Modifications for the Monowheel Transporter (Trailer) to ease loading and unloading.
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By
Bud Yerly
Custom Flight Creations, Inc.

This paper outlines the modifications I have made at Custom Flight Creations, to improve the monowheel transporter trailer. The trailer as sold by Europa Aircraft has some clearance issues and is very tough to get the fully rigged mono up onto the trailer and properly secured.

The Europa Transporter was designed for the 8 inch soft turf tire to fit the slot or wheel support. Consequently, those with the 7 inch tire found the aircraft leaned excessively because the 8 inch wide wheel slot was too large for the 7 inch tire. Modifications were needed to close this gap.

View YouTube video on my modifications. Either search "Europa Mono Wheel Trailer Mods Short" for the video or just click on or copy and paste the link provided here:
https://www.youtube.com/watch?v=AkMHilMEKJk .

In this video, I outline the changes I have made to improve the ease of loading and unloading as well as assure a damage free transport of the Europa Mono. This paper gives more detail on the modifications and a separate paper is available with part numbers for those desiring to make the same changes.

I will outline the construction of the ramp I made, my wheel well inserts to secure a 7 inch tire, the construction of the ramp, and the installation of the winch. Drawings are included. The wing sling dimensions to clear the fuselage and turnbuckle arm modifications are outlined at the end.

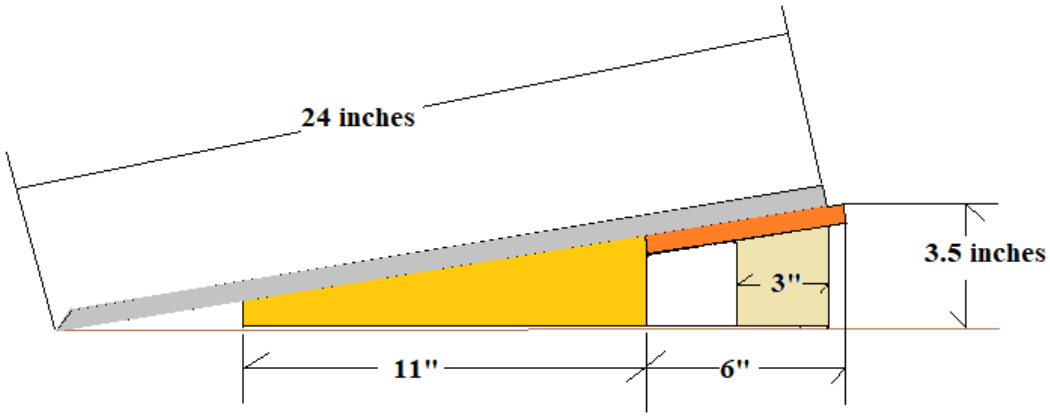
With the aircraft unloaded, it is best to put the trailer in a level area or a roomy garage to complete the operational modifications.

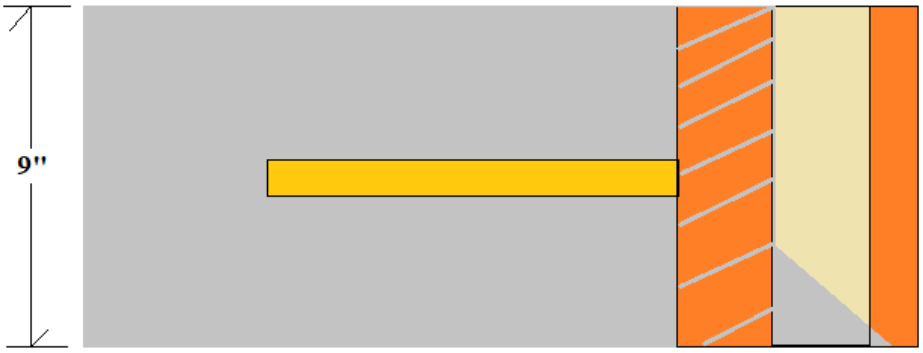
Ramp Construction:
The ramp is a simple ¾ inch ply board of approximately 9 x 24 inches. I found I and my helpers were no longer strong enough to pull and push the plane up on the transporter short arm ramp. At first we used ratchet straps to pull the aircraft and ease the muscle force. We also found the aluminum ramp of the stock trailer was at such a high angle the inboard flap brackets would strike the trailer before the main wheel was seated. Using a standard chock of 2.5 inches nominal height and a plane ¾ inch board about 18 inches to 24 inches allowed the flap brackets to clear and made pulling and pushing the plane up slightly easier. The ramp and inside spacers are made from ¾ inch ply. Dimensional lumber such as 2x4s or even ¾ ply can make the ramp much stiffer and easier to use. The wood extension ramp should elevate trailer ramp at least 2.5 inches (3.5 preferred) and make a consistent slope to the ground to give a reasonably easy push and pull for manually loading the main wheel into the trailer wheel slot.

