

Sparky: Radio Installation Interim Progress Report (09 May 2010)

Background:

The radio set up in Sparky is predicated on flexibility to allow moving the radios to different operating positions: mobile in the vehicle, indoors at 2 different RTC-TH licensed stations, and 2 portable modes (in Sam the RTC-TH trailer and a backpack mode---presently in design stage).

The present arrangement of equipment allows planned operations for Sparky in full mobile operation (in motion), semi-mobile (short stop/go) mode, and parked (long stop) mode.

Description		Full Mobile	Semi-mobile	Full Park
Active Recon mode		Vehicle in motion on mobile scout operations	Vehicle makes short stops for observation during mobile scout	Vehicle makes observations from a fixed location; possible overnight stop
VHF	Ant swtch 1	5/8 λ magnet whip		
	Ant swtch 2		Slingshot beam	
	Ant swtch 3			Arrow J-pole
	Ant swtch 4			Arrow 4 element yagi
HF	Ant swtch 1	7m whip/wire	1-wire NVIS (if needed)	
	Ant swtch 2		Super Antenna MP-1	
	Ant swtch 3			V-beam
	Ant swtch 4			Dipole w/ ladder line

The basic arrangement is to locate VHF antennas on the driver's side of the vehicle and HF antennas on the passenger side. Mobile / Semi-mobile antennas are mounted on the front half of the vehicle. Full park antennas are mounted on the rear half of the vehicle. Lightning grounding follows the antenna mounting pattern with ICE lightning arrestors located close to the antennas (as per the ICE installation instructions) with front and rear ICE bus bars. (In full parked mode, two ground rods are bonded to each other and the two ICE bus bars and the push-up masts.)

Other Operating options: The options are based solely on RTC-TH operations and do not include any other local HAM radio operators. However, it requires a minimum of 2 RTC-TH operators. The optimum number of operators would be 6-8 to allow for 8 hour shifts, relief, or shuffling operators between mobile and base stations.

- **Parked at an RTC-TH licensed station:** If the licensed station is equipped with a permanent mast/antenna system (with complete ground ring), Sparky can be parked and connected to the antenna/ground ring system without removing the radios.
- **Radios dismantled for use in an RTC-TH licensed station:** The radios (one or both) can be removed from the radio console in Sparky and installed inside the station for operation. The station console would have its own antenna switch, power, external speakers, and ground bus connections for the radio(s). Appropriate HF antenna tuners may also be dismantled.
- **Parked at Sam (the RTC-TH portable / trailer station):** Sam is equipped with a various VHF/HF mast/antenna systems (with complete ground ring), Sparky can be parked and connected to the antenna/ground ring system without removing the radios.
- **Radios dismantled for use in Sam (the RTC-TH portable / trailer station):** The radios (one or both) can be removed from the radio console in Sparky and installed inside Sam for operation. The console in Sam would have its own antenna switch, power, external speakers, and ground bus connections for the radio(s). Appropriate HF antenna tuners may also be dismantled.
- **Recon / Rover for Sam Base:** In this mode, Sparky would use a 2m HT and dismantled VHF mobile and HF rigs/antenna tuners for use in Sam. This assumes Sam will handle longer range VHF and HF communications and Sparky would be handling short range/local emergency scouting communications for Sam. Ideally, the addition of another mobile VHF unit would ensure more reliable mobile communications.

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It is preferred to have a minimum crew of two persons for safety even if only one is a licensed radio operator. However, the equipment layout in Sparky was minimalist design of a single operator. So all controls have been laid out for easy access from the driver's position.



View from exterior front showing the blue PVC pipe cable tray and the tops of instruments on the over the dash mounting bar.



Interior view of the interior front; overhead shelves, over the dash instrument clusters, dash panel, and the top of the radio console.



The radio console contains the radios, antenna switches, 12 VDC power panel and antenna tuners. Station ground bus panel is on the interior firewall directly behind the radio console.

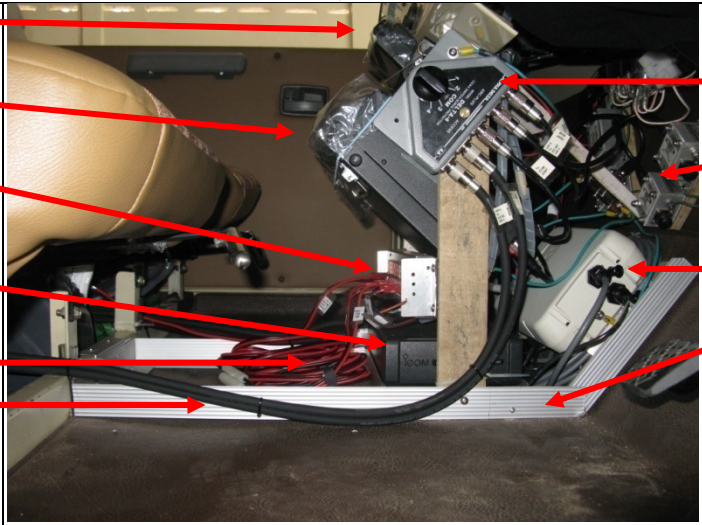



Radio Console (top to bottom/left to right): HF antenna switch, VHF radio, VHF antenna switch; HF radio, 12 VDC power distribution panel, antenna tuner.

