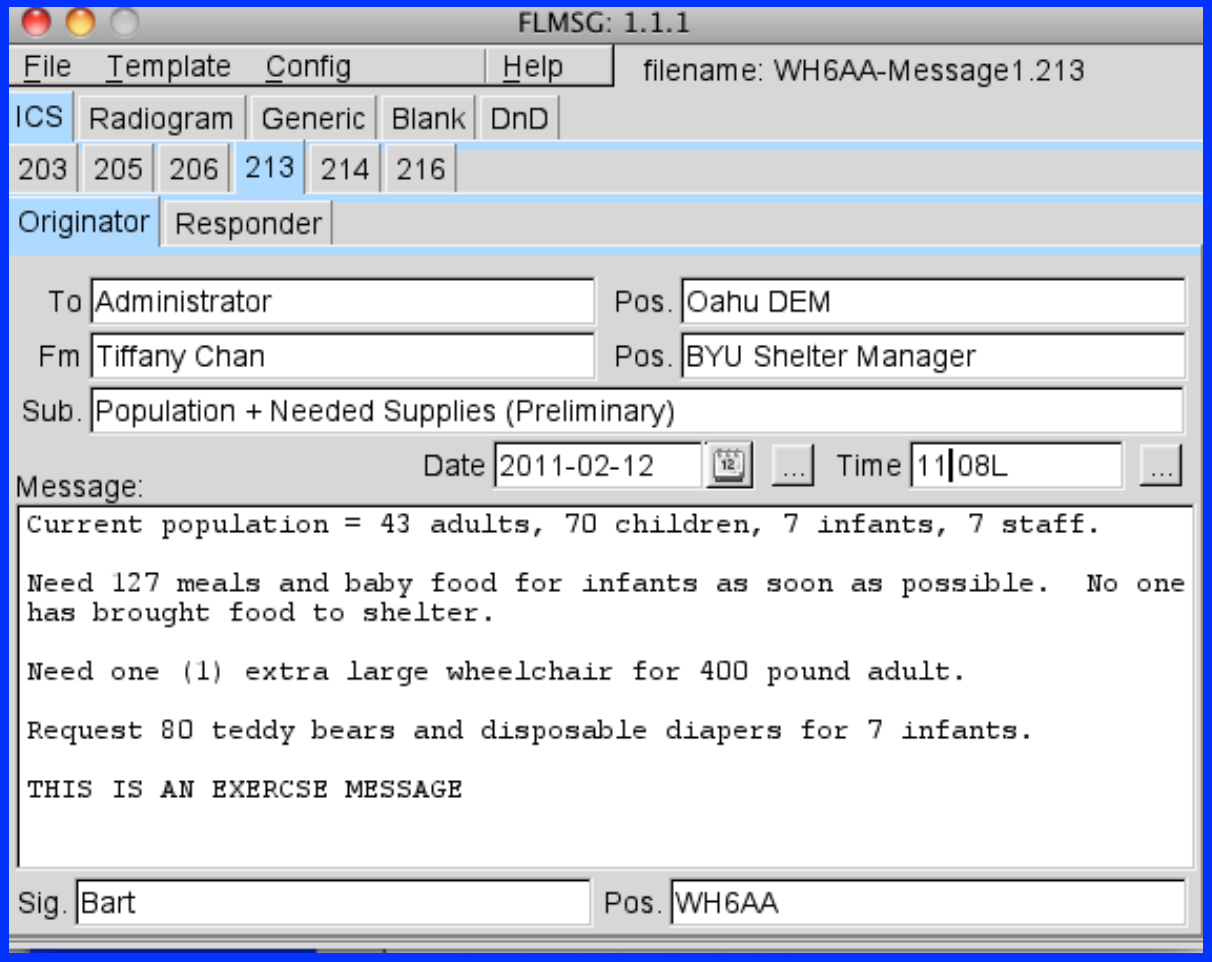
- Always use upper sideband (USB), even on 40M and 80M.
- Disable speech compressor, noise blanker, AGC, and all other audio processing.
- Adjust mike gain so that ALC just moves a little; don't overdrive audio.
- Digital modes are 100% duty cycle like CW or RTTY so 50 watts is plenty.
- RF kills touchpads...use an external mouse!

