Coax cable strain relief plastic pulley assembly.

# Wire Yagi for 40 Meters with a Suspension Harness

This easy-to-deploy wire and rope antenna is perfect for ARRL Field Day.

**Andrew Siegel, N2CN***

I designed this Yagi antenna for use at our Stamford Amateur Radio Association, W1EE, Field Day. The harness is physically stable, compact for storage, and can be deployed rapidly. We typically get an SWR of 1.5:1 or better in the CW portion of the 40-meter band.

## The Suspension System

Figure 1 shows a top view of the harness and the wire Yagi antenna elements. Suspensions at each end hold spars that support cross-bracing diagonal ropes connecting the four corners of the antenna. The RG-8X coax feed line is draped from the center feed point of the driven element to a plastic pulley (see lead photo) at the center of the cross-bracing, which acts as a strain relief. The weight of the coax hanging to the ground is borne by the cross-bracing, not by the driven element, so the driven element and reflector remain co-planar, and the antenna remains horizontal.

The wire antenna elements fasten to stainless-steel screw-eyes near the ends of the spars using stainless-steel clips, and the suspension harness and cross-bracing ends are all pre-tied with loops that slip around the screw-eyes and clips.

## Construction

See the "Materials" sidebar for a complete parts list. Each end of the reflector consists of a stainless-steel clip, 2 feet of 3⁄16-inch Dacron rope, and a dog-bone insulator, with 70 feet of copper wire between the insulators.

Each end of the driven element consists of a stainless-steel clip, about 3 to 4 feet of 3⁄16-inch Dacron rope, bowline knots at either end, and a dog-bone insulator. Two 32.9-foot lengths of copper wire, connected at the center with a Budwig HQ-1 center insulator, are suspended between the dog-bone insulators.

***Honorable Mention in the 2017 *QST* Antenna Design Competition, 80 Through 10 Meters category**

## Materials

(2) 18-foot-long aluminum, wood, or fiberglass poles or spars

(4) stainless-steel machine-threaded screw-eyes

(8) stainless-steel washers

(4) stainless-steel nylon lock nuts

Stainless-steel clips (such as Amazon B00D6IB1BK or B00N44UIWE)

(4) dog-bone insulators

(1) lightweight center insulator (such as the Budwig HQ)

140 feet of #14 AWG bare copper wire

160 feet of 1⁄8-inch Dacron rope

75 feet of 3⁄16-inch Dacron rope

(2) steel rings (about 3 inches in diameter)

Extension cord reel (Amazon B000GAS3K8)

Small plastic pulley (Amazon B00EPQMP58)

(4) cable ties

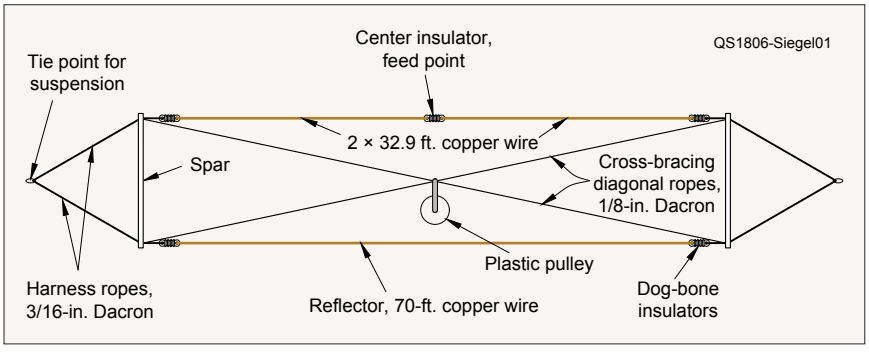


**Figure 1** — Top view of the harness and the wire Yagi antenna. The RG-8X coax (not shown) connects to the center insulator and drapes over the plastic pulley. The antenna measures 95 feet between tie points.

Drill holes on the spars clear through each end, 2 inches from the tip. They should be parallel with one another and wide enough for the screw part of the screw-eye.