A 24 x 24 inch ply piece of ¾ cabinet ply was cut to 9X24. One end was cut to the shape of the trailer ramp angle. The other end was cross cut at a 45 to ease the initial pull up the ramp. A 9 X 6 piece was cut out of the remaining ply to act as a ramp support. Dimensional 2x4s were cut to be the vertical support under the ramp. A single piece of plywood was cut to fit down the center to support the full weight of the plane and prevent the ply from bending and cracking under load.

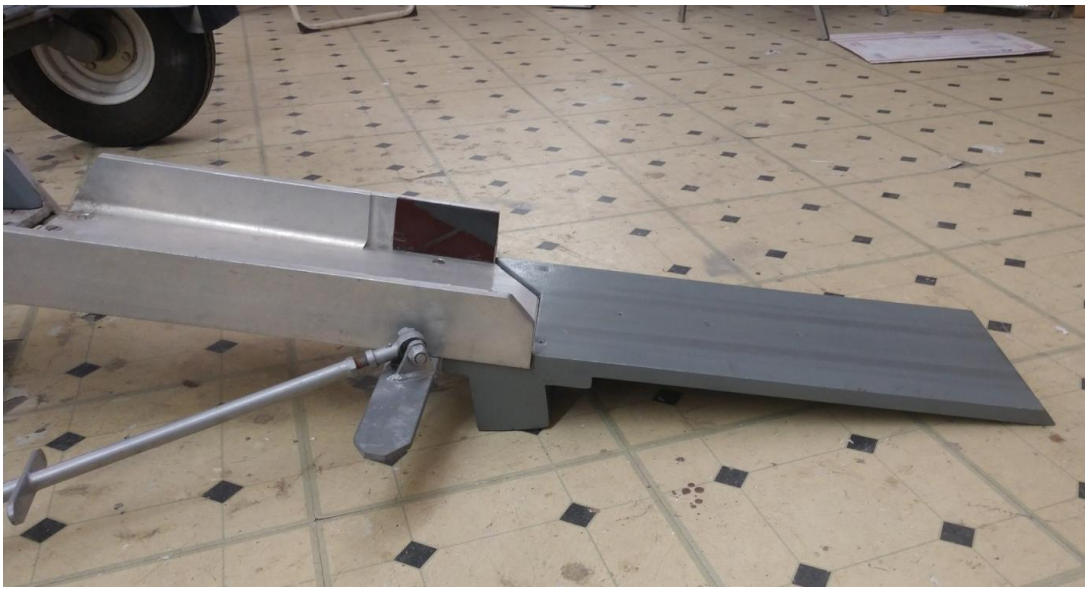
The entire piece was glued and screwed together then coated with epoxy and paint to seal the wood from rain and mud.

Europa Mono Trailer Modifications for 7 inch tire and extension ramp to assist clearance and ease of loading and unloading aircraft on the trailer.

