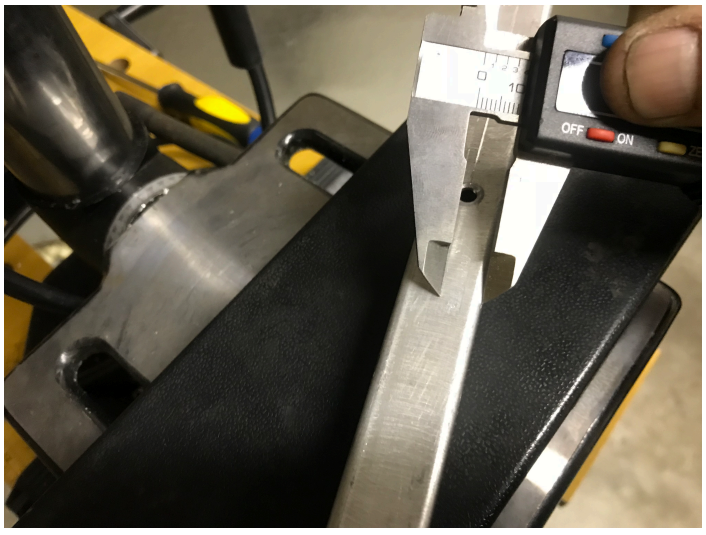
One of the advantages of being a portable satellite op is that you can take your station to some excellent places to work DX. The disadvantage of this is that in many cases you're doing everything manually including being your own antenna rotor. Some people go the tripod route to make this easier but it can come at the cost of just how naturally you can point and twist for polarity by hand holding. Having held an Alaskan Arrow nearly horizontal for those low passes, I can see why people have a difficult time. Despite the light weight of an Arrow antenna the leverage of it can put a strain on your wrist over time. I set out to lighten the load and bring the advantages of hand holding to more people who might find it challenging.

I found two key areas where improvements could be made to make the antenna easier to handle. While we definitely improved upon the weight of the antenna we also accidentally improved on another common problem, loosening elements.

The first place I looked was pretty obvious, the boom. The boom is constructed of a light weight aluminum alloy. When I build my own booms I use 6061-T6 aluminum, if it's good enough for building a satellite then it should be good enough on the ground. I decided to try removing some of the sidewall of the boom between each element. Drilling was my first choice because it requires minimal equipment and could remove a fair amount of material and maintain structural integrity. In the end I had an antenna that was 40% lighter than the original, is more than durable and has a really nice look.

To successfully drill a boom you will need the following tools:
Small drill press
11/64" and 3/8" drill bits
3/4" countersink bit
Ruler or measuring tape
Caliper
Center punch

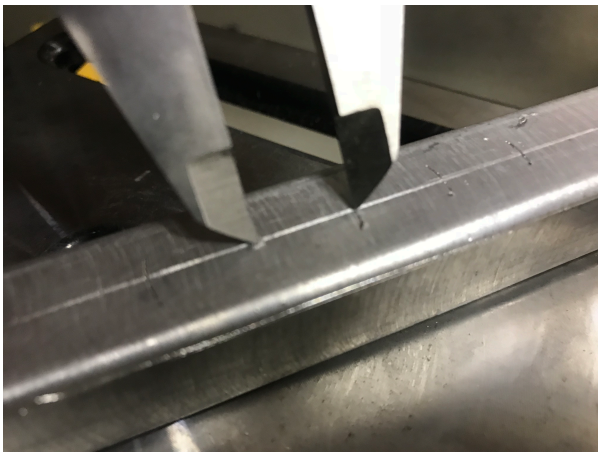
The initial layout of the hole locations will ultimately determine how the completed boom turns out so take your time, you'll thank yourself later. To give a nice centered look we first start by scribing a center line down one side of both the VHF and UHF sides of the boom. I do this by setting my calipers to half the width, on the 3/4" boom we move our caliper to 0.375" and lock it in place. I then run one side of the caliper down the edge of the boom and use the sharp edge scratch a line in the aluminum down the center. Keep in mind we don't want to go too deep since we want to clean this up later with some fine sandpaper or abrasive pad.

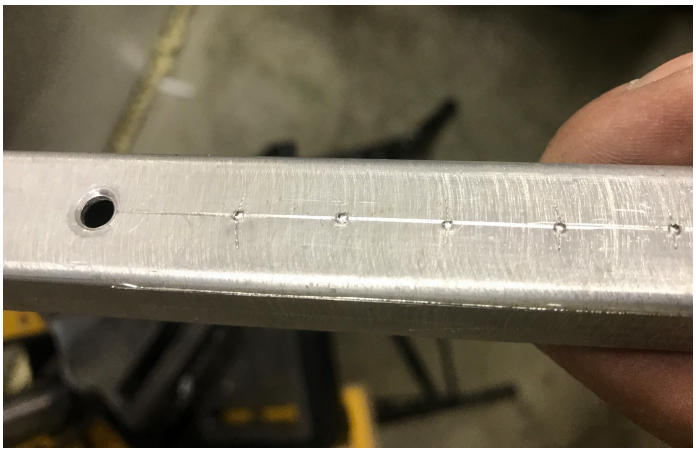


Once you have a center line we want to measure the distance between each set of elements to find the center between them. We will then punch a mark on the center line at the midpoint between each neighboring pair elements.

A few words about the center punch for those who haven't had to drill into metal at precise locations. The punch gives the drill bit a place to start without "walking out" when it first touches the metal and begins cutting. By using a punch you can mark these starting points with very good accuracy.

