Saratoga CERT
Radio Communications Plan

(Preliminary)

November 8, 2008

SARATOGA CERT RADIO COMMUNICATIONS PLAN

1.0 CERT RADIO COMMUNICATIONS OVERVIEW

The generic Saratoga CERT radio communications connectivity is shown in Fig. 1. CERT field personel use FRS radios to communicate with each other and with the District Leader on FRS frequencies. The District Leader or designee is paired with an amateur (ham) radio operator. The amateur radio operator provides the communications link from the CERT field personnel to the Saratoga City EOC, or other CERT teams, on amateur radio frequencies. Amateur radio frequencies are also used to communicate from the City EOC to the Corporate Yard Base.

The Saratoga EOC communicates with the Santa Clara County EOC on a Public Safety frequency pair. Amateur radio equipment located at the Saratoga EOC provides backup communication to an amateur radio station located at the County EOC. This amateur radio link is capable of transmitting both voice and digital (packet) data.

There will eventually be a link between the Saratoga EOC and the Regional OES via amateur radio. This latter capability has not yet been defined or implemented.

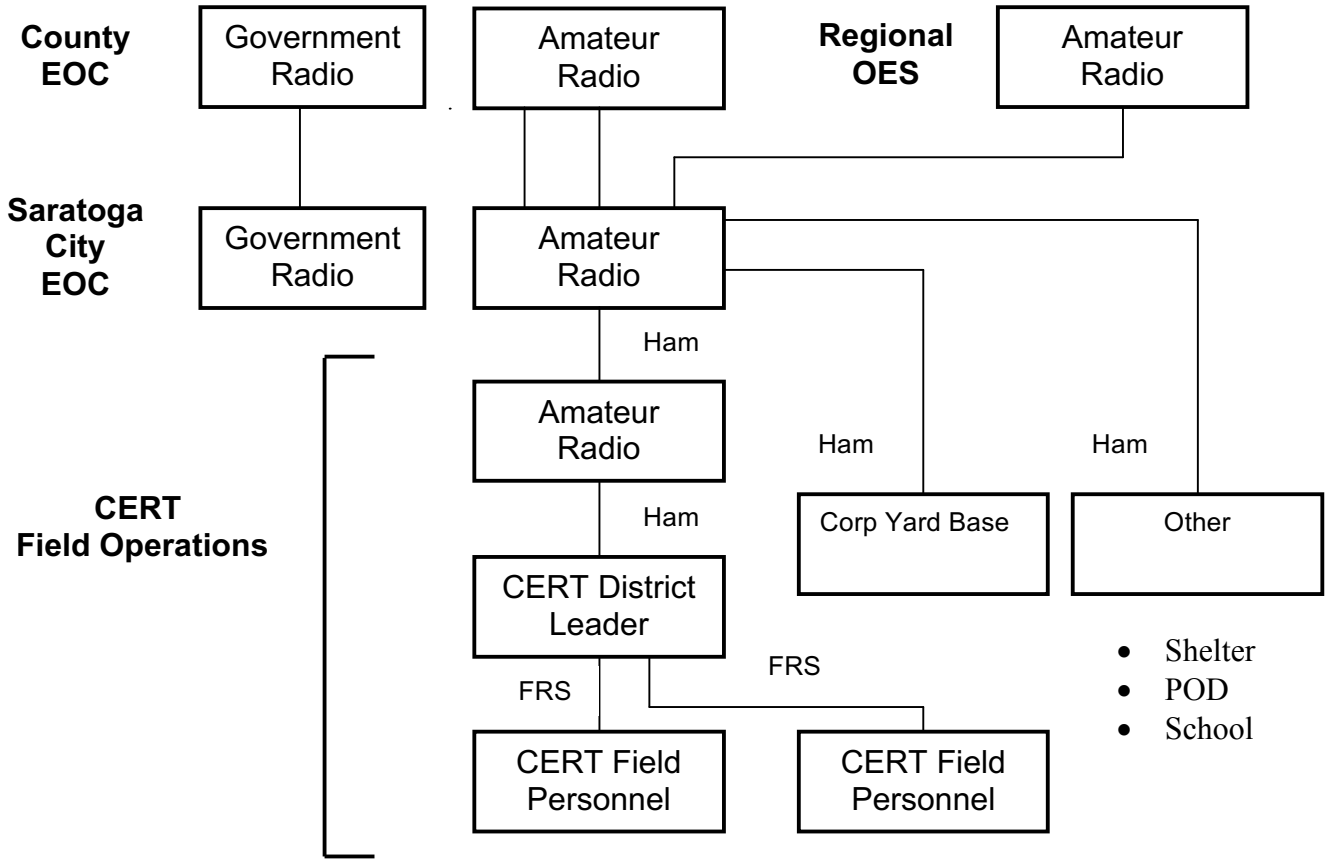

Fig. 1. Saratoga CERT radio communications links

2.0 IMPLEMENTATION

The CERT communication concept described above utilizes CERT communicators using FRS radios on UHF frequencies under FCC Part 95 rules, and amateur radio operators provided by Saratoga ARES/RACES using VHF radios under FCC Part 97 rules. No license is required to operate the FRS radios. An Amateur Radio License, Technician Class or higher, is required to operate the VHF radios.

GMRS, MURS and CB are not utilized in this plan. Some municipalities are apparently planning to use GMRS for general communication in potential violation of Part 95 rules. Saratoga CERT specifically avoids the use of GMRS radio frequencies.

The City of Saratoga has multiple handheld and mobile units licensed on a Public Safety frequency pair. None of those units are utilized in this plan.

3.0 ORIENTATION AND TRAINING

3.1 CERT. Every Division will receive FRS radio familiarization/orientation training by a member of the CERT Communications Committee. Training content will be determined by the CERT Communications Committee and will include topics such as the setup and operation of the radio, how to change frequencies, and communications protocol. The intent is to provide a common operational baseline for all users.

3.2 ARES/RACES. The Saratoga Amateur Radio Association is responsible for creating and maintaining a core group of trained amateur radio operators capable of providing EOC and CERT communications support. Training content will be determined by the SARA ARES/RACES.

