

	Rural Training Center-Thailand: Technical Paper ศูนย์ฝึกอบรมชนบท-ประเทศไทย: ทางเทคนิคกระดาษ <h2 style="text-align: center;">Portable Slingshot VHF Antenna Set-up</h2> <p style="text-align: center;">© 2011, All rights reserved.</p>	
www.neighborhoodlink.com/org/rtc2k5	E-mail: rtc2k5@gmail.com	
Community-based environmental education for the self-sufficiency and sustainability of small rural family farms ชุมชนตามสิ่งแวดล้อมศึกษาเพื่อการพึ่งตัวเองและยั่งยืนชนบทขนาดเล็กครอบครัวฟาร์ม		

You may post questions / comments to the Discussion area of our website

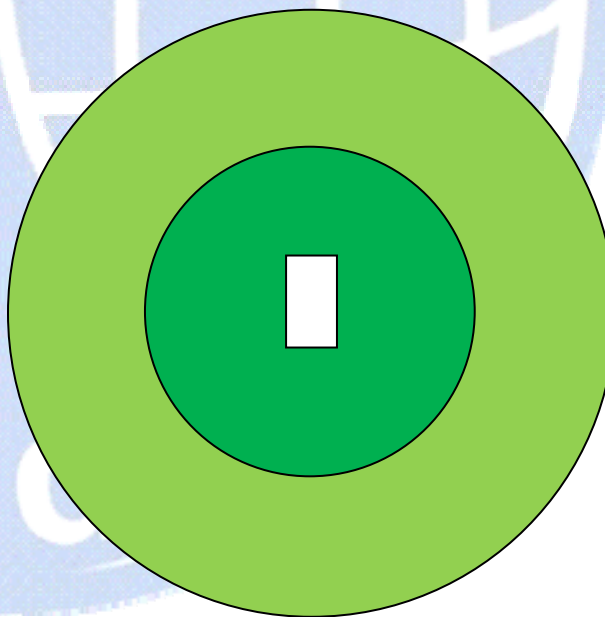
The Slingshot VHF antenna was built using plans and information from www.hamuniverse.com/slingshot.html but adapted to our circumstances in rural Thailand. These set-up procedures pertain to the portable slingshot antenna used with Sparky, the Batt-mobile (the RTC-TH alternative energy demonstration vehicle).

The Slingshot beam antenna would be used in a park 'n stop portable operating mode. Sparky might be deployed in recon/scout operations and if necessary, use the slingshot antenna to communicate when the normal mobile vertical whip antenna was ineffective.

Parking Site: The set up process begins with selecting a suitably level parking position that is vertically and horizontally clear of overhead obstructions. To quickly estimate the slope of the site, tie a brightly colored streamer to the horizontal cross bar below the PA speaker roof rack on the passenger side of Sparky. From a distance of 18m, place a walking stick perpendicular to the ground. Hold a hand sight level against the stick and sight in on the streamer on Sparky. Use a short measuring tape to get the height of the sighting level elevation in meters. Divide by 18 and express the result as a %. If the slope is 0-12.5% (0-7° angle), the site is considered level. [**Note:** This is the same slope angle for a “level” helicopter landing zone. Slopes from 12.5-25% / 7-15° require helicopters to hover but not land.]

Avoid parking under overhead obstructions, especially utility lines/wires. This is an absolute “No Go” condition when using push-up masts. Sparky carries a variety of optional push up mast/antennas that extend to about 8 m AGL—above ground level. A horizontal stand-off for Sparky is 16 m allowing the use of any combination of push-up mast/antenna onboard without moving Sparky. The minimum horizontal stand-off for the slingshot antenna is 11m.

The horizontal stand-off is a safety precaution should the mast/antenna fall. Without guy-lines, assume the fall zone would be equal to the total height of the



Dark green is minimum horizontal stand-off from overhead obstructions is 11m for the slingshot antenna. Light green is 16m. If conditions change, calling for optional taller push-up masts, Sparky won't have to be moved. (Note: Diagram is not to scale.)



Set the hand parking brake; post the warning sign



Set the wheel chocks on a rear tire.



Post the warning sign.



Slide the PVC base cup bracket into place on driver side.



Deploy driver side PVC at right angles to vehicle.

mast/antenna. If properly guyed, the fall zone would be about 1/3 the total height of the mast/antenna.

Parking:

- Set the hand parking brake and post the warning sign.
- Set the wheel chocks on a rear tire and post the warning sign.

General Prep: Unload the slingshot antenna components from Sparky:

- Light weight aluminum push up mast
- PVC stem/extension
- PVC base cup bracket (driver side)
- Slingshot antenna
- Coax cable & tether cord
- 2-way mast level
- Medium flat blade screw driver

Setting the Mast Mount: The Slingshot antenna uses the driver-side (starboard) mid-ship side mount.

- Slide the base cup bracket onto the under frame mount.
- Loosen the clamps and pivot the outrigger perpendicular to the side of Sparky. Do not tighten the clamps yet.