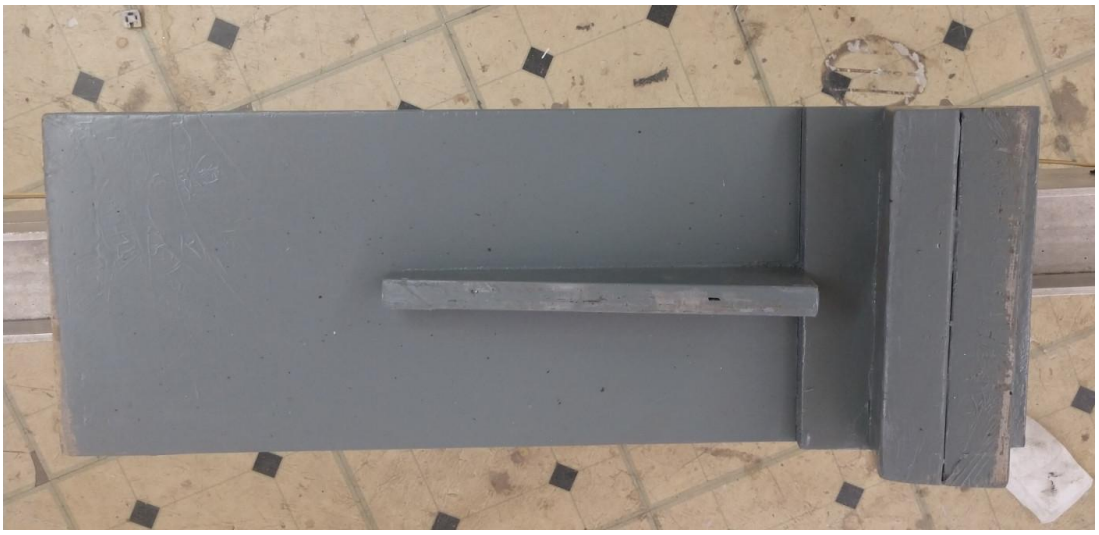




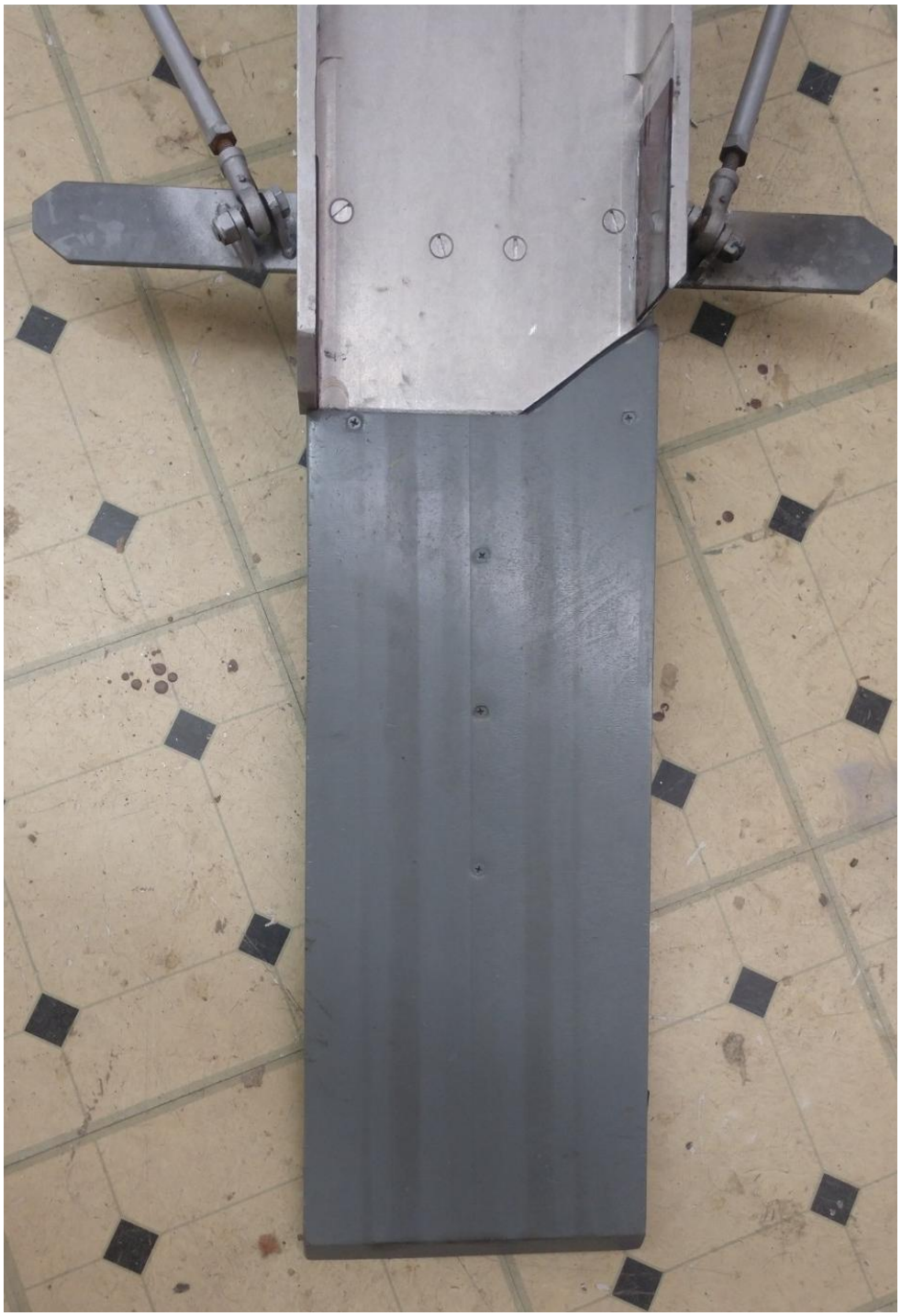
Upper Ply Ramp in Gray. Angles are approximate