4.0 NOTIFICATION AND ACTIVATION

Official notification and activation of Saratoga CERT will be in accordance with the "Saratoga Community Emergency Response Team (CERT) Operational Plan" for the City of Saratoga. Official activation is required in order for individual communicators to be covered by workers' compensation insurance while performing their assigned duties as Disaster Service Workers.

SARA ARES/RACES members will likely convene on the K6SA repeater frequency within minutes after the onset of an event, well before any official activation takes place. County-wide damage assessment polling will likely take place on the AA6BT repeater, again well in advance of any official activation.

5.0 COMMUNICATIONS EQUIPMENT

5.1 FRS radios (issued). Saratoga CERT will issue at least one pair of City-owned FRS radios to each Division.

5.2 FRS radios (individually owned). CERT members are encouraged to use their personal FRS radios since they are already comfortable with their "feel" and operation. The radios must, however, be configured in accordance with Section 8.1, which may be different than they way they are configured for family use.

Desirable characteristics for individually owned FRS radios include:

- Ease of use
    - Can switch channels easily
    - Can disable privacy codes
    - Can lock keyboard
- Replaceable AA batteries
    - Compact but longer life than AAA
    - Readily available battery type
    - Avoids half-charged or no-power scenarios of rechargeable batteries.
- Remote speaker/microphone (with clip) capable
    - CERT members may be busy with their hands
    - Easier to operate while wearing gloves
- FRS-capable only
    - Avoids GMRS license issues
    - Unfortunately, most radios sold today are combination FRS/GMRS

5.3 Amateur radios. Amateur radio operators are responsible for providing and maintaining their own communications equipment. Amateurs operating with CERT teams in the field should have a handheld programmable VHF two-way radio, with a spare battery pack, capable of operating on the 2-meter amateur band. There is no plan for the City to supply any of these radios.

5.4 EOC radios. The SARA is the custodian of the amateur radio equipment installed at the EOC. The SARA will provide operational support to the City-owned radio at the EOC during emergencies and will perform the monthly EOC-to-EOC radio checks sponsored by County Communications. Technical support for the City-owned radio is provided by County Comunications. This equipment consists of a Motorola MaxTrac radio and a colocated Astron power supply.