Install the Mast:

- Remove the white end cap from top of the mast.
- Slide the mast into the outrigger PVC T-fitting.
- Place the bottom end of the mast into the PVC base cup.
- Use the 2-way mast level to assure a perpendicular mast alignment. Adjust the PVC base cup and/or PVC T-fitting as needed to get the mast as perpendicular as possible. When you are satisfied with the alignment, tighten the clamps of the PVC T-fitting.



Unload the light weight blue push up mast.



Remove the white rubber grip handle.



Insert the push up mast in the PVC mast supports.



Use the 2-way mast level to vertically align the mast.



Get the jumper to the VHF switch #4 position.



Put it behind the back seat into the rear compartment

Sparky Coax Connections: The Slingshot uses the VHF #4 ICE lightning arrestor located in the rear compartment. It uses the coax jumper to the #4 position of the VHF antenna switch at the driver-side of the under dash radio console.

- Connect the antenna switch jumper coax to the “radio” SO-239 (top) on VHF #4 ICE.
- Connect the coax from the Slingshot antenna to the “antenna” SO-239 (bottom) on the VHF #4 ICE.

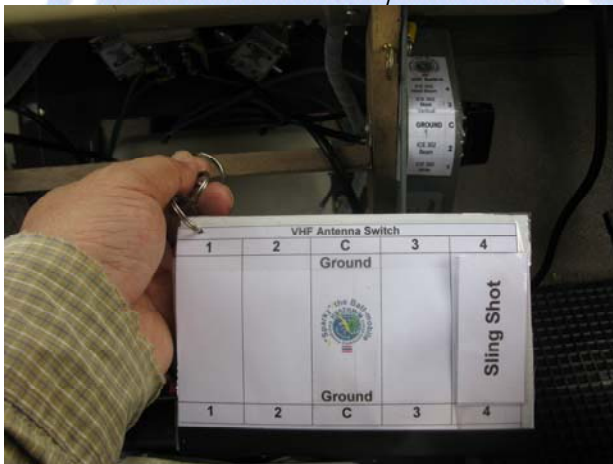
- Put the Slingshot ID tab in the VHF Antenna reminder card near the VHF antenna switch.
- Connect the VHF antenna switch to the radio.



Connect the VHF antenna switch jumper to VHF ICE #4 located in the rear compartment



Connecting coax feed line to VHF ICE #4 from under the rear compartment..



Inserting the Slingshot ID tab in the VHF Switch card



Connecting the radio to the antenna switch.

Antenna Rigging:

- Insert the PVC extension/stem into the PVC T-fitting on the Slingshot antenna.
- Insert the combined Slingshot antenna, PVC extension/stem into the upper section of the lightweight Blue push-up mast.
- Line up the holes in the mast and the yellow stem; insert the locking pin and secure it with the rubber friction band. **[Note:** This locks the antenna to the mast so it can be rotated manually by turning the mast.]
- Tether the coax with air choke to the antenna. Be careful the tether is secured around the PVC T-fitting so the load is not put on the aluminum antenna elements. Use the blue guide marks on the tether to get the proper alignment to tie the tether. Below the PVC T-fitting, the air choke is secured to the PVC extension. Tuck in tail end of the tether so it will not whipped around in the wind. (See details on p. 8.)
- Remove and stow the dust caps from the antenna and coax. Firmly attach the coax to the SO-239 on the antenna.

[Note 1: Double-check all coax connections BEFORE raising the mast.

[Not 2: This mast is **not grounded** for lightning as the fittings and connections for the segments would restrict easy raising and lowering of the mast/antenna assembly. The lightning detector should be turned on anytime push-up masts are deployed. When lightning is detected, radio operations should cease. This means: 1) turn off all power to radios, 2) disconnect the radio from the antenna switch and ground the coax, 3) lower the mast / antenna to the lowest position, 4) then seek appropriate shelter and wait the appropriate time to resume operations. Lightning can strike 56+ km away from a storm even when you under clear skies.]



Unload the Slingshot PVC extension/stem.



Get the Slingshot antenna



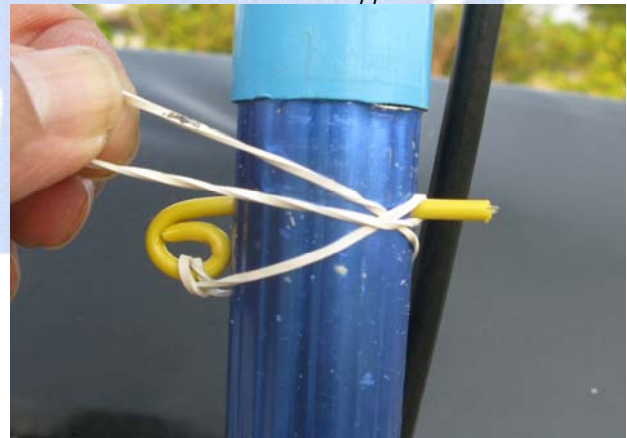
Attach the PVC extension/stem to the Slingshot



Insert the stem into the upper mast section



Line up the locking pin holes.



Insert and secure the locking pin.

