



ASSEMBLY MANUAL
for the
LARGE BUBBLEBARN

supplied by

T.A.M.E. Ltd.
Radwell Lodge,
Baldock,
Herts, SG7 5ES.

Tel 01462 834 776 FAX 01462 732 668 E-Mail tame@flymicro.com

Reg. in England No. 1897004. End use No. EU/0917/262/94 V.A.T. No. GB 563 5371 34

Directors; R. Meredith-Hardy, N. Meredith-Hardy

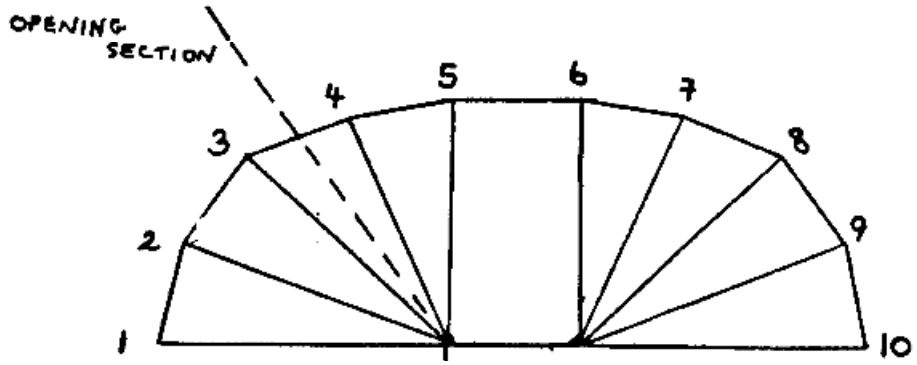
© TAME Ltd 1999 Manual Issue 9/99

CONTENTS

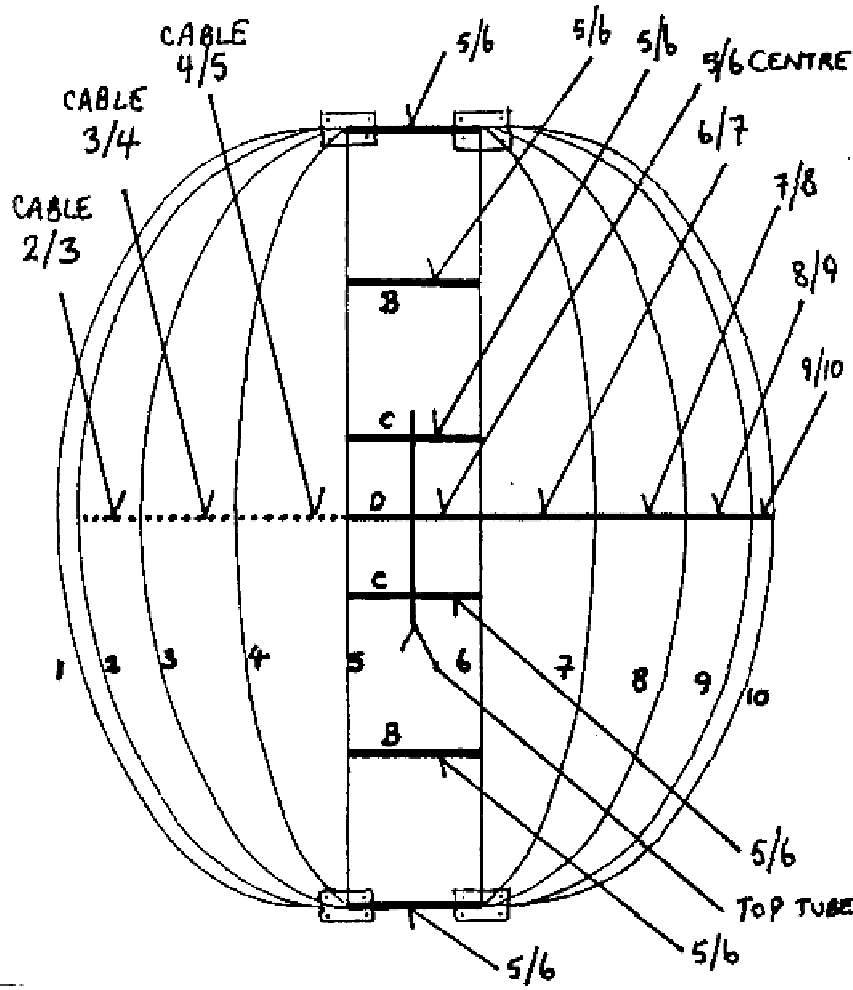
CONTENTS..... 2
Basic description of the Large Bubblebarn 3
Description of Parts 4
Tools needed..... 5
Site 5
Erection 6
Fitting the cover 8
The difficult method 8
The easy method..... 8
Repairs 10

