learning curve

BY RON OCHU, KOØZ*

Cobwebs Anyone?

CQ Reviews: MFJ-1836H Cobweb Antenna

If you are like me, then I'll bet you have a few items you've purchased just sitting in some forgotten corner collecting dust. That is so true of me and in the interest of complete transparency, the word "few" is a euphemism for me. However, I'm here to tell you that I am making slow and steady progress.

The Best Laid Plans …

Three years ago, while attending the Dayton Hamvention©, I decided to purchase an MFJ-1836H, a 6- to 20-meter Cobweb Antenna (*Photo A*). I've always liked the idea of a multiband wire antenna using spreaders. My thought at the time was that it could be a good antenna to build and use for Field Day, which would have provided a good opportunity for club members to put it to the test and to do side-by-side comparisons (A/B test) with other antennas on site.

However, COVID-19 became a pandemic, and we went into lockdown mode. To complicate matters even more, I found myself moving from central Illinois to eastern Missouri. Moving a QTH (location) is not a fun chore. Especially more so when one finds himself in his early 60s. The cobweb project got relegated to my garage corner to collect dust (*or cobwebs? – ed.*).

A few years later, my shack is taking shape and I've put up a few antennas. I'm back on HF (high frequency) with a Hy-Gain 14 AVQ vertical, but it operates on the 10- to 40-meter bands and not on the so-called WARC (World Administrative Radio Conference) bands of 12, 17, and 30 meters. I love propagation on those bands.

Meanwhile, I spied the cobweb antenna box (*Photo B*). Summer 2022 turned out to be a good time to work on this project. Admittedly, not my original plan for it, but here and now is just as good as there and then! I know just the spot in my suburban backyard to erect it. Best of all, since this antenna is basically a folded dipole, I wouldn't need to put down ground radials.

Have you ever heard the expression, "my eyes were too big for my stomach," or "don't bite off more than you can chew?" Both expressions are applicable to me regarding my original intention for the cobweb. That's not to infer this is an "undesirable" antenna — far from it. Rather, it is a commentary about me. I am older, heavier, slower, and not as agile as in my younger days. However, I still think of myself as a younger man with an abundance of enthusiasm and stamina. So please keep in mind my "senior citizen" status as I comment on antenna construction. If the project involves more than lifting a beverage (not the antenna), then I am likely to find it challenging.

Antenna or Cobweb?

Looking at MFJ's Cobweb instruction manual cover page in *Photo A*, one can see five separate squares attached to four fiberglass spreaders and one fiberglass support tube holding the matchbox which feeds all the wire elements. Electrically, one-quarter wave down the folded wire is an insulator. The second half of the dipole is also a quarter wave attached to the other insulator end, thereby forming a half-wave dipole. The dipole is "folded" to conserve space. The outermost square is a folded 20-meter dipole. The next inner square is a 17-meter folded dipole, followed by additional folded dipoles for 15, 12 and 10 meters. The Cobweb also includes a 6-meter corner-fed dipole, beginning at the matchbox, with wires stretching to a spreader arm and draping back towards, but not touching, the metal mounting plate.

With the 20- through 6-meter wire elements laid out, the antenna looks a lot like a spiderweb. In fact, my neighbor's kids asked why I was building a spiderweb. The "spiderweb" square is 9 by 9 feet which MFJ advertises as a "neighbor-friendly" package. In many ways it looks similar to a square umbrella clothesline (*Photo C*) found in hardware stores like