We Could Use Help

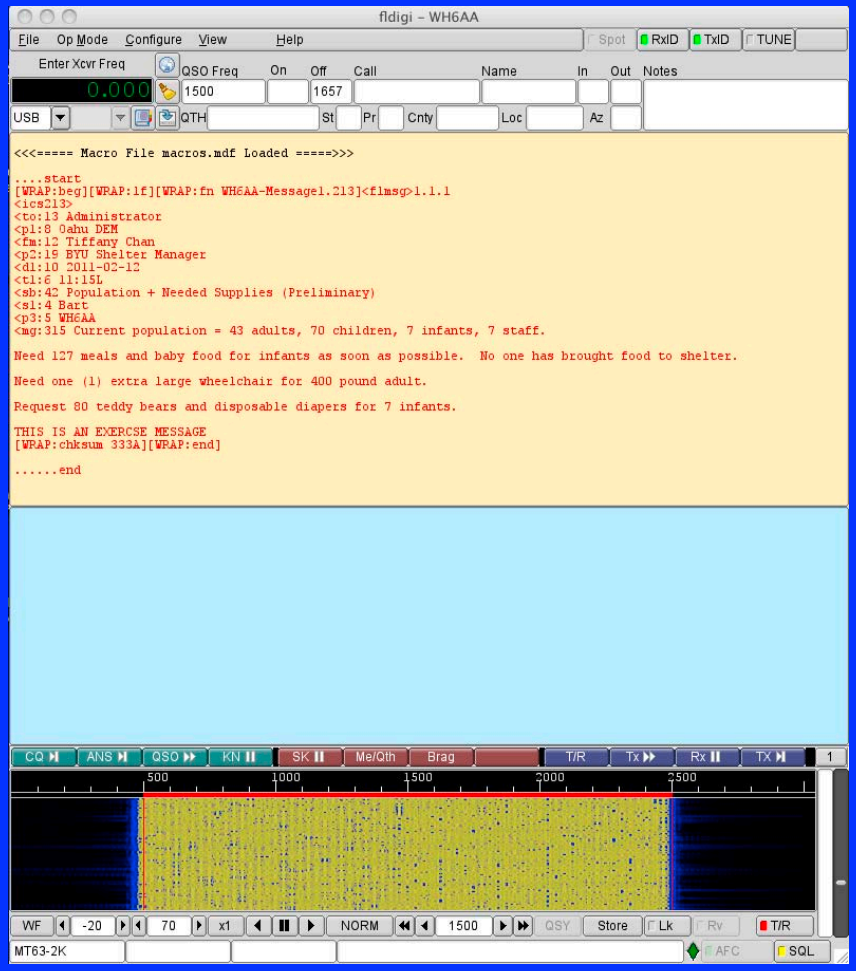
- Linux Elmer
- Practice Net Participants
- 80 Meter NVIS antenna for urban setting
- Community Volunteers for Primary Care Centers