At each end of the spar, place a stainless-steel washer over the drilled hole, and insert a screw-eye through the washer and the hole. Place another washer on the end of the screw, and screw a nylon locking nut tightly onto the screw. The eye of the screw should be turned so that it is in the same plane as the spar, and both screw eyes should be on the same side of the spar.

## Make the Harnesses

Cut a 30-foot section of 3/16-inch Dacron rope and seal the ends. Thread the rope through a steel ring, making sure the ends of the rope are even. Tie the ring onto the rope using an overhand-on-a-bight knot. Tie overhand-on-a-bight or bowline knots on the ends of the rope, leaving loops about 4 inches long. Repeat this for the second harness.

For the cross-bracing, cut two 80-foot lengths of the 1/8-inch rope, and seal the ends. Holding both ropes together, find the center point and tie an overhand-on-a-bight knot, leaving a loop about 3 inches long. At the end of the resulting 4 legs, tie another overhand-on-a-bight or bowline knot, leaving loops of about 3 inches. When deployed, the center of the cross-bracing should hang below the plane of the Yagi by 1 or 2 feet.

Drill holes at 9 o'clock, 12 o'clock, and 3 o'clock positions on the strain relief pulley just inside the rim of the pulley. They should be wide enough to admit the width of cable ties.

## Ordering of Elements on the Reel

Wind the various parts onto the reel in reverse order of their need: cross-bracing (center loop first), then one harness, the reflector, the other harness, and, finally, the driven element. Use the clips, rings, loops, and added knots on the various parts to hold the elements together in a long chain as it is wound onto the reel.

> *"Two antennas of this type contributed greatly to our Field Day performance in recent years."*

## Assembling the Yagi

In a large open area, lay the two spars parallel to one another, about 70 feet apart with screw-eyes facing inward. Pick up the reel and clip the end of the driven element to the screw-eye on one end of a spar.

Walk to the corresponding end of the other spar, unwinding the driven element as you go. Clip the other end of the driven element to the screw-eye on that spar. Pick up the end loop of the harness that is now outermost on the reel and lay it by that screw-eye.

Walk along that spar, unspooling the harness. At the other end of that spar, lay the other loop end of the harness by the screw-eye. Clip the now-exposed end of the reflector on the reel to the screw-eye.

Walk to the corresponding screw-eye on the other spar, unrolling the reflector. Clip the other end of the reflector to the screw-eye at your feet. Unroll the harness as you did the other one.

Lay the four loop ends of the cross-bracing down by the screw-eye at your feet. Walk towards the very center of the rectangle enclosed by the antenna, unrolling the cross-bracing as you walk. Set the reel aside.

Untangle the four legs of the cross-bracing, distributing one to each corner of the Yagi. You should now have a clip, a harness loop, and a cross-brace loop by each screw-eye. At each screw eye, unclip the antenna element, loop the harness loop over the screw-eye, put the cross-brace end loop in the clip, and re-attach the clip to the screw-eye.

Two people should stretch out the Yagi by each holding a spar and pulling outward. Watch for kinked copper wire and ropes that twist around the ends of the spars.

Run the feed coax under the antenna past the center cross-brace loop to the center insulator on the driven element. Screw the PL-259 on the coax to the SO-238 on the feed point. Measure about 12 feet of coax from the feed point.

Wrap the 12-foot point halfway around the strain relief pulley, with the 12 o'clock hole at the top. The two ends of the coax should drape down past the 9 o'clock and 3 o'clock holes.

Cable-tie the coax to the outer edge of the pulley at 9 o'clock, and at 3 o'clock. Cable-tie the coax and the 12 o'clock hole in the pulley to the cross-bracing center loop. Trim the ends of the cable ties with flush cutting diagonal cutters. Tie the suspension ropes to the tie points.

Finally, hoist the antenna and you are ready to operate!

Photos by the author.

Andrew Siegel, N2CN, has been licensed since 1975. His three-generation ham family includes his father-in-law, K5QXY, and two children, KB1PIY and KC1ACO. He holds BS and MS degrees in computer science and has worked in the media and entertainment industry as a software developer and system administrator. He enjoys casual CW operation, but has a special place in his heart for ARRL Field Day. Andrew is a member of the Stamford (Connecticut) Amateur Radio Association.

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