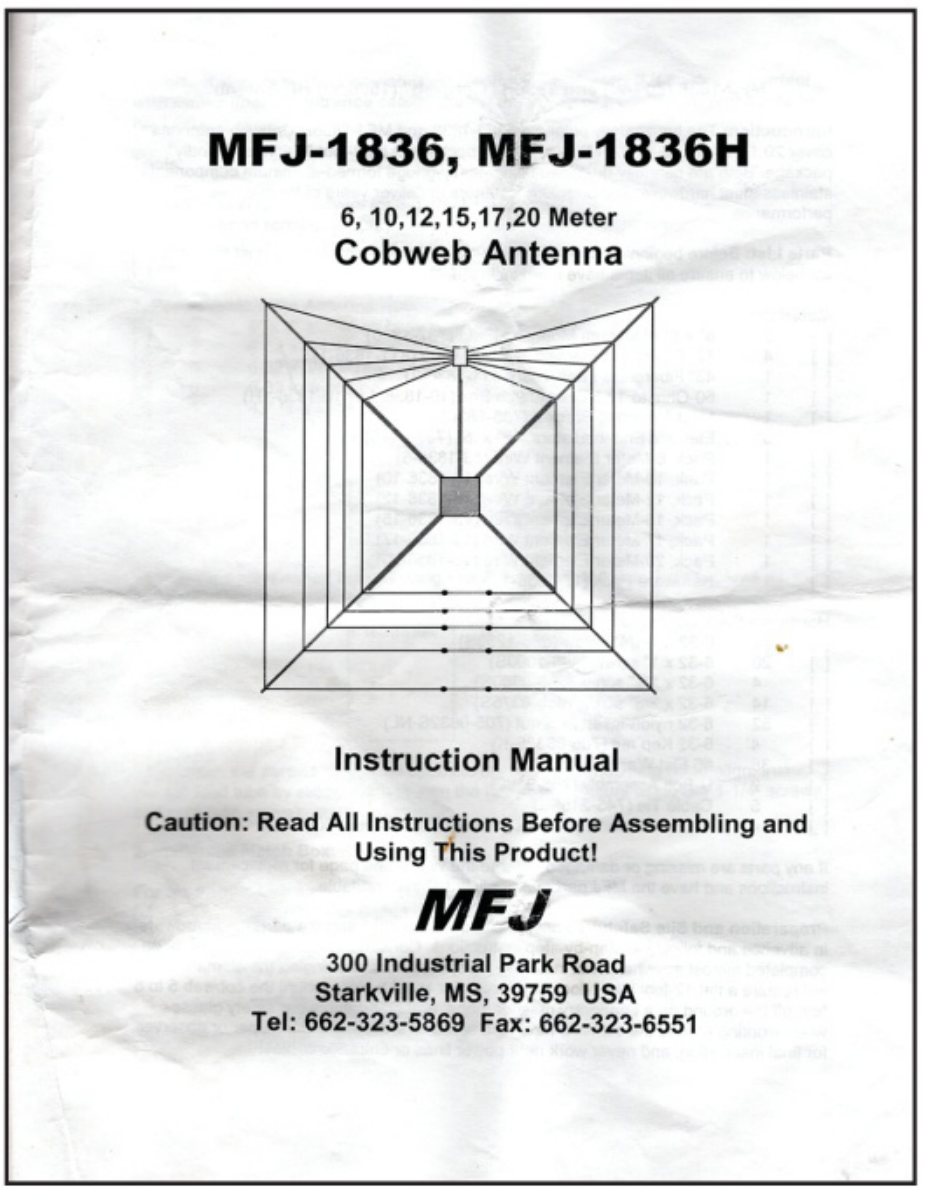

Photo A. MFJ's instruction manual cover page depicts its cobweb antenna. It looks like a spiderweb. (All photos by KOØZ)

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Photo B. My dusty, but not forgotten, box purchased a few years earlier at the Dayton Hamvention™ containing a yet to be constructed cobweb antenna.

Lowe's. If one has one too many nosy neighbors, perhaps socks could be hung from it to "disguise" the antenna.

The wire elements are thin (approximately 18 gauge), so I wouldn't hang too many socks from it. In addition, MFJ recommends it be at least 10 feet off the ground, which would make using it as an umbrella clothesline just a wee bit problematic. It could be mounted at head level, but SWR tuning and the antenna's radiation pattern would be affected. Speaking of which, MFJ's cobweb antenna is omnidirectional and horizontally polarized. Horizontal polarization tends to make for a quieter antenna. Most manmade and natural static tends to be vertically polarized.