The interior crew front compartment in Sparky is spacious due to the minimal controls for the vehicle. There is no clutch or shift lever. Under dash wiring is also minimal due to sparse instruments on the dash: a volt meter, 3 position switch (forward, neutral, reverse), indicator lights for power, battery status warning, turn signal indicator, head lamp indicator, horn, and a pair of 12 VDC accessory sockets.

The radio console is mounted slightly off center under the dash between the driver and passenger seats. Both VHF and HF rigs can be pivoted toward either driver or passenger seats for easy of viewing or operating. Each rig has a separate external speaker mounted on the over dash equipment bar. Microphone hooks are at the top of each vertical strut (HF on left, VHF on right). Microphones are securely stowed and connected only by licensed radio operator.

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← Vehicle Rear	Radio Console, Driver side view	Vehicle Front →
<ul style="list-style-type: none"> • VHF radio (ICOM 2200T) • HF radio (ICOM 718) • 12 VDC power distribution panel (Rigrunner 4010S) • Antenna tuner (ICOM AT180) • Various power cords • VHF coax cables for #3 and #4 optional rear push-up mast mounted antennas 		<ul style="list-style-type: none"> • VHF antenna switch (Alpha Delta 4) • Station ground bus panel with lightning arresters • Antenna tuner (ICOM AH4) • Radio console bracket (aluminum base frame and wood vertical strut)

← Vehicle Front	Radio Console, Passenger side view	Vehicle Rear →
<ul style="list-style-type: none"> • HF antenna switch (Alpha Delta 4) • Station ground bus panel with lightning arresters • Antenna tuner (ICOM AH4) • Radio console bracket (aluminum base frame and wood vertical strut) 		<ul style="list-style-type: none"> • VHF radio (ICOM 2200T) • HF radio (ICOM 718) • 12 VDC power distribution panel (Rigrunner 4010S) • Various power cords • Antenna tuner (ICOM AT180) • HF coax cables for #3 and #4 optional rear push-up mast mounted antennas

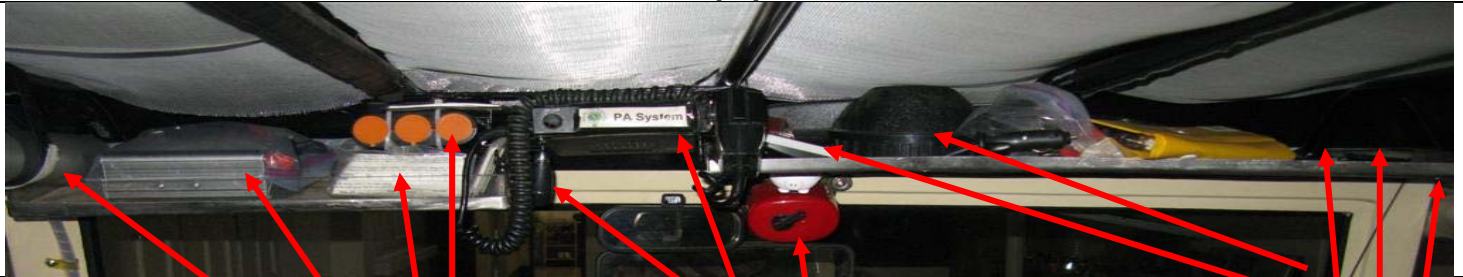
All equipment in the radio console is individually grounded to the Station Ground Bus Panel.

VHF Antenna / Lightning Arrestor Array				HF Antenna / Lightning Arrestor Array			
Switch post	ICE type	Antenna	Position/use	Switch post	ICE type	Antenna	
1	#302	5/8 λ whip; magnet	Front roof; mobile/short stops	1	#308	7m whip/wire	AH4 tuner
2	#302	Slingshot beam (to be made for short stop use only')		2	#300	1-wire NVIS	
3	#302	Arrow J-pole	Rear; mast mounted; parked	3	#300	Super Antenna MP-1	AT180 tuner
4	#302	Arrow 4 element yagi or Hentenna		4	#309	V-beam (to be made) Dipole; ladder line fed	

Notes: Coax jumpers for rear mounted antennas are connected to the antenna switches and stowed. They are to be connected to appropriate rear ICE units as rear push up masts are deployed.