Basic description of the Large Bubblebarn

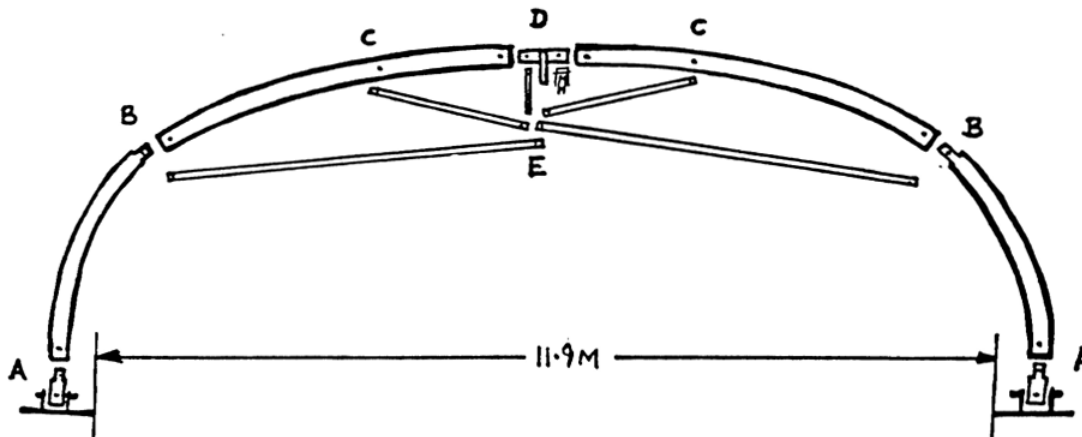
The large Bubblebarn is a structure with a floor area of over 1200 sq ft. Bubblebarns are substantial structures able to withstand heavy snowfall loads and high winds. (they have been proven to over 1 metre of snow in central European and Alpine conditions. Virtually the only limiting factor in extreme wind conditions is the efficiency of the ground fixings.



The large Bubblebarn is made up of ten frames in the shape of hoops which are fixed at their ends to articulated feet either staked or preferably bolted to concrete pads in the ground. There are four articulated feet, so five frames are attached to each pair of feet. The frames numbered 1 (on the ground) to 5 (permanently vertical) are connected by flexible cables at their central point and concertina together when the Bubblebarn is opened.



Frames 6 (permanently vertical) to 10 (on the ground) are connected at their central point by rigid compression tubes that are identified by the two frames to which they each attach. For example, the compression tube between frames 6 and 7 is known as Tube 6/7. Frame no. 10 is permanently attached to the ground.



Each frame consists of five parts. Two short arcs, two long arcs and the central coupling. The point at which the frame joins the feet is known as Joint A, that between the long and short arcs, Joint B, the central coupling Joint D. Frame nos 4, 5, 6 and 7 have five tension tubes to maintain the shape of the Bubblebarn under load. Joint C is where the short tension tubes are attached to the long arc, joint E is where all the tension tubes are attached together.

The cover is made from PVC coated polyester material of the type which sees extreme service conditions compared to a Bubblebarn on the sides of "curtainsider" lorry trailers. It is UV treated to give a long and reliable service life. Interior ventilation is provided by means of vents in the roof and around the articulated feet at the base.