Opening the Box

As with any project, the first order of business is to find a suitable workspace, open the box and take inventory (*Photo D*). MFJ recommends a 12-foot by 12-foot workspace. MFJ also cautions that none of the antenna elements be exposed to any AC (alternating current) electrical wiring. I used my garage to shade me from the hot, blazing, July sun. My concrete floor also made it easier to find accidentally-dropped screws, washers, and nuts. Despite my precautions, I somehow still managed to lose a few parts. Therefore, I recommend purchasing a few extra stainless-steel screws, washers, and nuts beforehand. I hate having to stop a project to go to the hardware store for lost parts when I am on a roll. I carefully lay out all the component bags and I check off the parts inventory provided with the instruction manual. Everything is accounted for and the excitement of testing a new antenna is rising.

Tools and Time

Not too many tools are needed for this antenna project: A Phillips screwdriver, 5/16 nut driver, pliers, tape measure

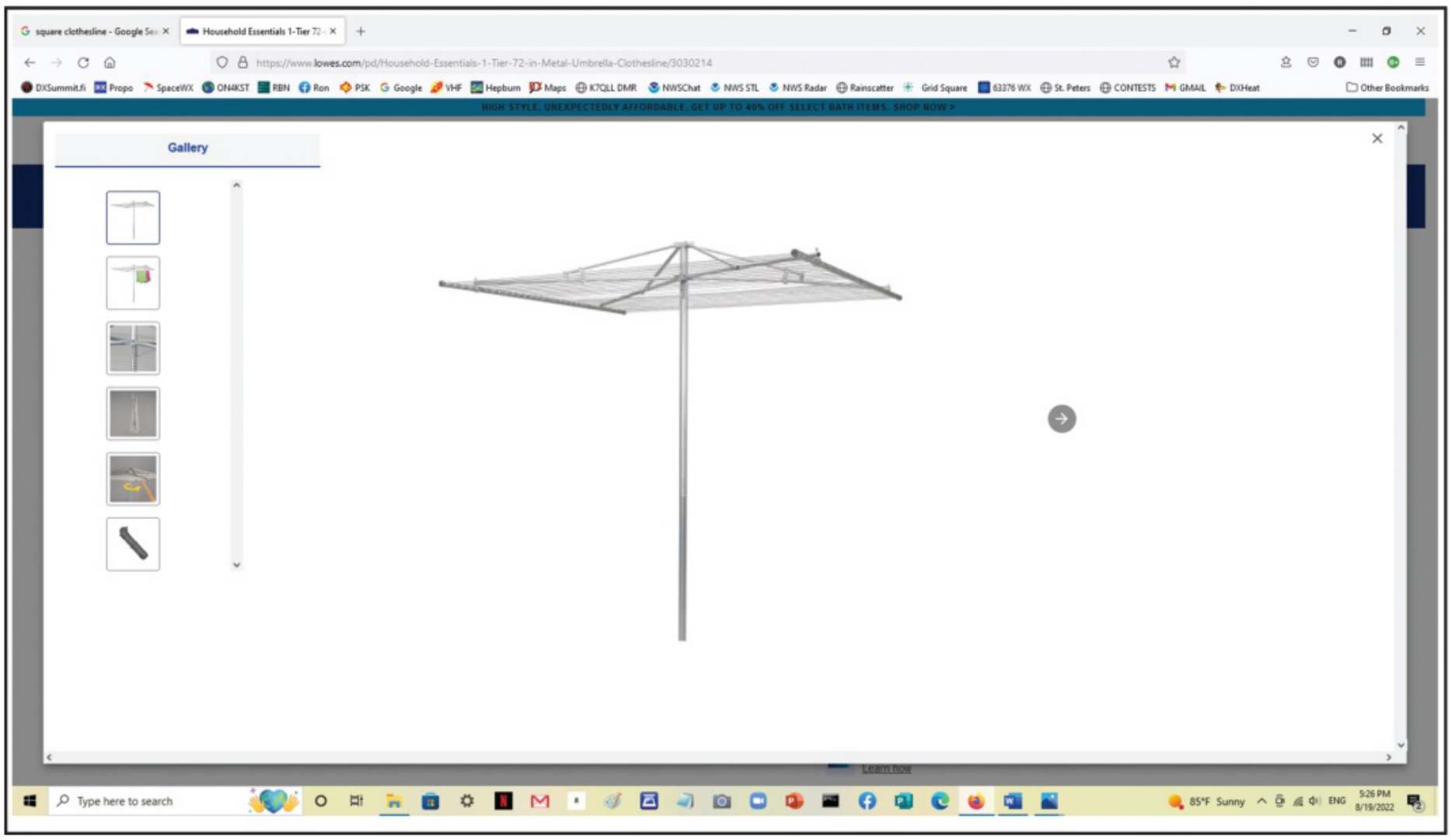

Photo C. For nosy, inquisitive neighbors, the cobweb antenna could serve as rudimentary umbrella clothesline to aid in reducing your carbon footprint…