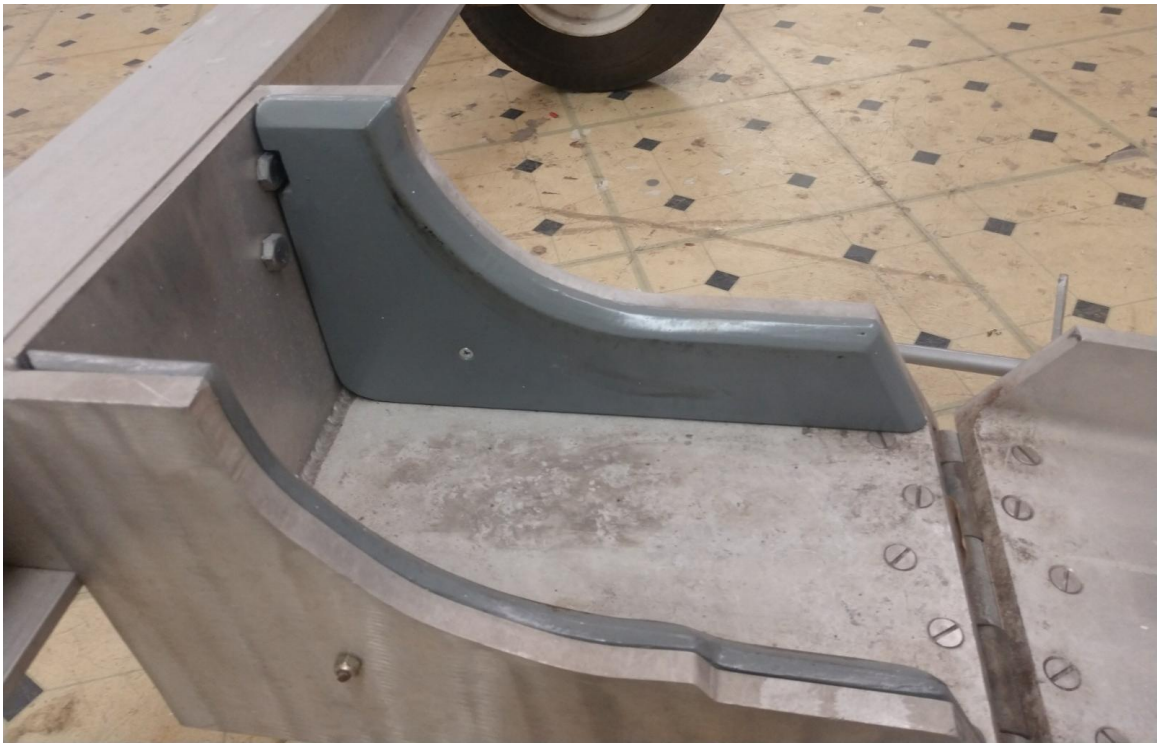
Note the support under the trailer ramp makes for a smooth consistent incline angle. The metal trailer ramp is clearly supported very well. Below is the detail of the wood ramp support. One center support running down the board was used to keep it light.



