Building a 16 Cell Tetrahedron

The Kite Retrospective

The tetrahedron is a pyramid of four equilateral triangles and four faces including its base. To use this form as a kite, two faces of the triangles are covered with fabric to create a flying surface. A dihedral is formed from the two covered surfaces which act as a stabilizer in flight.

The first person to develop this shape for a kite was Alexander Graham Bell, he built many multi cell kites including some with pilots and power driven designs, but were very difficult to control in the air, and never became airborne long enough to become a true flying machine. In later years Buckminster Fuller designed a method of building a tetrahedron kite with two interlocking triangles, with a tension line in the centre to hold the triangles in shape. This method is O.K. for a single cell kite but it is still very difficult to join many cells together without adding too much weight to the kite.

The sixteen cell (Fig. 1)

The tetrahedron is one of the most spectacular kites to make and flt. The main reason why they are rarely seen I believe is the complexity of the connectors and fittings. I have made many of these kites and have developed a very easy way of making all the fittings and for very little cost.

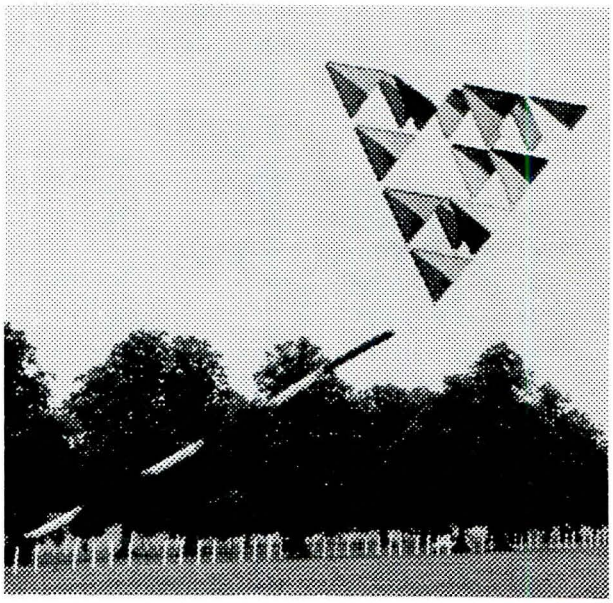

Fig.1 Tetrahedron. 16 Cell with tail.

Ground Rules

As with all kites that fly in a well behaved manner they need to flex and adjust naturally in the wind, so it is very important to select the correct length and width of spar material and the right weight of sail cloth. A rigid small spar will cause a skittish kite whereas a long flexible spar will make the kite very unstable.

Construction

The kite I shall be building is a sixteen cell tetrahedron with thirty two colour panels, sixteen half panels of black, and then four half panels of green, blue, yellow and red, these can be arranged in a different pattern each time the kite is built up.
The total size 6' x 6' x 6', each cell is 18" x 18" x 18", the spars are 1/4" ramin dowel 18" long. The first 1/2" of each end is turned down to 3/16" to accept the joints.

The Sails

The sails are hot cut out of ripstop with sewn hems round four sides (pockets for the spars) the easiest way to find the size of the sails is to construct one cell, make a paper template around the cell, remove, and cut out sixteen sail panels.(Fig. 2).

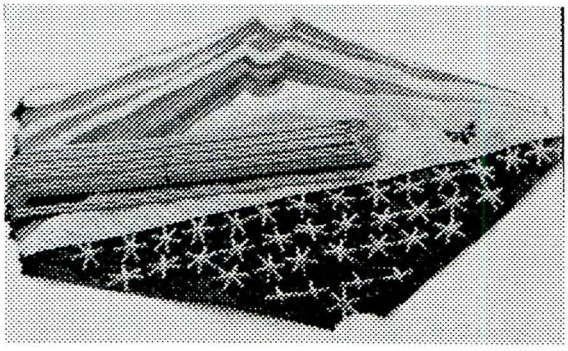

Fig.2 The sails, spars and joints

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Plastic Joints

All the joints described are made from 1/4" plastic tubing, it is important to punch all holes in the tubing as this stops tears and splits spreading which would lead to failure when under great pressure. The joints are lashed together with at least 80lb braided line again to take the large loading in the air, and superglue the knot to ensure the joint does not come apart.

I have used this method of joint making on many types of kites and tetrahedrons and have not had a joint failure yet. This joint construction can be used for any unusual kite fitting. I have found it very strong and reliable and very low cost to produce.

6 Joint Fitting

1 Cut three lengths of 1/4" plastic tubing 1 1/2" long
2 Punch a large hole through the middle of two pieces
3 Punch a tiny hole in the centre of the third piece
4 Push the two pieces of tube onto the piece with the small hole (warm in water to help fitting) (Fig 3)

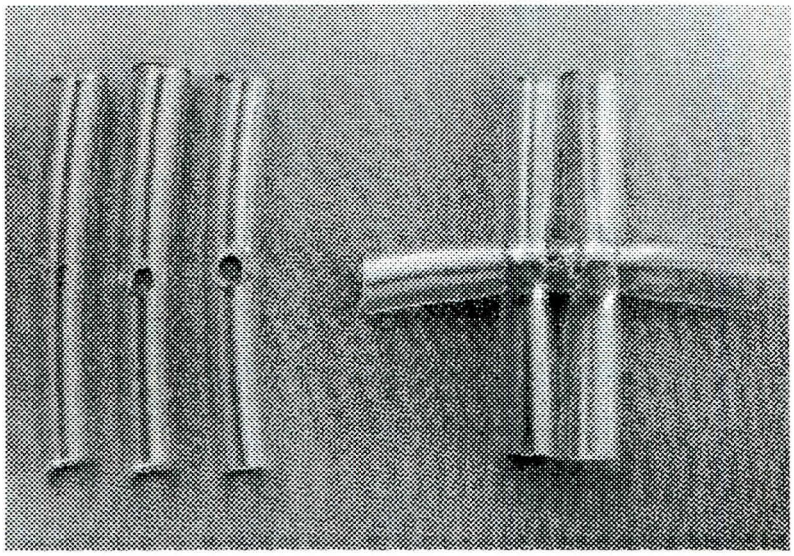

Fig 3. The six joint fitting (before lashing)

5 With a sleeving needle and 80lb lash the joint together going through the small centre hole, finally knot and super glue the knot.