Description of Parts

Amongst your parts, you will find that you have got:

- ★ 4 feet, these are the heavy plates each with 5 articulations.
- ★ 40 curved tubes, 20 long arcs and 20 short arcs. This is enough to make 10 frames.
- ★ 10 central couplings, (D couplings) these are a short length of tube with a plate with three holes welded onto the middle.
- ★ 7 large compression tubes 2.05 M long, (tubes 5/6). Of those 7 you will notice that one of them is slightly different in that its corners have been slightly snipped off, this is tube 5/6 centre.
- ★ You have also got 4 slightly shorter compression tubes,
 - 3 x 1.6 M, these are tubes 7/8, 8/9 & 9/10.
 - 1 x 1.3 M, this is tube 6/7.
- ★ Of the tension tubes (the thin ones) or cables, you have 3 lengths.
 - 4 x 320mm, these are tubes D/E.
 - 8 x 1.27 M, these are tubes C/E.
 - 8 x 5.21 M, these are tubes B/E.
 Any of these may be cables rather than tubes, it makes no difference as they act only in tension.
- ★ There is also one odd tube which has 3 holes drilled into it, and this is the top anti puddle tube and the very last part that you fit.

In the cardboard box with all the little bits and pieces in it you will find:

- ★ One winch and its winding handle and one long length of cable. This is the cable that eventually goes on the winch.
- ★ Four shorter lengths of cable with eyes in.
 - 2 are the same length, cables 3/4 & 2/3.
 - 1 short, cable 4/5.
 - 1 with one eye only, cable 1/2.
- ★ Eight bits of angle iron which have two drilled holes, these are the joints between all tubes B,C & D and frames 5 & 6.
- ★ Various 10 mm bolts. The easiest way to describe these is:
 - Long long ones,
 - Short long ones,
 - Long short ones,
 - Short short ones.All of them take the same nyloc nuts.
- ★ 8 Pulleys
- ★ Various other little bits and pieces. As long as you keep them safe, when we come to them in the actual construction you will know where they go.
- ★ Last of all comes the cover, it weighs 350 kilos and you will find it an entertaining exercise trying to get it on your bubblebarn later on!

Tools needed

2 x 17mm spanners
2 x 13mm spanners
1 x 10mm spanner
1 x large sledge hammer
1 x 2lb lump hammer.
1 x 4.2M ladder, this is the most convenient length.
2 x 15 metre lengths of good quality 10mm rope.
1 x 20 metre length of 5 or 8 mm rope.
1 x Stanley knife.
1 x long tape measure, preferably at least 12.5 M long.

A socket set and a good cordless drill with a ½ inch drive in the chuck certainly speeds the process up a lot.

Although a Bubblebarn can be erected by one person it is much easier with two and at least three are needed to get the cover on the frame. You will also need a car to pull the frames up.

Site

One whole end of a Bubblebarn opens up and it is very important to try and site your Bubblebarn with the mouth away from the prevailing wind. This is because there is an absolute wind limitation of 45 MPH with the door open face on to the wind.

It does not matter how close, in terms of easy installation, you have the sides of the bubblebarn from an obstruction, but it does make things easier if you have a bit of space behind and in front. The reason for this is that you tow the frames into position using your car, and you need a bit of room to manoeuvre. Of course it is easily possible to erect a Bubblebarn with a small space behind but you will have to fix up some kind of pulley arrangement when it comes to lifting frames 1, 2, 3, 4 & 5.

Ideally, you want at least 15 metres clearance from the back and front walls of your Bubblebarn to manoeuvre your car.

The site needs to be flat, but not necessarily perfectly level. Flatness is important because you want to avoid gaps around the rim when the Bubblebarn is complete.

Erection

The first thing to do is to lay out your four feet plates. It is crucial that they are positioned exactly right, once you start building there is no way that you can move them.

You should decipher the numbers on the articulations of the feet, these refer to their respective frames. The pair of feet with articulations 1, 2, 3, 4, 5 are at the front, opening side. The ones at the back, will be 6, 7, 8, 9, 10, Articulations Nos. 1 & 10 are the longest articulation and should be inside all the other articulations. If the numbers written on the articulations seem to be contradictory, follow these instructions rather than the numbers, bearing in mind that the whole structure is symmetrical.

Take a long tape measure and measure 11.9 Metres exactly between the inside edge of the foot plate one side and the inside edge of it's opposite the other side.