Photo D. Every project should begin with a complete inventory of parts to acquaint the builder with components.

and a 1/2-inch wrench should fit the bill. Allow yourself plenty of time to assemble this antenna, and line up anassistant if possible. It is not heavy, but its 9-foot by 9-foot dimension makes it a wee bit unwieldy for a single person to handle. I put my antenna on an 8-foot rectangular table so I could easily rotate it while I strung the wire elements.

Some days, I could only devote a few hours to this antenna project, so I'd be forced to take it out of the garage, prop it up alongside the house, and move my vehicle back inside the garage. This practice added a few more hours to assembly time. I always tend to underestimate time for a project. I didn't log my hours, but I'd estimate that I spent 24 hours altogether on this antenna, working by myself.

What's Next?

My next order of business was to assemble the antenna hub and to attach it to the 43-inch feed tube (*Photos E* and *F*). At the far end, a black, balun/matching box is attached to the insulated feed tube. Ferrite beads, used to suppress unwanted current flow on the outside of the coax, are slipped onto the coax and then the whole assembly is attached to the feed tube (*Photo G*). The matchbox / balun serves to match the cobweb's folded dipole impedance to 50 ohms.

This matchbox / balun is the heart of the cobweb. In fact, MFJ offers the 1836 and the 1836H, in which the "H" is the high-power version. The internal components inside the "H" version matchbox are rated for full legal power (1,500 watts or QRO). I'd prefer to have a more robust matching network. Not that I run QRO all too frequently, but it's nice to be able to use the extra power if needed. Another thing to point out is to notice the holes drilled into a box cover? These holes let heat and any moisture out so it is important to ensure the holes are

Photo E. The cobweb needs a 5/16-inch nut driver and pliers for assembly of the mounting box.

Photo F. Mounting box (for the mast) and the coax feed tube that will be used for the matchbox and coax attachment.