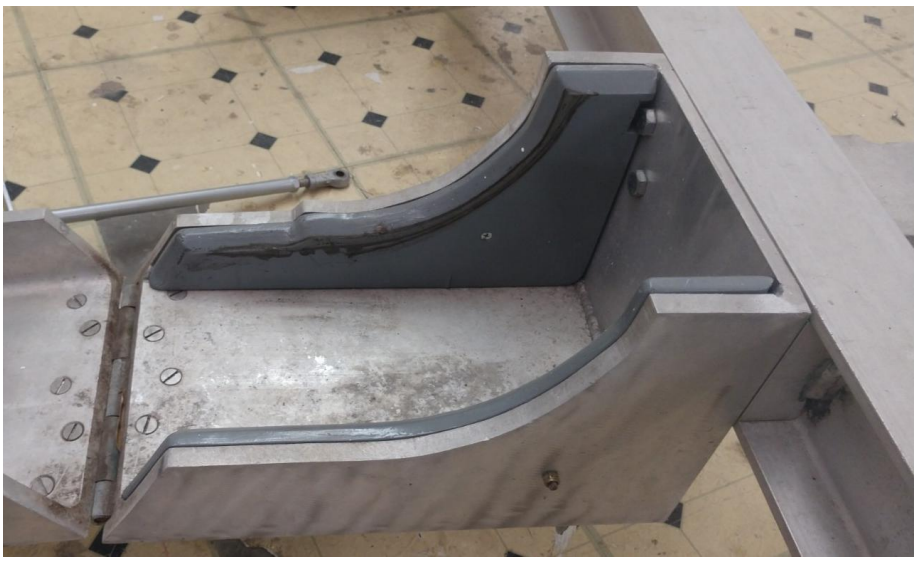
The angle cut in the ramp is not just cosmetic. It makes sliding the wheel slightly much easier. When being assisted by only one person and with the trailer attached to a vehicle, getting the alignment of the plane and trailer is somewhat frustrating. If the aircraft main wheel is not centered in the slot as it hits the ramp, it is very time consuming to change the trailer orienintation to realign the aircraft with the trailer. I prefer to load with the trailer disconnected from the vehicle. Raise the tail and insert the tailwheel into the trailer slot, then roll the trailer tongue left or right to align the main wheel with the ramp. It is best to do this on concrete rather than in a muddy field. See below.



Tire support area modifications:
If you are using a 7 inch tire (most of us do) the spacers in the trailer wheel slot are essential.



These inserts are ¾ ply. The back sides are relieved to clear the weld beads and bolts that may interfere with a snug fit. They are then trimmed to the same size and shape of the trailer. Then the upper and forward surfaces are routered to give a smooth curve for the tire to slide into the slot. Not more than a ¾ inch cove bit or 45 degree bevel is necessary. I drilled and used a counter sunk #10 screw to secure the spacer to the sides. That way if the spacers need to come out for an 8 inch tire or the wood needs to be refinished, it can be removed quickly. See photo below.



That is enough wood working. Now to saving the back breaking push and pull and eliminating multiple helpers needed to get the aircraft on to the trailer. The winch will make quick and easy work out of pulling the aircraft onto the trailer. To start, measure the area between the trailer hitch handle and the vertical rails of the tail wheel trough running down the trailer. This is best done with the plane on the the trailer or note where the wheel set previously.

The winch chosen was the shortest winch I could find to fit between the hitch latch and the tailwheel. It also had to clear the trailer jack, its handle and still allow attachment to the wheel. Once the measurements were made, I made two 45 degree cuts in the vertical ends of the tail wheel trough to attach the winch and clear the handle and harware. I normally use the supplied ratchet handle, but a knob can be fitted as this customer did below.