6.0 EXPENDABLES AND MAINTENANCE

6.1 FRS Radio. Saratoga CERT will supply alkaline (non rechargeable) batteries to each Division for use in the FRS radios. Batteries stored at the Division level will be rotated every year.
Reliance on rechargeable batteries in personal FRS radios is discouraged since once they are discharged there may not be any power available to recharge them. Recharging also takes many hours.

6.2 Amateur Radio. Amateur radio operators will provide their own batteries and power packs.

7.0 SARATOGA CERT AMATEUR RADIO DEPLOYMENT

Amateur radio operators supporting CERT will be assigned to the following locations in the order shown, subject to availability of personnel. These assignments can be changed at the discretion of the City Emergency Manager or his/her designee.

- Emergency Operations Center
    - Three persons (Two licensed amateurs and one support/EOC communicator)
- Divisions (Neighborhoods)
    - One per division. May be the same person as the CERT Communicator.

- Corporate Yard Base
    - One person
- Emergency Volunteer Center
    - One Person if EVC is remote from the EOC
- Rovers
    - Convergent Volunteers (Spontaneous Untrained Volunteers or SUVs) as assigned by the Emergency Volunteer Center
- Point of Distribution, Shelter, etc.
    - One Person (TBR)
- Local Schools
    - One per school (TBR)
- Saratoga Retirement Community
    - None
- West Valley College
    - None

8.0 RADIO COMMUNICATIONS EQUIPMENT INITIALIZATION

The following initial communications equipment configuration is recommended in order to provide a common baseline for all communicators. Modifications to this configuration can be performed by mutual agreement once baseline communication is established.

8.1 FRS Radios. Configure the FRS radios as shown below. Not all radios will have all of the options listed.

- Set the frequency to channel 11 (467.6375 MHz).
- Privacy Code (CTCSS or DCS) or Interference Eliminator Code turned off.
- Call Tone or Call Alert turned off.
- Voice Activated Transmit (VOX or iVOX) turned off.
- QT Noise Filtering turned off.
- Vibrate turned on.
- Keypad Tone turned on.
- "Roger" Beep (end of transmission) Tone turned off.
- Keypad locked once settings are entered.

8.2 Amateur Radios. Amateur radio frequency assignments are determined by the SARA ARES/RACES. Typically, communications will be conducted via the K6SA repeater on a frequency of 146.655 MHz, negative offset, 114.8 Hz PL tone. Yaesu WIRES should be disabled. In the event of a repeater failure, communication will continue on 146.655 MHz simplex. The alternate simplex frequency will be 146.505 MHz, no PL tone.

8.3 EOC Radio. Turn on the Astron power supply and the Motorola MaxTrack radio. Assure channel 1 (duplex) is selected. Channel 2 is simplex.

9.0 COMMUNICATION PROCEDURES

All communicators are expected to follow generally accepted communication procedures, some of which are listed below:

- Listen on the frequency before transmitting in order to avoid interfering with a communication already taking place.
- Speak in plain language and use common terminology.
    - Do not use any "10 codes" or TV cop lingo.
- Speak in a normal tone of voice. Shouting only distorts the voice, it does nothing to increase the range.
- Use predetermined tactical call signs. Amateur radio operators must also use their FCC assigned call sign.
- If someone seems to be in charge (a net control station, for example) listen to them and do what they say.
- Use the four basic procedural words "THIS IS," "OVER," "GO AHEAD" and "OUT."
- Direct all communications to a specific person or unit.
    - Say the id of the unit you are calling, then say "THIS IS" then say your id, then say "OVER." At the end of your final transmission, say "OUT" meaning that you are done and expect no further reply. Using "OVER and OUT" together is unnecessary.
- Respond only to known persons.
    - Say "THIS IS" then say your id, then say "GO AHEAD."
- When transmitting a formal message, say five words at a time and ask for an acknowledgement after each five-word group.
- Do not speak immediately upon pressing the push-to-talk switch, because the first syllable will probably get "clipped." Hesitate for a fraction of a second before speaking
- Test your radio before separating from your group or partner.
- Use universally accepted phonetics. See Appendix 4.

10.0 PRACTICE DRILLS

Communications practice drills will normally be part of a larger CERT exercise. The objective of the drills are to practice and demonstrate communications capability from the Saratoga EOC to the Districts and back (and vice versa), communications within the Districts, and communications between the Districts. Drills also provide the opportunity to practice response to communications anomalies.