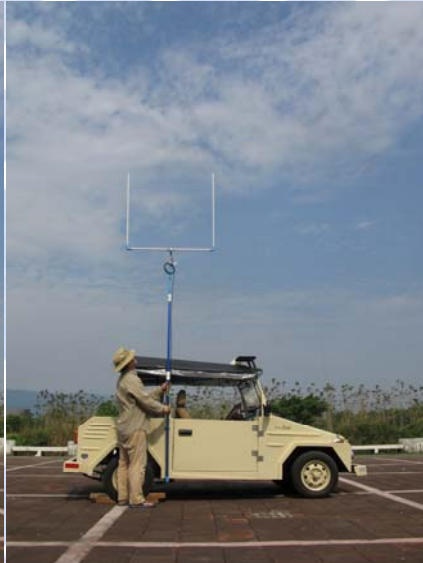
Raising the Mast: Check the wind conditions before raising the mast. For rapid response portability, it is anticipated that guy lines will not be used most of the time. The mast will be raised to the operating height according to prevailing wind conditions. Calm to Light Air: Full extension; feed point is 3.86m AGL.

- Light to Gentle Breeze: Extend only second section; feed point is 3.02m AGL.
- Mild to Fresh Breeze: Do not extend mast; feed point is 2.12m AGL.

Note: Using any light weight mast/antenna combination will be guided by the estimated wind stresses using the pressure data on the RTC-TH modified Beaufort Wind Scale or MEWS anemometer measurements



*Slingshot not extended
Winds: Mild to Fresh Breeze
Feed point is 2.12m AGL
Antenna tips are 3.15m AGL*



*Slingshot medium extension
Winds: Light to Gentle Breeze
Feed point is 3.02m AGL
Antenna tips are 4.05m AGL*



*Slingshot fully extended
Winds: Calm to Light Air
Feed point is 3.86m AGL
Antenna tips are 5.16m AGL*

Antenna Orientation: The Slingshot is a beam antenna aimed by aligning the vertical elements toward the LOS azimuth of the station of interest.

- Refer to reference tables or maps to get the LOS azimuth your operating position to the station of interest.
- Use a magnetic compass to determine the horizontal azimuth of the antenna.
- Manually rotate the mast until the vertical elements line up desired station azimuth.
- Secure the mast to the outrigger PVC T-fitting with a large elastic band to lock it in position.
- Post the "Slingshot Antenna Deployed" warning sign.
- Set the VHF antenna switch to position #4 to select the Slingshot antenna and transmit.

Azimuth/Range to Nan Repeater (~18.7373 N, 100.7395 E, 315m AMSL)		
RTC-TH Operating Sites	True Azimuth	Est. Range (Km)
Wang Wa QTH	189.51°	42.68
Na Fa QTH	201.25°	39.43
Hill Top Site	189.22°	39.17

Magnetic declination in Nan Province is less than 1°. For most civilian compasses (non-survey grade) compass card calibration is in 2° increments. This means that there is little discernible difference between True and Magnetic North.



Posting the "Slingshot", wheel chock, and parking brake set warning signs directly in front of the driver's position is a simple manual safety procedure to avoid accidentally moving Sparky when equipment is deployed. Sometimes there are just too many things to remember.



Use a magnetic compass to aim the Slingshot

Slingshot Beam Antenna Details	
Dimensions (cm)	Height: 106 cm (vertical elements)
	Width: 110 cm (between elements)
	Tubing: 2 cm OD
Wind Profile	Min: 0.264 m ²
	Max: 0.7584 m ²
Weight	0.5 kg
SWR	1.5:1
Set-up Time	~12 min set up; ~7 min take-down
Construction	Aluminum tubing, PVC fittings, copper strips, aluminum pop rivets, stainless steel screws, SO239 connector
Accessories	<ul style="list-style-type: none"> • Light weight blue aluminum push-up mast (Lowe's Aqua EZ telescopic Pole, Item #102924, model PO15) • PVC stem/extension (22mm OD) • Feed line tether • Locking pin (mast to PVC stem) • Coax connect dust caps • PVC base cup bracket • PVC T-fitting outrigger • RG8X coax feed line (~6m with air choke; 6 turns of coax)
Tools	<ul style="list-style-type: none"> • Flat blade screw driver • 2-way mast level
Info Source	www.hamuniverse.com/slingshot.html



Point the elements toward the station of interest

The antenna, supporting mast, and accessories all easily fit inside Sparky. It takes about 12 minutes after parking to set up and get on the air (take down time is about 7 min.).

The rapid set up time is facilitated by the simplicity of the mast/antenna components and the integration of the mast support brackets, ICE lightning arrestors, coax jumpers, and VHF antenna switch in Sparky. **[Note 1:** The 4 position VHF antenna switch gives flexibility to set up a beam and a vertical antenna at the same time. **Note 2:** The light weight mast can be left in the support brackets for short distance moves to another operating location.]

Feed Line Tether Details



Loop the tether over the PVC T-fitting



Watch the guide marks on the tether



This keeps the load off the elements



Keep symmetry in the tether loops



Bring the tether back to the air choke



Loop around the main PVC stem



Keep it loose around the stem



The weight helps lock the T-fitting



The full load of the coax is on the T.