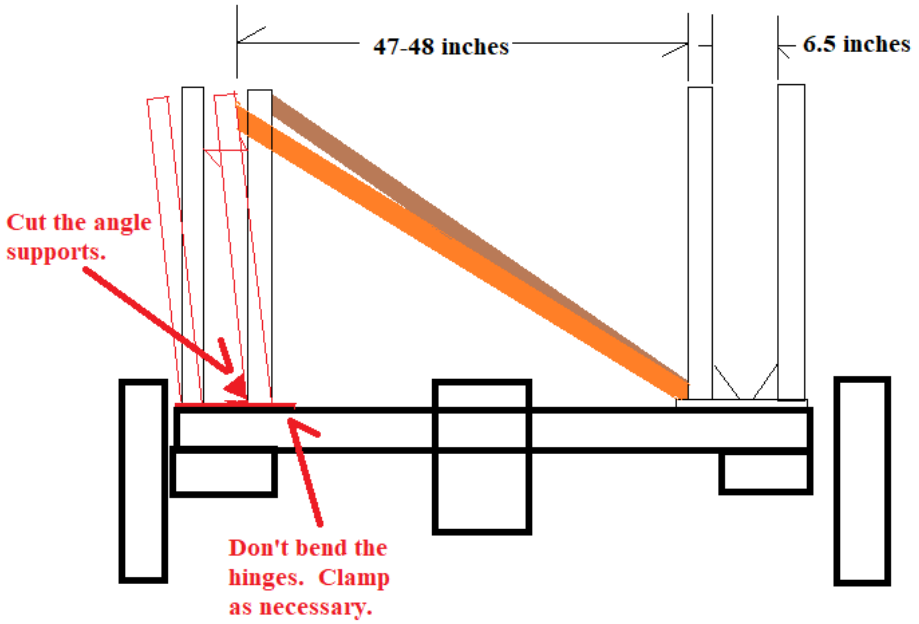
Some of the old trailers had non adjustable arms on the ramp making it very difficult to secure the ramp to the swing arm of the gear. Later models had left and right hand Heim type joints to make the ramp to swing arm adjustment easier.

If you have an older model simply remove one of the Heim Joint ends. Normally on these old trailers the Heim is screwed into a right hand nut welded on to a round tube on either end and some the rod was threaded. Simply remove the right hand nut with a hack saw. Clean off the rust and paint. To make adjusting the arm easy, cut a piece of one inch by ¼ inch thick steel bar to 8-10 inches, bore a hole in the center to match the rod diameter and slide it on to the round shaft. Then weld the adjustment cross arm and weld on a left hand and insert a left hand Heim joint. Install into the brackets again as shown.

Finally, some of the early Mono Transporters wing supports were a bit narrow, used foam for support which failed and slings were fashioned haphazardly. Unfortunately these arms were also dreadfully close to the fuselage. I found with a few timbers, jacks and some metal cuts, I could rebuild these arms to easily use slings, clear the fuselage by two inches each side and give a generous 7 inches between the upper arms to prevent transport damage.

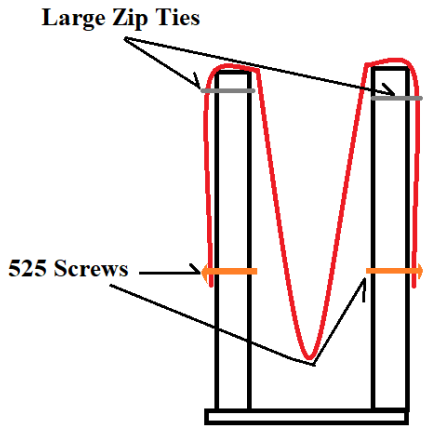
Attaching the slings is a personal matter, however one must be careful. Normally I make a tee on the top of the vertical support and screw the web material to the support. For those who don't care to weld and make complex attachments, on the older trailers the top of the wing sling arms were rounded and filled. On these, simply make the web material long enough to drape over the vertical support to go down about halfway down the vertical support. Use one or two zip ties to hold the web to the side of the upper arm and use one or two screws to attach the web to the vertical support with a nut on the inside of the vertical arm far enough down the arm so wing and fuselage clearance is sufficient from the nut and head. The caution here is not to allow any web attaching screws to contact any aircraft part. See the drawings below.