Amateur radio support to these practice drills will be performed under ACS authority, rather than RACES, to avoid conflict with FCC limitations imposed on the use of amateur radio repeaters for RACES training.

11.0 INTERFERENCE MITIGATION

All radio communication is susceptible to interference from various sources, natural or man made. Interference may be accidental or intentional. Saratoga CERT can be the recipient or the interferor. The most likely "surprise" interference will occur on the FRS frequencies, probably due to children playing with the radios, or adults trying to contact other family members.

The Saratoga CERT FRS initialization frequency is intentionally chosen to be channel 11 (467.6375 MHz) centered in the FRS-only region of channel 8 to channel 14 so that there are three frequencies (channels) above and below the initialization frequency. It may be possible to avoid an interferor by stepping up (or down) one or two or three channels. Frequency changes must be must be coordinated with the Saratoga EOC to avoid total loss of radio contact.

It might be possible to reduce or eliminate interference by simply moving to a slightly different location. Sometimes, moving only a few inches will make a difference.

Another method is to simply wait for the interferor to "go away." Listening to the conversation may give a clue as to how long the contact will last.

Contacting the interferor to ask to use the frequency for a moment might work, but most likely they are using CTCSS or DCS and can't hear you.

Using CTCSS or DCS does not eliminate interference between units on the same frequency. It simply masks it and creates the illusion of non-interference.

12.0 CONVERGENT VOLUNTEERS

Convergent Volunteers are also known as Spontaneous Untrained Volunteers (SUVs).

Radio-communications-capable volunteers will likely surface in event of an emergency. Some will appear in person and others will show up on the FRS or amateur radio frequencies, particularily on the K6SA repeater.

Those that appear in person should be referred to the Emergency Volunteer Center so that they can be registered as Disaster Service Workers and deployed to local areas needing their expertise.

Those that show up on one of the radio frequencies shoud be utilized as casual informants only, and *not* assigned to any task until they have been registered as a Disaster Service Worker. This is important because the State of California Disaster Service Worker Volunteer Program provides workers' compensation insurance coverage in the event a Disaster Service Worker volunteer is injured while performing *assigned* disaster duties.

APPENDIX 1

Abbreviations and Definitions

ACS	Auxiliary Communications Services
ARES	Amateur Radio Emergency Service
CERT	Community Emergency Response Team
CTCSS	Continuous Tone-Coded Squelch
DCS	Digital-Coded Squelch
EOC	Emergency Operations Center
FRS	Family Radio Service
GMRS	General Mobile Radio Service
MHz	Megahertz
OES	Office of Emergency Services
PL	Private Line
RACES	Radio Amateur Civil Emergency Service
SARA	Saratoga Amateur Radio Association
SUV	Spontaneous Untrained Volunteer
TBD	To be determined
VHF	Very High Frequency
VOX	Voice Operated switch
UHF	Ultra High Frequency
WIRES	Wide-coverage Internet Repeater Enhancement System

APPENDIX 2

FRS/GMRS Frequencies

Chan.	Freq.	Service	T7400*	T9500*	KF-100*		
1	462.5625	GMRS/FRS	1	1	1		
2	462.5875	GMRS/FRS	2	2	2		
3	462.6125	GMRS/FRS	3	3	3		
4	462.6375	GMRS/FRS	4	4	4		
5	462.6625	GMRS/FRS	5	5	5		
6	462.6875	GMRS/FRS	6	6	6		
7	462.7125	GMRS/FRS	7	7	7		
8	467.5625	FRS	8	8	8		
9	467.5875	FRS	9	9	9		
10	467.6125	FRS	10	10	10		
11	467.6375	FRS	11	11	11		
12	467.6625	FRS	12	12	12		
13	467.6875	FRS	13	13	13		
14	467.7125	FRS	14	14	14		
15	462.5500	GMRS	15	15			
16	462.5750	GMRS	16	16			
17	462.6000	GMRS	17	17			
18	462.6250	GMRS	18	18			
19	462.6500	GMRS	19	19			
20	462.6750	GMRS	20	20			
21	462.7000	GMRS	21	21			
22	462.7250	GMRS	22	22			

* Channels by manufacturers radio model.