In each plate you will find there are four holes drilled in the side of the flange that the pin holding the articulations goes through. Select the hole on the outside nearest the middle and bolt foot 1 2 3 4 5 to foot 6 7 8 9 10 with one tube 5/6, using two long short bolts. Do this on both sides.

Measure diagonals between the articulation pins on each foot to get all four plates perfectly square to each other. Now check again they are still exactly 11.9 metres apart on the inside edge of the foot plate. **THIS IS VERY IMPORTANT, SO MEASURE IT AGAIN TO BE SURE THAT THE FEET ARE POSITIONED EXACTLY.** Once the frames are attached to the feet the whole thing becomes very heavy and would be difficult to move.

Once you have got the feet set exactly in the right position, stake or bolt them in. At this stage only put three stakes in each foot, you will need some spare stakes for the erection. Bash them in fully, preferably in a slightly outward direction to maximise the bearing area.

If you haven't worked up a good sweat doing this or for any other reason you think they have gone in too easily you probably need longer stakes, these are available from T.A.M.E. Ltd. Alternatively, and we recommend this as the best installation, the feet should be set and bolted onto concrete pads.

Now look at your articulations, and you will find that there is one long, two medium and two short ones. Select the outside short one, No.6, this is the frame you will be building first.

Although all the short arcs are the same, you will discover that not all the long arcs are. You will find that eight have an extra hole for joint C. Of these eight, four may be of heavier gauge. These are for frames 5 & 6. The two lighter ones with joint C are for frames 4 & 7.

Now assemble arch no. 6. The easiest way to do this is to first fit coupling D to the two long arcs using two short long bolts. Next insert the two short arcs into the long arcs, joint B, but at this stage do not bolt them.

Fit one of the bits of angle iron which have two drilled holes to a long long bolt (through hole in shorter angle), fit long tension bars (or cables if they are supplied instead) under angle and then complete joint B with that bolt. Do the same with medium tension bars to joint C. Fit pulley in the smaller, central hole of coupling D and fit short tension bar on other side of the coupling's plate

under the nut. (You will find this tube will only fit one way). Leave this bolt slightly loose to enable the pulley to swing a little on it's bolt. Finally fit long short bolt E to tie all the tension tubes together. You may have to pull the legs of the arch together to be able to insert this bolt. Oil the pulley and make sure that it is free moving.

Fit the ends of the arch onto the articulations. This may need some wiggling to get them to fit.

To erect the arch, take your two bits of large 10mm rope and tie them both with good bowlines, around the tube at Joint D. One rope will lead to the front and one to the back. Tie the rope to the front to your car, ask your assistant (the one with more brawn than brain) to lift arch to chest high, and then reverse the car away until the arch is vertical. This is a fairly delicate procedure as the arch must not fall over the other side. Steady it with the second rope and when in position stake both ropes VERY SECURELY with the spare stakes you kept back for the purpose.

It is vitally important that the stake, particularly on the side your car is, is VERY FIRMLY IN THE GROUND, because later on the weight of the whole frame will become much greater. IF THERE IS ANY DOUBT ABOUT THE INTEGRITY OF THE SOIL, TIE THE ROPES ONTO OTHER CARS THAT ARE PARKED SIDEWAYS ON TO THE DIRECTION OF PULL.

Once this is complete, you next assemble arch no. 7. This is exactly the same as no. 6 except you do not use the pieces of angle iron. You must also attach to the upward hole in coupling D, compression tube 6/7 using a short short bolt.

To erect it, fetch your piece of 5 or 8 mm rope and tie it with a bowline to point D, run it through the pulley on the frame already erect and then to the car, lift frame to chest height, and reverse the car pulling the arch up. Compression tube 6/7 is then bolted to its opposite number's hole on the centre coupling of the frame you have already erected. For this you will need the ladder.

When you take the tension off the rope to your car you will see that the whole lot is now a little heavier on the rope that you have got going to that stake. At the moment you are alright but you will have to put two ropes at least to other stakes when you have completed the next frame.

Now assemble arch no. 8. This is exactly the same as the arches you have already assembled, except there are no tension tubes. The pulley is fitted as usual. Fit compression tube 7/8 and raise in the same way as with frame 7.