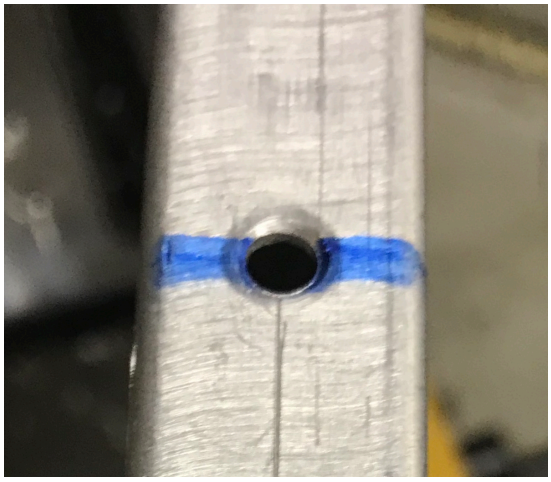
We will use the initial center punches to locate all of the other hole locations. The holes are set on 1/2" centers. Take the caliper, move to 0.500" and lock down. Put one point of the caliper on the center punch and use the other point to scribe a small line across the center line. You can then use the cross point to as a place to start progressively working toward the element holes. Keep working outward and stop when you get to 1/2" or less of the element holes; this will keep the countersunk holes from running into them.



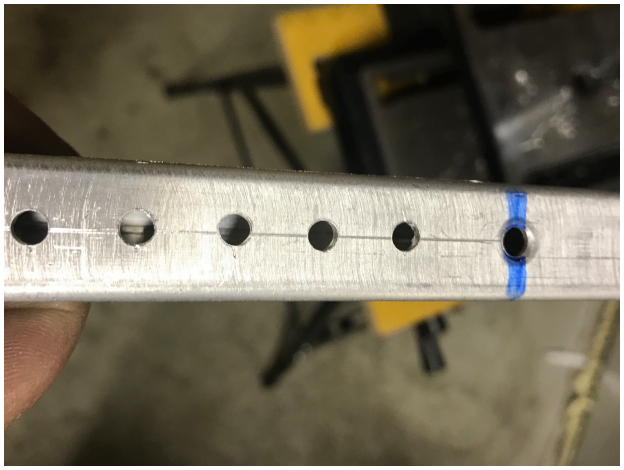


After you have scribed and center punched each spot on the boom you can move to drilling the pilot holes. The pilot holes will guide the larger bit helping you maintain accuracy. I chose a 3/8" bit with with a guide tip on it, this really helps to quickly self center the bit. Keep in mind

that we only need to layout one side of the boom for 2m and 70cm. We can save a lot of time by only drilling pilot holes once for each side. When we drill out the full size holes we can plunge straight through the opposite side and save a lot of work. I do not recommend doing this with the much smaller pilot bit as it is more flexible and can walk off of center when attempting to plunge through the other side. Also before you begin to drill, it is a good idea to mark the pre-existing holes for the elements, we don't want to accidentally drill them out later. I use a permanent marker for this and it works quite well.



Again, we only need to work down on side for 2m and one side for 70cm during this step. With a drill press that has its table squared up we can start the 3/8" hole inside the pilot and then continue straight through the opposite side saving a lot of time in the process.



With our element holes marked and pilot holes drilled, we can begin with the 3/8" holes. Let the drill center itself and then firmly hold the boom to the drill press table. Once you make it through the top, continue all the way through the bottom side. You might need to occasionally

remove a burr on the bottom side holes to make sure the boom sits flat on the table for the next hole.

Having made your way down the length of the boom for both the 2m and 70cm side you will begin to notice just how much lighter it is. The weight will be reduced significantly at this point but more can be saved with our next step of countersinking the holes. Not only will this shave off some additional weight, it also deburrs the holes and gives a nice clean and professional look.

For countersinking, I use what is known as a fluteless countersink bit. With this style of bit you're less likely to have problems with the bit "chattering" while in use giving a very nice finish.

With the countersink you will need to properly setup the depth stop on your drill press. You can set the depth to initially take away some of the aluminum around the holes. I begin by countersinking three holes in a row and slowly increase the depth stop so that the countersinks don't run into each other with a small amount left between each. After the depth is set and locked you can move right along over each hole rather quickly.

Having all of the holes countersunk you are almost complete and you will notice just how light the boom is. You will also notice that it still is a little rough on the surface with all of the scribing and some scuffs from the drill press. This is easily taken care of with a piece of abrasive pad often sold under the name Scotch Brite. Give the whole boom surface a once over with the abrasive pad without pressing too hard as to take away from the finish left by the countersink holes.

When you're finished you should have a boom that is about 40% lighter making it a joy to use handheld. Not only does it make an Arrow antenna easier to operate but it also looks great too.

But why stop there, is there more we can do to improve the experience? In looking at each component weight wise, the steel element studs really stood out. They don't seem like much but take a whole set in your hand and think about that weight distributed down the boom. With a little research online, I found aluminum 8-32 threaded rod. I cut these down to 2-1/4" in length and then cleaned up the ends on a belt sander.

Replacing the studs helped save even more weight but it also came with a nice surprise. I found that after having my Arrow in the backseat for hundreds of miles through various terrain in Southern California that I didn't have to tighten my elements once.

I’m still not sure what the mechanism is but I have a few ideas. None of which really matter because it just works. I’ve since put thousands of miles on with only having to tighten up elements more than half a dozen times at most.

Use this guide to take an already great antenna and make it easier to handle and maintain, optimizing your equipment will only improve your chances of success.