Wing Support Modifications for Early Mono Trailer



Cut any angle brackets supporting the wing sling arms to allow them to be bent if the distance between the arms is too close to the fuselage. Bend the inner arm outboard and then brace as shown and open up the space for the wing. Ideally the space between the two wing slings is 48 inches but no less than 47.

Wing Sling Detail of Attachments



How to trailer the Mono without damaging it.

If you have a Europa supplied Trailer or Transporter as it was called, it is a marvel of simplicity. However as in my video above a few things are absolutely necessary for proper loading and strapping down of the aircraft to the trailer so as to prevent damage.

Failure to secure the Europa Mono to the trailer leads to a disaster on the road.

Aircraft prep for trailering:

1. I prefer to defuel the aircraft to make it lighter. I remove any loose gear in the aircraft.
2. Air up the main tire to a minimum of 25 pounds. It rolls easier and will glide into the holder. It will also raise the aircraft up and allow the inboard wing flap brackets to clear the axle beam with ease.
3. Make a rudder and fin control/safety lock device. If you tow the aircraft the rudder will flop left and right. Making a simple rudder control lock from PVC or ply and foam padding is sufficient. Just bend the thin ply and pad it to prevent paint damage. Tape is insufficient to prevent aileron movement. Ailerons can flap around a bit and if concerned on a long tow, fabricate an aileron control lock also. I've found 2 inch blue painters tape very effective.
4. The outriggers have been known to come down with the flap on travels. On the aileron gust lock create a strap to hold the outrigger up also. I normally use blue masking tape and tape the aileron, flap and the outrigger to prevent movement.

Trailer mods a quick review from above:

1. First, chock the trailer well or hook it to the vehicle. You will need assistance to roll the mono onto the transporter the ramp alone is a bit steep and it takes much effort to raise the aircraft up the ramp (note I did not say roll as the angle is quite steep it is a lift and push exercise). In the past I simply put my hoist on the aircraft and lifted it on to the trailer. Today I build a ramp as shown above which cuts the forces considerably but still requires considerable effort to push the aircraft up the slope.

2. Install a winch to the tongue of the trailer as shown above. This allows the owner an easy crank of pulling the aircraft up the now elongated ramp with a helper only needed for keeping the wings level so the inboard flap bracket clears the axle.

3. Take the time to create spacer boards in the cradle for the main tire or it will allow the tire to slip to one side and the fuselage will lean into the wing cradle and damage the fuselage side. Using these bunker boards on the sides of the tire keep the mono tire (even a 7 inch tire) centered in the cradle. Then let out a little air an allow the tire to really squeeze in the slot.

4. Properly maintain the ramp arms to allow the ramp to be lifted up and secured to the diagonal arms. Pull up the ramp on to the swing arm and find some way to hold it up. I lay on my back and put my feet on the ramp. The ramp should slip on the front of the gear swing arm and both sides should be snug.

5. Just as important as making the bunker boards for the tire, the ramp may need thin pieces of Phenolic to allow the swing arm and ramp to fit snugly. It shouldn't take a hammer to secure the ramp up to the arm, but it should be a very snug fit. The ramp should contact the swing arm when fully seated. I normally do not pad the ramp edge to prevent marking the swing arm. A simple piece of thin cowl seal is fine to prevent marking the swing arm. This proper fit of the swing arm to ramp may require a bit of time grinding down the aluminum ramp to cradle contact bevel to get the angle just right for your airplane.

6. I have an assistant align and pin the two diagonal rotating arms to secure the ramp. If working alone or not wanting to bother the assistant crawling under the aircraft, use a pair of ratchet straps to initially pull the ramp into place then attach the two arms and pin them.

7. The arms should rotate freely and allow an easy tightening.

8. Rock the aircraft and test for rigidity of the aircraft in the cradle seat and arm. The aircraft should not move more than an inch with a 100 pound push on the side.