Now you will find that there is a lot of weight on the rope staked to the ground in the direction of the car. No tension is on the rope to the back. Unstake this rope and walk round and restake it at the front of the bubblebarn so you have an extra margin of safety. When you put the next frame on the whole lot will be extremely heavy, be VERY careful about working directly under where it could fall down.

Now assemble arches 9 and 10 all the same way as you assembled arch 8. Once 10 is completed, and the compression tube fitted, release the ropes to give a free standing quarter sphere.

You can now start assembling the other side of the bubblebarn, that is frames nos 5, 4, 3, 2 and 1. This is done in the same way as you have already done with the back.

Assemble arch no. 5. This you do in exactly the same way as frame no. 6, not forgetting to fit the bits of angle iron at B & C. Erect the frame and connect all the remaining tubes 5/6 with small small bolts to frame 6. Tube 5/6 centre connects the two D couplings.

Next assemble frame no. 4, the same as frame no. 7, but instead of using compression tubes as you did between the arcs on the back, you are now going to use cables. These are the 10mm cables with the eyes at their ends. In the same way as the back compression tubes, one is shorter than the rest, and this is the one that goes between arcs 5 and 4 (cable 5/4). Amongst the small bits in the cardboard box are some bobbins, these go through the eye before being bolted to coupling D allowing the eyes to swivel.

Assemble and erect frame nos. 4, 3, 2 & 1 in the same way as those at the back, the wire 1/2 only has an eye at one end to provide some adjustment with a cable clamp. Alternatively you can omit this cable altogether.

Now fit the winch. The mounting plate is first clamped to tube 9/10 at a convenient height with the U bolts provided and the winch subsequently bolted to it. Ensure the U bolts are done up really nice and tight, otherwise when you wind the winch, it could slip up the compression tube. The wire needs to be fitted onto the winch using the clamp supplied, and then run wire through all the pulleys, all the way down to frame no. 1 to which it is attached using the 'U' clamp supplied. It is crucial the cable is securely attached to frame 1 or it could fall on someone during operation.

Finally bash one of the two special stakes with a tab and hole under point D of frame 10 and bolt it to the coupling. If you are setting the Bubblebarn on concrete pads we would also suggest you set the stake which holds the back and the front down in concrete as well.

Now you can try the correct operation your Bubblebarn out if you like. By winding the winch the door will open. The winch is a two speed affair, changed by moving the winding handle between the two square drive points. To avoid undue wear do not be tempted to allow the door to close by freewheeling, wind it all the way down. If you do accidentally let the handle go, immediately stand well clear and on no account try to stop it, there is a lot of power in that winch.

Fitting the cover

Examine the frame for any sharp points which may damage or chafe the cover. Check particularly the ends of the tension tubes at all points B on frames 4,5,6 & 7. A little trimming with a hacksaw may be needed.

As you can imagine, this is not a very easy task because the cover itself weighs 350 kilos. If no lifting gear is available, there are two ways of doing it, the difficult way (as recommended by the French manufacturers), and (we think) an easier way we developed ourselves. I will briefly explain the difficult way, and you can try that if you like but our method seems to make much less strain on everything, including your patience.

Both involve the same initial preparation. The structure must be in the closed position. The cover is perfectly symmetrical about the centre-line D, except there is a small zipped off- centre access door which should end up next to the winch. The inside surface has lots of tabs to fix it to the frames. The centre line D is identifiable by a reinforcement running from front to back on the inside and the tramline weld line of this on the outside. The cover should be properly folded on delivery, that is it was placed on the ground inside down and folded into the middle along lines parallel to the centre line D to a long sausage about 1.5 M wide. The only place you can see the outside is in the crack between the two sets of folds. The way it was then rolled or folded thereafter up does not matter.

The difficult method

In practice this needs at least four people.