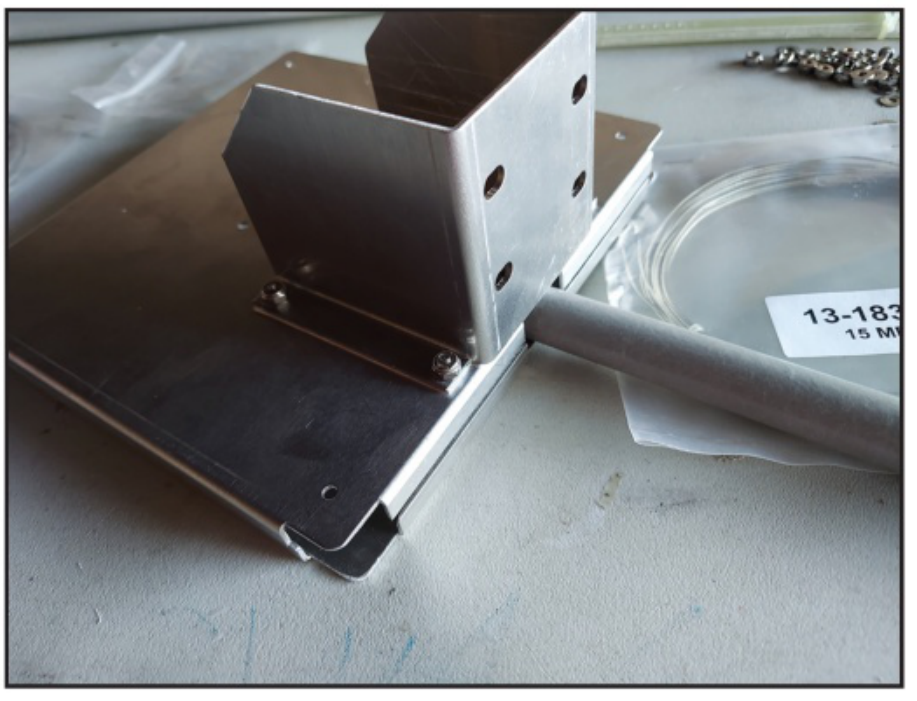

Photo G. MFJ 1836H Matchbox, UHF coax jack (SO-239) and ferrite beads to reduce RF current flow on the outside of the coax.

pointed toward the ground to not let the matchbox fill up with rainwater.

Spreader Arms

The four 72-inch fiberglass element support tubes (spreader arms) are what give the MFJ-1836H its' spiderweb appearance. The four tubes are attached to the mounting box with 6-32 by 1-1/4-inch screws and lock nuts. Along each spreader are five spaced pre-drilled holes for 6-32 x 1-inch screws with washers and Ny-Lock nuts. These five sets of screws, washers, and nuts are used to anchor each band's wire elements. Remember, this antenna is symmetrical. One quarter-wave wire element occupies one half of the antenna, and the other half has the other quarter-wave wire element. The two quarters are connected at an insulated strip with the other ends connected to the black matchbox.

Wiring the Cobweb

MFJ's instructions suggest installing the innermost band — 10 meters — first and moving outward to 20 meters. If you choose to install the 6-meter element, it is corner fed. So, it extends from the matching box and to a spreader arm and then back along the spreader arm back toward the mounting hub. I found it a pain to move the antenna around to install the 6-meter element after all the other bands are wired. If I had it over to do again, I would install 6 meters first before moving on to 10 meters.

The wire elements are made from thin stranded wire. I'm guessing the elements to be 18-20 gauge. MFJ cautions not to make the wire elements too taut. I can attest to that. I found

behind the bylines...

Maciej "Miles" Muszalski, SQ5EBM ("EmComm From the Ground Up," p. 10), brings a wide-ranging and eclectic background to his hamming. A native of Warsaw, he describes himself as the, "happy father of a 2-year-old and husband of a very ham-radio-compatible XYL." A political scientist by education, he has found a career niche as a photographer and photo technician, first in film and now in print. A second-generation ham, Miles got his license in 1995 and enjoys many aspects of amateur radio, primarily emergency communications and rag-chewing on HF (He says ham radio has been his primary venue for learning English.). Miles also enjoys contesting and is currently into 160-meter DXing. In 2020, he was honored by the Polish Amateur Radio Union (PZK) for his work in promoting emcomm and ham radio to the general public (examples in his article).

Scott Ruesch, W9JU ("Developing Your Radio Voice," p. 20), is a regular contributor to our annual Emergency Communications Special. He is the SATERN (Salvation Army Team Emergency Radio Network) Coordinator for the Wisconsin / Upper Michigan Division of The Salvation Army.

Paul Signorelli, WØRW ("EmComm from the 1950s and '60s," p. 24, and "Amateur Radio on the Home Page," p. 28), is also a regular contributor, writing mostly about pedestrian-mobile operating. In these two articles, he looks at amateur radio emergency communications in both the past and present.

Rich Stiebel, W6APZ ("Six Meters to the Rescue," p. 26), has shared previous stories of his work as an engineer for Knight-Kit in the 1960s. This story, from the same time period, has a slightly different slant, or should we say, slip-and-slide.

Isidor Buchmann ("Calibrating Smart Batteries with Impedance Tracking," p. 37), is the founder and CEO of Cadex Electronics Inc. For three decades, Buchmann has studied the behavior of rechargeable batteries in practical, everyday applications, has written award-winning articles including the best-selling book "Batteries in a Portable World," now in its fourth edition. He has written several articles for *CQ* in the past. For more information on batteries, visit <www.batteryuniversity.com>; product information is on <www.cadex.com>.