Note:

The aircraft can be lifted directly up off the trailer even after all this. It must be strapped down to the trailer or a rough road or undulation could cause the aircraft from lifting partially out of the cradle. So strap the wheel down to the trailer!

I prefer to use 600 pound ratchet straps to secure an aircraft properly. One goes over the top of the tire, and on to the center of the tire cradle. I place the two hooks (if not using a continuous strap) under the cradle. The other strap goes around the swing arm, and around the ramp to hold the swing arm firmly forward and down. I normally have to slide the strap under the brake line to assure the brake line has no strapping force on it. One or two more straps are used to secure the tail wheel to the trailer.

In the photo below are some more colorful straps (not 600 pounders but 400 pound load straps that were thin used for the short smooth 9 mile trip to the airport from my shop).

Note:

Ensure the over the tire strap goes down past the axle. I have never made a Y strap sewn to pull down and prevent slipping as I don't personally own a mono and if hauling someone else's aircraft I stop often and recheck my straps to ensure there is not chafing or slipping.

<u>Use care not to pinch the brake line.</u> Remove a screw securing the line if necessary to get the strap under the brake line.

Any ratcheting strap can chafe on the sharp corners. Use tape to protect the straps and always carry extra straps just in case.

I highly recommend you shorten the straps to suit your needs, especially on the tail wheel as these are not long straps. Have the ends dressed or sewn properly to prevent fraying. Otherwise you will be wrapping and tying long ends of the straps.

Warning:

Never use the pull to friction straps as they loosen quickly. I highly recommend a ratcheting strap. Remember to maintain your straps properly. Keep the mechanism lubricated and the straps clean and the hooks, if used, properly coated.

Secure the tailwheel two ways. With a winch obviously, the tailwheel can't go forward even if the ramp falls off so ensure the winch is tight and locked. Always use a shortened strap to secure the tail wheel spring or wheel pulling down on the spring/wheel and going under the longitudinal beam. Take care to avoid the trailer wires if present. If you don't have a winch, use two straps to secure the tailwheel. One to pull it aft and one to hold it down as shown below.

Note this client used a hook over the tail wheel axle. Use caution to make sure the washer is sized so the hook cannot slip off the end and the spacer is properly sized also to fit the hook.

This spacer was of proper length, but the washer was a bit too small of an OD. Choose wisely if you must change any hardware. 600 pound steel hooks with a plastic coating are probably overkill so simply size your hook to the spacer. A small ¼ inch hook will require no modification and then the Scott tow bar will fit nicely over the washer originally supplied.

Caution:

Do not put straps over the top of the fuselage. If the wheel is properly spaced into the cradle using wood spacers the aircraft will not lean enough to contact the wing cradles on each side. An aircrafts' landing gear are designed for the shock of landing and off runway excursions. The fuselage supports are not.

I have seen some photos of owners using a beam through the fuselage wing hole pinned into the wing pin supports in the cockpit bulkhead. I find this not effective except for when hoisting the aircraft then a beam through the spar hole comes in handy ensuring the plane stays level. This area is not designed for the impact loads of trailering

Finally, keep your trailer in shape. Cover it from the elements as best as can be done. Grease the axles, ensure the tires are serviceable and carry a spare wheel, lug wrench and a jack suitable for the trailer. Prevent rust on the wing spar hold downs and the hinges and pins.

Always put a rudder control lock on the fin and rudder if travelling long distances and or at high speed down interstates as the winds from trucks and passing cars can shake the heck out of the aircraft. The gusts will easily slam a unprepared rudder hard over and damage the rudder as it hits the stop or ripping out the control rod or rudder control arm.

I have traveled over a 1000 miles using the Europa Transporter. It is possible but again, it is really best for two and from the airport transport for the flying season. Frankly I prefer to simply load the transporter and airplane on to my flatbed and pull the aircraft forward. That way the rudder stays streamlined and the trailer is lashed to my flatbed so the aircraft is double sprung and rides very smoothly. I normally use my wing racks designed for the Europa to put the wings in as it is very secure then.