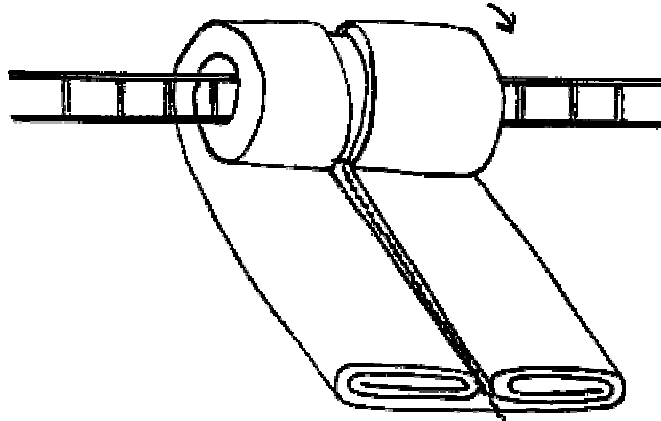
Lay out the tarpaulin in a long sausage along an imaginary extended centre line to the rear (Winch side) of the Bubblebarn. Inside down, folds on top. Check the zipped door lies at the end of the sausage furthest away from the structure. Take the strong rope and tie a slip knot around the end of the sausage nearest the bubblebarn, pass it over the frames and onto your car....and pull. We found this does not seem to be very good for either the car's clutch, the cover itself or the temper of the people who are helping you. We tried rollers made of plastic tube over some frames but this didn't help much. It can be done but is heavy and frustrating work.

The easy method

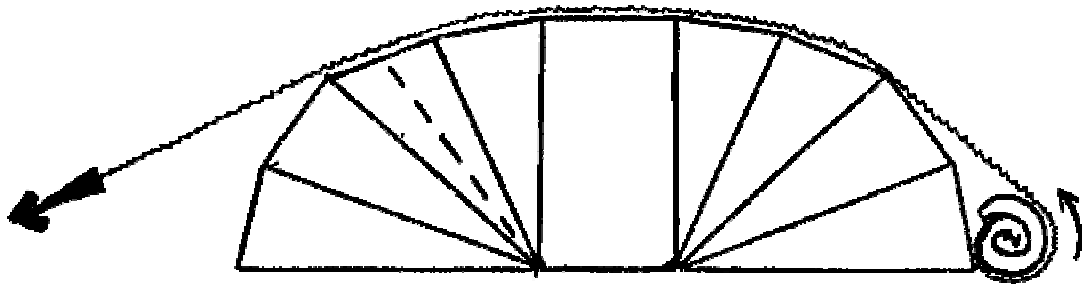
In practice this needs at least three people.

Rather than dragging the whole thing over as a sausage our method relies on the cover actually unrolling over the frames. The crucial thing about this unrolling method is to get the whole lot set up in the right way to begin with.

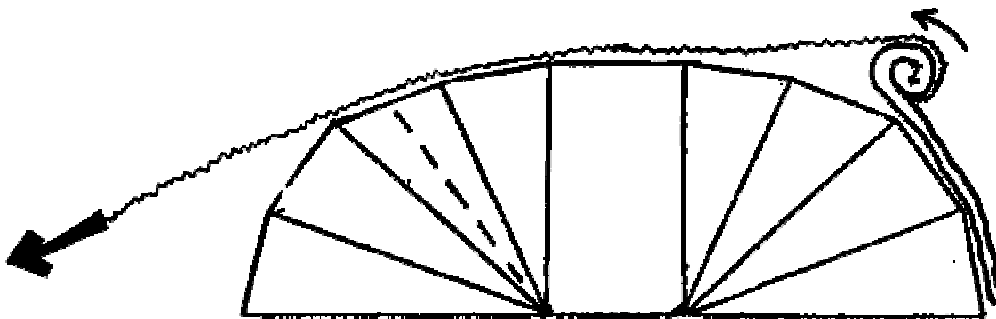
The first thing is to unroll the cover and check it is folded properly.