3 Joint Fitting

These are for the four corners of the kite. The three joint fitting is the same method as for the six joint, again the small lashing hole is on the inside of the joint.
(Fig 4)

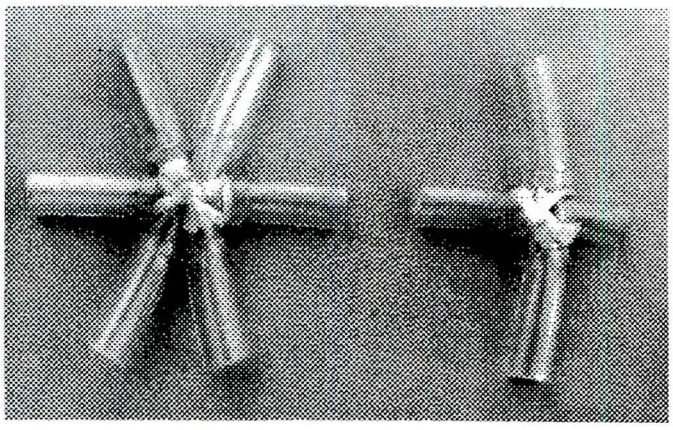

Fig 4. The finished 3 and 6 joint fitting

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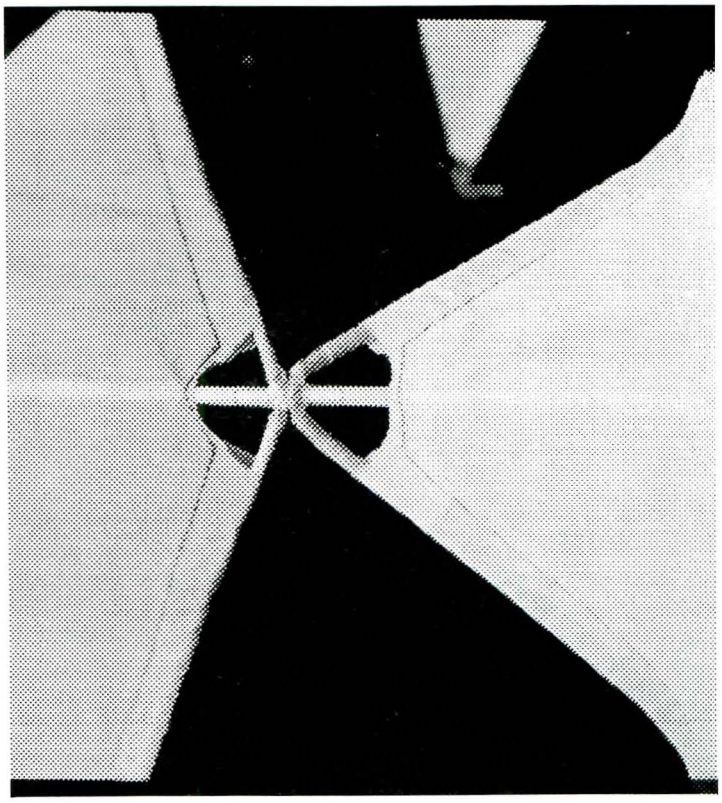

Fig 5. Six joint in the completed kite.

Building Up

Once all the sails spars and joints are made, it is just a matter of constructing the geometric puzzle

(Fig. 5)

Bridle

The bridle can be connected to the joint between the first and second cell at the front edge (which works well), or a two leg bridle which is connected to the top joint and bottom joint on the front edge, this will give you an adjustable towing point

It is a great kite to fly, it changes shape seen from different angles (Fig 6), it is also very stable and has an enormous pull in strong winds, if you want to fly something different then try a tetrehedron. Wind speed 12 -30mph

Bryan Cantle

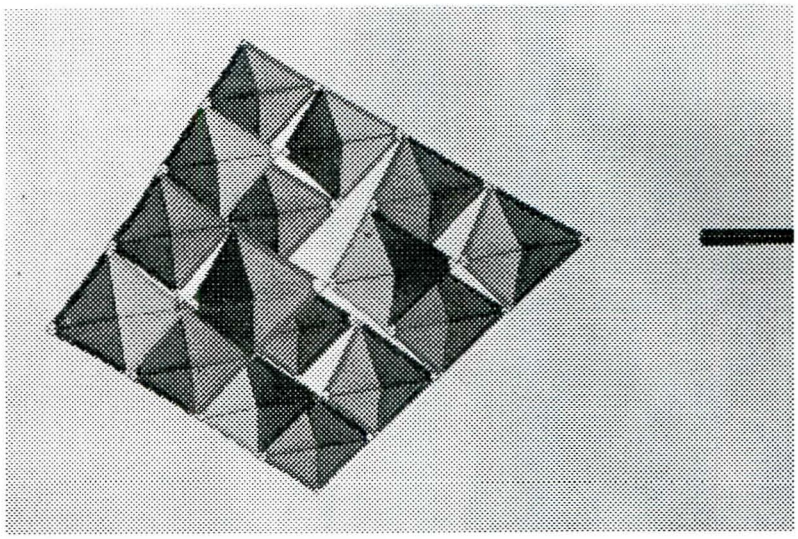

Fig 6. View of kite from underneath