Frequencies are in MHz. FRS = Family Radio Service. GMRS = General Mobile Radio Service.
A license is not required for FRS-only frequencies. A license is required for operation on GMRS-only frequencies.
A license is not required for GMRS/FRS shared frequencies provided that transmitter power complies with FRS limits (0.5 watts max).

APPENDIX 3

Typical FRS Radio Setup

Function/Menu Selection	Description	Action (for CERT)
Channel Select	Sets the operating frequency. All radios must be on the same frequency. Channel number and frequency are not standardized and might not be the same between different units.	Select one of the seven FRS-only frequencies. Do not use a GMRS-only frequency. Use a GMRS/FRS shared frequency as a last resort.
Privacy Code (CTCSS) or Privacy Code (DCS) or Interference Eliminator Code	Blocks reception of any transmission not using the same code. Most radios have CTCSS codes 1-38. Motorola adds 99 or 121 digital codes . Midland adds 83 DCS digital codes.	Must be turned off to receive signals from radios not set to this same code. Compatibility issue.
Call Tone or Call Alert	Transmits an audible alert tone to other radios set to the same channel and code.	Not functional if the Interference Eliminator Code/CTCSS is turned off.
Vibrate Alert	Radio vibrates when receiving a message from another radio set to the same channel and code.	Not functional if the Interference Eliminator Code/CTCSS is turned off.
QT Noise Filtering (Motorola)	Uses Call Tones in conjunction with Interference Eliminator Codes for enhanced interference masking.	Not applicable if the Interference Eliminator Code and the Call Tone are turned off.
“Roger” Beep (end of transmission) Tone	Transmits a beep at the end of each transmission when the PTT button is released. Alerts other users that you are through talking.	Recommend turning this on.
Voice Activated Transmit (VOX or iVOX)	Radio detects your voice and transmits when you speak. Allows hands-free operation.	Recommend turning off except in special (mobility) cases. Can create undesired transmissions on the frequency due to background noise.
VOX Sensitivity Level	Sets the sensitivity level when using VOX.	Not applicable if VOX is not used.
Keypad/Keystroke Tone or	Radio sounds a beep each time a button is pressed or a setting is changed.	Don’t care. Recommend turning this on to provide user feedback or warning of inadvertant change.
Silent Operation	Disables all “beeps” and “tones”.	Leave “beeps” and “tones” enabled.
Keypad Lock	Prevents accidental changes to configuration settings.	Always keep the keypad locked when not in use.

APPENDIX 4

Phonetic Alphabet

The NATO phonetic alphabet assigns code words to the letters of the English alphabet so that critical combinations of letters can be pronounced and understood by those who transmit and receive voice messages by radio or telephone regardless of their native language.

A	Alpha		N	November
B	Bravo		O	Oscar
C	Charlie		P	Papa
D	Delta		Q	Quebec
E	Echo		R	Romeo
F	Foxtrot		S	Sierra
G	Golf		T	Tango
H	Hotel		U	Uniform
I	India		V	Victor
J	Juliet		W	Whiskey
K	Kilo		X	Xray
L	Lima		Y	Yankee
M	Mike		Z	Zulu

Although these words are preferred, the CERT communicator is free to use any that convey the message and that come to mind. For example, A might be Adam, Apple, Airplane, etc.

MISCELLANEOUS NOTES

Resources (Resource/Capabilty/Utilization matrix?)

The following communications resources were considered as part of this planning document:

Family Radio Service
General Mobile Radio Service
MURS
Amateur (Ham) Radio
Citizens Band
Travelers Information Service
Commercial Television
    Local news
    Saratoga community channel
Commercial Radio
National Weather Service
Saratoga City Business Radio
Emergency Operations Center Business Radio
Satellite Telephone
Cellular Telephone
Landline Telephone
Pager
Internet

Saratoga and vicinity CERT Divisions

Saratoga High School Division – Madelyn Lipford
Foothill Division – Alex Tsao
Quito Center Division - Rodriguez
Cox Avenue Division – Karen Burley
Argonaut Division - TBD
Saratoga Retirement Community – N/A
West Valley College – Kim Aufhauser

Tactical calls