Robert "Ral" Leskovec, K8DTS ("The Space Age at 65: How High School Hams Tracked Sputnik," p. 40), was president of the St. Joe's High School radio club at the time of the Sputnik launch in 1957. He currently maintains the club alumni website at <sjhrc.org>, where you should be able to listen to a recording of Sputnik's beeps and stream a video showing events of the time. He says that anyone who has trouble with either should contact him at <Robert.Leskovec@gmail.com> and he will email a copy. The January 1958 *CQ* article to which he refers is reprinted in this issue as one of our two "CQ Classic" features.

Norm Sutaria, KB2JRP ("ARISS to the Max," p. 44), is the Mission Commander at the Buehler Challenger and Science Center in Paramus, New Jersey. An 11-minute video of the ARISS contact with Astronaut Bob Hines (with some *amazing* questions!) is available on YouTube at <www.youtube.com/user/ccsse/videos>.

David Kazdan, AD8Y ("The Flutenna," p. 48), is faculty advisor to the Case Amateur Radio Club at Case Western Reserve University in Cleveland, Ohio. He is retired as Chief of Anesthesiology Service at the Cleveland VA Medical Center and as Assistant Professor of Anesthesiology at Case, where he remains active as an Adjunct Assistant Professor of Electrical Engineering. David is also very active in HamSCI, the Ham Radio Science Citizen Initiative.

Photo H. Matchbox holes for the MFJ 1836H (the H stands for high power) to vent out heat and moisture. It is important to have the holes facing towards the ground.

Photo I. MFJ recommends elevating the cobweb to 6 feet for pruning the antenna for optimum SWR. I used my nonconductive trash cans to hold my cobweb up for tuning. It wasn't off the ground six feet, but I took that into account while shortening the wire elements.

moving the antenna structure with taut wires lends itself to snapped wires. Part of my total assembly time was spent repairing broken wire elements. I found some wire "slop" helped. Additionally, I discovered physically moving my cobweb around from place to place by myself can be problematic. If there is anything the wire elements can snag on, they will. The other annoyance I came across is trying to keep the wire element ends attached to insulator strips from tangling up with each other. Two people makes it a whole lot easier to slowly raise the cobweb to avoid tangling wire elements.

Tune Up

Tuning the cobweb is easier with an antenna analyzer such as an MFJ -269. MFJ recommends placing the cobweb at least 6 feet off the ground to tune it. I used non-conductive trash cans to hold my cobweb above the ground (*Photo I*). Admittedly, the antenna isn't 6 feet off the ground, but 4 feet will put me in the ballpark. I'll have to remember that the SWR (standing wave ratio) will be a bit higher because of close ground proximity, but it will drop when I get the antenna higher. The cobweb is tuned by snipping off the excess wire hanging from both sides of the insulator strips. I snipped 1 inch of wire at a time on each side, took an SWR reading, recorded it, and then continued to snip until I approached an SWR of 1.8 to 2.0:1. I didn't go lower because of the ground coupling. I knew the SWR would go lower when the cobweb was up in the air. Allow yourself plenty of time to tune the cobweb. Five bands (six if you include 6 meters) is a lot of wire snipping. My initial SWR values of all untuned, pre-pruned six bands ranged from 3.7:1 to 8.2:1 with most being around 6.2:1. After careful pruning, my SWR ranged from 1.0:1 to 1.3:1.

According to MFJ's literature, "the cobweb's folded half-wave elements have somewhat less bandwidth than straight-line elements." I've found that to be true, but my transceiver's antenna tuner easily tunes out any reactance when I stray too far from my cobweb's resonant frequency on each band. So, what does that mean? Simply put, if you tuned your cobweb to be resonant in the center of a band, the SWR most likely increases toward the band edges. My antenna tuner handles the reactance at band edges. To get my cobweb up in the air, I purchased a 10-foot chain link top rail. As predicted, my SWR values became even closer to the ideal 1:1. All

Photo J. Upward view of the cobweb silhouetted against the blue sky makes it easy to see the matchbox wire element feed point and the terminated wire elements insulator strips.

of the bands are below 1.4:1 SWR. Not too bad for a "senior citizen," one-man antenna project.