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Overhead Shelf Equipment/Installation



- Push-up masts
- 12 VDC to 220 VAC inverter
- 12 VDC adapter
- Triple 12 VDC accessory sockets

- LED dash light
- PA system
- Windshield wiper motor

- Map lights (stowed)
- Hand-help spot light
- Portable rain gauge
- Binoculars
- LED dash light

Over Dash Instrument Cluster Quadrants



Passenger Side	Passenger Center	Driver Center	Driver Side
Communication / Storage Cluster	Weather Cluster	Navigation Cluster	Communication / Storage Cluster

Passenger Side Communications / Storage Cluster



- HF External speaker
- Plastic box storage space

Weather Cluster



- Seiko Instruments WF-110
- Strike Alert Lightning detector
- Kestrel 3000 pocket weather station stowed in plastic box

The Weather Cluster consists of 4 specific units which are not all visible in the photo. The Seiko WF-110 and Strike Alert units are visible. The Kestrel 3000 pocket weather station is stowed in the plastic box/white lid (in lower right of photo). The portable rain gauge is stowed in the driver side overhead shelf. (Note: Seiko WF-110 temperature data is NOT suitable for MEWS---Mobile Emergency Weather Station observations. MEWS quality data is reported using the Kestrel 3000 unit which is better suited to support flight data reports. A wind streamer can be deployed at the top of a push-up mast / antenna system.)

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Navigation Cluster



Driver Side Communication / Storage Cluster



- *Altimeter*
- *Magnetic Compass*
- *Pitch / Roll Indicator*
- *GPS (Global Positioning System)*

- *Digital Camera (still / video capable)*
- *VHF External Speaker*
- *2 m HT holder*
- *Cell phone holder*
- *Blue Storage box*

Future work scheduled:

Antenna Construction: Some antennas have yet to be made.

- VHF slingshot beam:
- HF V-beam
- HF multi-band inverted V dipole (ladder line fed)

Antenna Installation: The next critical phase for this installation effort involves the antennas.

Some antennas are yet to be made. Some exist, but need to be installed and “tuned” for use on Sparky. Some mounting issues involve the fact that Sparky has a mostly fiberglass body. This present a problem to use a magnet mounted antenna. A front roof bracket mount is being designed to support the VHF magnet mounted antenna and the slingshot VHF beam antenna. It will also provide the grounded mounting point for the 1-wire dual band NVIS antenna (back up to the HF bumper mounted whip / wire antenna).

The rear push-up mast (one each for HF and VHF antennas) mounts are being designed. Two basic designs are being considered. The final design will affect various details concerning feed line connections/lengths and masts / antenna grounding.

Antenna Tuning: All antenna installations then need to be tuned for optimum performance when set up on Sparky.

Operational Testing: All antennas installed on Sparky will need to be “road” tested in all operational modes (full mobile, semi-mobile / mobile-at-rest / full park). These tests must also be conducted at the two licensed RTC-TH station sites and the “most likely” RTC-TH portable operating sites (e.g. Ban Na Fa elementary school, RTC-TH Hill top farm site, Thawangpha District Office open field).

Support Supplies:

Food / Water: The plan is to pack Sparky with sufficient food/water to support a 2 person crew for a 1-2 days recon deployment.

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Personal Gear: Each crew member would pack sufficient personal items for a 1-2 day camp out. Sparky would be equipped with a tent and bedding for 2 people. Even when deployed with Sam (the RTC-TH EmComm trailer), Sparky could still be available for 1-2 day recon deployments away from the portable base station.

Power Supply Options:

- **12 VDC from Vehicle:** Presently, the radios are powered by a dedicated battery completely separate from the vehicle. (This allows use of the vehicle batteries fully for transportation. Maximum range is 80 km/full charge. A maximum round trip plan would mean an operating range of 40 km/full charge for a round trip. At this time, an “optimum” operating radius is set a 20 km/full charge to provide a battery “reserve” of about 500 amp hours for radio operations from the vehicle batteries. This should be field tested and verified.) A separate power line must be prepared from the vehicle to the 12 VDC power distribution panel in the radio console.
- **220 VAC line power:** A quality extension cord and 220 VAC surge protector will be fitted to Sparky. In the event access to 220 VAC is available, a float battery charger will be connected to charge the radio battery.
- **Solar Panel:** Future plans call for fitting 1 or 2 solar PV panels to a roof rack with an option to allow the panels to be ground mounted to recharge the radio battery.
- **External Generator:** In the future, Sam (the RTC-TH trailer) may be equipped with a portable generator with 12 VDC and 220 VAC output which could then be used to provide power to recharge the radio batteries.
- **Hydrogen Fuel Cell:** CFEE, the maker of Sparky, has been researching hydrogen fuel cell technology. A small 500 watt unit should be adequate to provide power for 2 radios. A 3 kw unit might be able to power a small office. CFEE has also been researching producing hydrogen via small solar powered home units.