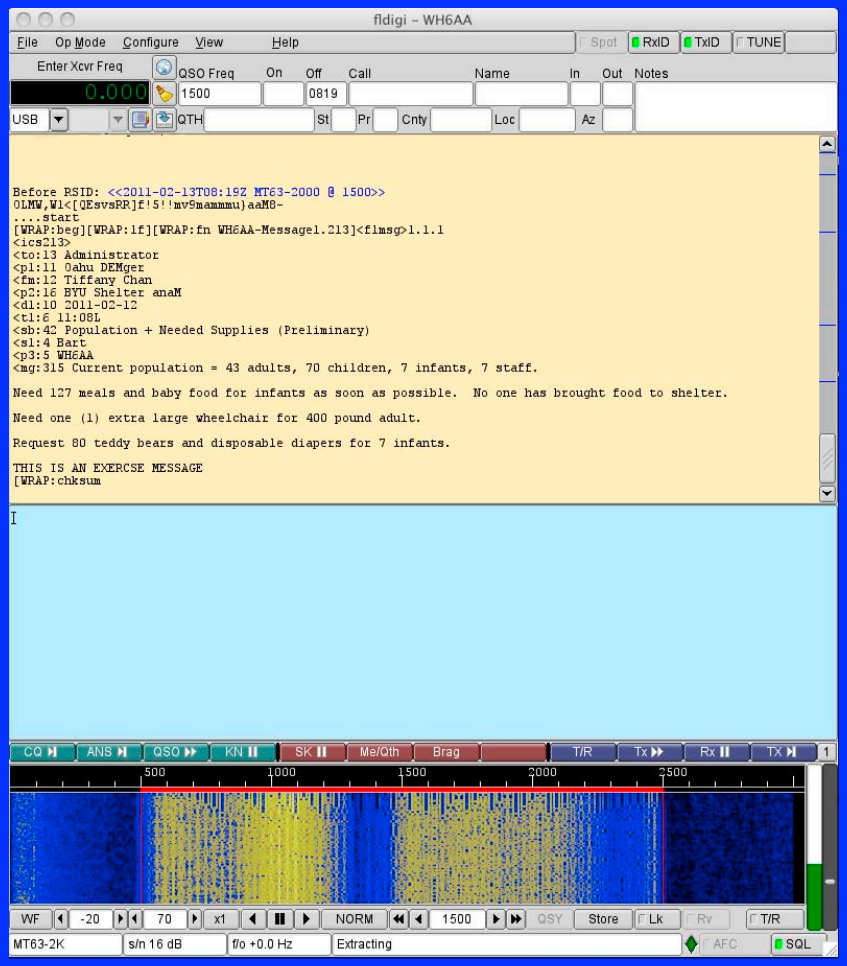
Message Transmission Demo

Message Entered

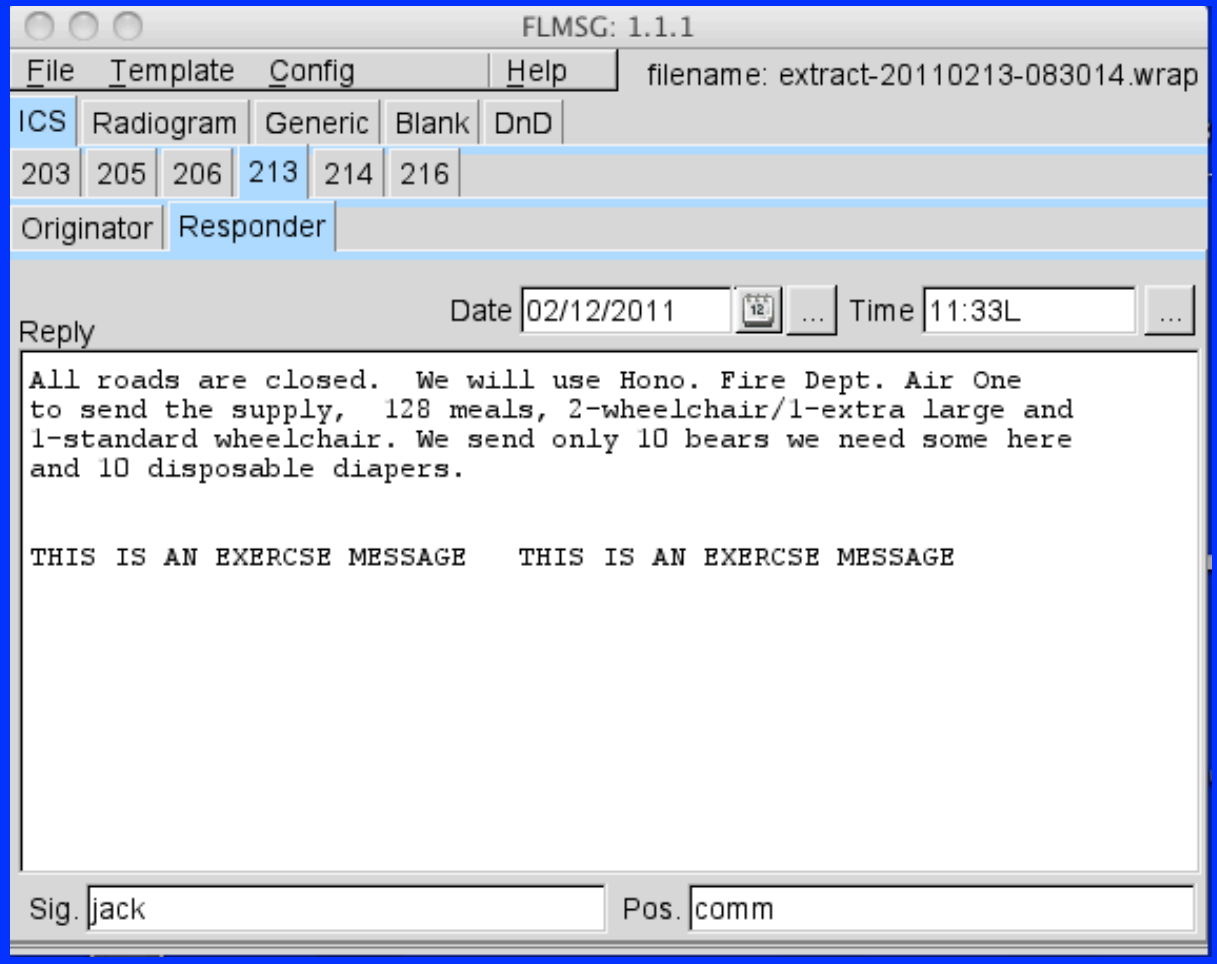


Message Transmitted / Received





Response Entered



Final Document

GENERAL MESSAGE
(ics-213)

TO: Administrator	POSITION: Oahu DEMger	
FROM: Tiffany Chan	POSITION: BYU Shelter anaM	
SUBJ: Population + Needed Supplies (Preliminary)	DATE:	TIME:

MESSAGE:

Current population = 43 adults, 70 children, 7 infants, 7 staff.

Need 127 meals and baby food for infants as soon as possible. No one has brought food to shelter.

Need one (1) extra large wheelchair for 400 pound adult.

Request 80 teddy bears and disposable diapers for 7 infants.

THIS IS AN EXERCSE MESSAGE

SIGNATURE: Bart	POSITION: WH6AA

REPLY:

All roads are closed. We will use Hono. Fire Dept. Air One
to send the supply, 128 meals, 2-wheelchair/1-extra large and
1-standard wheelchair. We send only 10 bears we need some here
and 10 disposable diapers.

THIS IS AN EXERCSE MESSAGE THIS IS AN EXERCSE MESSAGE

DATE:	TIME:	SIGNATURE/POSITION:
02/12/2011	11:33L	jack/comm

Digital EmComm Radio Links

http://www.w1hkj.com/Fldigi.html
The main fldigi software site

http://wpanbems.org/
The purpose of this site is to elmer those interested in NBEMS/ FLDIGI for Emergency Communications and to develop standardized procedures and settings for the use of the software

http://www.wpaares.org/ecom.html
WPA Section Standards for Digital Emcomm

http://www.youtube.com/watch?v=SWZ2vKWSilE&feature=related
Video: Basic NBEMS FLDIGI setup for use with the MT63 mode on FM.

http://berkscountynbems.homestead.com/
Berks County, PA NBEMS homepage. Good links. The Help documents are excellent.

http://www.oliviamode.com/
This site's goal is to present information to help digital amateur radio operators better understand and be able to more efficiently use the different Olivia digital mode configurations

Yahoo NMEMS/FLDIGI groups.

http://groups.yahoo.com/group/NBEMSham/
http://groups.yahoo.com/group/win-fldigi/
http://groups.yahoo.com/group/linuxham/
http://groups.yahoo.com/group/MT63/

Mahalo