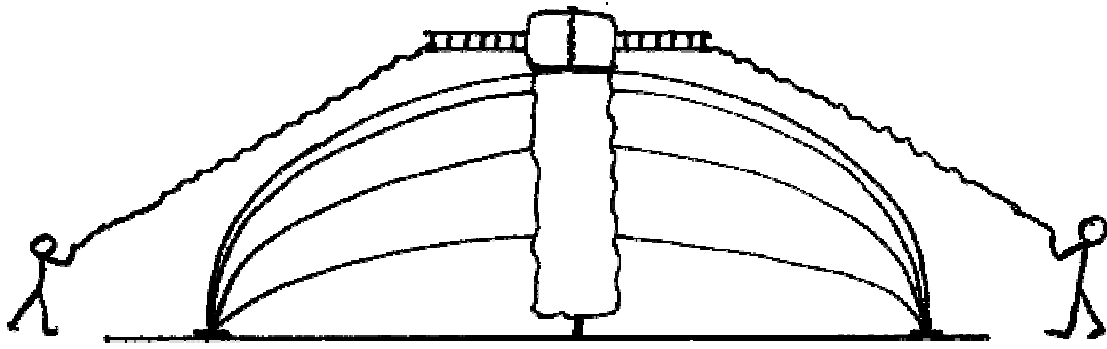
Take one of the bits of strong rope and tie it to the middle rung of your ladder. Lay the centre of the ladder across the cover at the end without the zipped door. Lay the rope out along the centre of the entire length of the sausage. Starting at the end that you have put the ladder, roll up sausage so that eventually the ladder is right in the middle of the roll. Try to make the roll as round as possible.



Orientate the roll adjacent to tube 9/10 (the one with the winch on it), in such a way that the rope passes from the car, over the entire frame and over the roll, before it disappears inside the roll. Everything, including the car must be dead on the centre line.



The idea is that when the car pulls it lifts and unrolls the cover at the same time.



Before starting tie balancing ropes at least 10 M long to the ends of the ladder.

Start pulling with the car, the roll will rise up the side of the frames, it may need a hefty push underneath to get it up to the level of frame 9, rolling on the compression tubes, being balanced and steered by the two people at the end of the balancing ropes. Keep going until the roll has gone right over. Once it gets to just over the top, the whole thing will just roll by itself down the opening side of the Bubblebarn.

Depending on how skilful you were at starting the roll, the cover will lay more or less in the centre and correctly positioned over the frame. It is easier to adjust large discrepancies in the position of the cover now rather than once it has been unrolled.

By having a person sitting on frames 4 & 7 and someone helping on the ground it is a reasonably easy job to unroll the cover down each side. Contrary to what you might think a little wind actually aids the final positioning of the cover by causing it to float a little on the frame.

Lace up with the nylon electricians type tie wraps all the tabs on the inside of the cover to their respective frames. Starting at the top of frames 5 & 6 and working down and out. It is a good idea to leave the lacing fairly loose for a week or two to let the cover settle down. Lacing up frames 2,3,8 & 9 will take the sag out of these frames and tension the cover. It is a good idea to prop these frames up with a stick whilst lacing so as not to over strain the first tabs you do.

Tuck the cover under the circumference (frames 1 & 10) from the outside in and fit all the bungies. There might be too much bungee to begin with so tie a knot in one end to shorten it. Don't cut off the surplus as the cover will shrink a bit with time and it might one day need readjusting.

Fit the final closing stake at point D on frame 1 so a padlock or bolt can be passed through the holes easily.

So there you have your Bubblebarn, virtually complete. You will notice there remains that last small tube. It goes over tube 5/6 centre and under the two tubes 5/6 nearest to it (it is supposed to bolt on but we find it better just to slip it in), it helps prevent puddles forming in these panels. Finally go round and tighten up all the bolts, ensure that all the stakes are properly bashed in and generally make sure that the whole thing is sound.

That is it, your Bubblebarn is ready for use. It might be of interest that our record speed so far is 6 hours for putting up a Bubblebarn. We would be greatly interested to know how long it took you, what problems you had and any brilliant ideas you might have to improve either the structure, the method of erection or indeed these instructions.

We would also be interested as to the different types and numbers of aircraft you have managed to fit in your Bubblebarn, most particularly we are interested in any you have NOT managed to fit in it.

Repairs

The cover is the only thing likely to sustain any serious damage and this is permanently repairable by welding, however, depending on the severity of the damage, it may be necessary to remove the cover from the frame for repair.

Superglue and a patch will make a lasting repair, ensure all surfaces are absolutely clean before applying.

Most types of adhesive tapes will not last long.