Antenna Pattern

Admittedly, I've only played with my cobweb on the air for a few weeks before this article went to press. From what I can tell, the antenna is omni-directional (receives and transmits in all directions) and it appears to be horizontally polarized. Doing an A/B comparison with my 14 AVQ vertical, the cobweb is a bit quieter when it comes to QRN (static). In addition, for the most part, my cobweb is two S-units higher in received signal strength as compared to my vertical antenna. Other times, the cobweb is on par with the vertical. I haven't asked any ops to assist me with an A/B transmit comparison, but that is my next antenna test. Moving the cobweb up higher would surely lower the antenna's radiation pattern closer to the horizon which would make it even better for working DX (long distance). On the other hand, a higher radiation pattern is advantageous to working nearby states for WAS (Worked All States) or EmComm (emergency communications)

Proof is in the Pudding

A bowl of chocolate pudding with coconut sprinkles sounds great right about now, but your editor is on a self-imposed diet. However, I can offer you an account of my first on-the-air antenna tests as a pudding substitute. Whenever I test a new rig or antenna, my hope is to report some exotic DX contact. More often than not, it's been my experience that my first contact from Missouri is with Ohio. Not that I have anything at all against Ohio, Ohio just isn't that far from Missouri. For once, I'd like to brag about a "super contact" antenna. Who will my cobweb's first on the air contact be?

Once I erected the cobweb and ran coax into my shack, it came time for the moment of truth. Noise levels were high. We were in the midst of a mild geomagnetic storm. It was evening locally. I listened to 15-meters phone, and I heard Marcus, PT2EM, in Brazil calling CQ. I gave him a call and he gave me a 5 by 3 signal report. Unfortunately, I didn't have any more time to devote to radio that evening, but my very first cobweb antenna contact wasn't with Ohio. The very next day, late morning locally, I worked Rudi, OX/DK7PE/P, operating from Greenland on 17-meter CW (continuous wave, Morse code). Later, I heard Robert, 3B9FR, on Rodriguez Island in the Indian Ocean calling CQ, and it was good contacting him. It had been a few years since our last QSO (contact). Since then, I've worked Phil, ZF1PB, (Cayman Islands), and Kimberley, K6YYL, in California (she lives only a few towns over from where I grew up in SoCal).

Photo K. Completed cobweb antenna, up 10 feet on a chain-link fence top rail.

WARC Bands

I purchased this antenna with the intention of using it as a club antenna for Field Day. Unless your club has a vehicle that can accommodate a 9- by 9-foot square antenna with five square, thin gauge wire elements, I wouldn't highly recommend it. On the other hand, if you're looking for a lower profile HF antenna that includes two of the three WARC bands - 12 and 17 meters - along with 6, 10, 15, and 20 meters, then this antenna is worth considering (*Photo J*).

Overall Impression

So far, I am pleased with my cobweb's performance. Granted, I've only put it through its paces for only a few weeks, but it hasn't disappointed me. I do have some concerns about windy days perhaps tangling up the insulated, terminated wire element ends or frozen precipitation loading down and snapping the thin wire elements, but time will tell. I am having a good time working two of the WARC bands with a new multiband HF antenna (*Photo K*). As solar cycle 25 continues to ramp up, 10 and 12 meters will roar to life.

Feedback

I appreciate reader feedback and I'd like to thank an especially astute reader, John Scott, K8YC, for suggesting a clarification in my July 2022 column regarding traps. John points out I wrote, "Simply put, LC circuits react to AC (alternating current) frequency. RF is AC and as frequency decreases, inductance decreases and capacitance increases. Inversely, as frequency increases, inductance increases and capacitance decreases." John's point is a reader could mistakenly think a fixed-value inductor or a fixed-value capacitor changes its value with frequency. For example, a 20-millihenry inductor or a 20-picofarad capacitor will not change values with applied AC. What will change with frequency is the component's *reactance* (AC resistance) to the increasing or decreasing frequency. The 20-millihenry inductor or 20-picofarad capacitor will remain at 20 millihenry or 20 picofarad. It's the component's *"reactance"* to the AC that is variable, not its numeric value. Thank you, John, for bringing that to my attention! Thank you for reading *CQ* and I hope to catch you on the WARC bands. *– 73, Ron, KOØZ*