

**ME318
MANUFACTURING TECHNIQUES**

**SPECIAL
PRODUCTION PROJECT**

*** Radio Controlled
(R/C) Model Sail Boat ***

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Aim:

The idea of making an RC Model Sail Boat has come during a discussion in Bogazici University Sailing Team. The main aim was to design and construct custom made Bogazici University RC Boats and start manufacturing it in an engineering based innovative way in the future...

This project would be a good start for the Bogazici University students to make their own custom RC boats.

Design:

The M.A.T 10 sailing boat has actually been the basics of the model boat even though it is not exactly the same. The hull dimensions have been taken except the keel. Keel has not been made since it would be useless for a non-floating boat. Also the height of the mast is proportional to the boat dimensions.

M.A.T 10 Boat is a 10 meter boat; and the model was made 43 cm long. All the dimensions have been shortened proportionally.

The main difference between the model and the boat is that of the model has only one main sail but not the head sail or spinnaker. Hence the location of the mast has been moved to the front of the boat. This difference eased the production.

The drawings of MAT 10 boat is given as an attachment.

The Working Principle:

The main goal of a sailing boat is to use the wind in order to make the boat move. The most important part is the rudder which is used to drive the boat right or left. A normal toy motor can be designed in such a way that it only moves right or left by supporting it with additional parts.

The other toy motor is for trimming the main sail sheet. As the motor shaft rotates, the sheet is being wound on it so that it trims the sail. If it is turning the other way then it is easing the main sail.

There are two controls on the RC control device. The steer turns the rudder motor so that it helps the boat turn starboard or port side. (right- left). The gas control turns the trimming motor which enhances the main sail motor turn. It trims the sail in or ease it off.

Selection of the Materials:

Wood has been used as the basic material for the production of the hull and the mast, boom.

Laminated sail cloth material has been used for the making of the sail.

Dental floss is used for the sheets, shrouds, backstay and forestay (ropes, steels lines...).

The electronic stuff is taken from a model car. It consists of a transmitter controller; a receiver; two pic controlled toy motors; a switch and a battery.

Apparatus:

- Wooden flat plate 30x40 cm. (4mm thickness)
- 12 mm diameter; 50 cm length wooden bar
- 4 mm diameter; 50 cm length wooden bar
- Model making tools
- Glue
- Dental floss
- Laminated sailcloth
- 4 small springs (unnecessary)

Total Costs:

The cost of the wood is around 10 YTL. (In Bauhaus)

The RC controls are taken out from a toy car which costs around 40-70 YTL. A simpler electronic model may be chosen and can be got for only 5-15 YTL in Karakoy. Basic electronic design can also be made by a student; that may cost less than 10 YTL.

The model making tools may cost around 10-15 YTL.

H=50; L=20 triangular laminated sailcloth may be asked from a sail maker. Otherwise, simple cloths or plastic sheets may be used.

Production Processes:

Cutting the wood plate for the hull:

A wood cutting knife is used for taking some portions off from the plate. Firstly the base is drawn on the board and cut out.

Then, five construction parts are taken out. They are actually for the real making of a boat.

The rudder and the other parts are also taken out.

The mast and the boom are cut from the two bars.

Gluing surfaces:

The cut wood have been glued each other so that the hull is ready.

The outside cover of the hull is not made since it is a different and more time taking process.

Inserting the electronics:

The pic board; the rudder motor; the main motor (for the sheet trimming) have been inserted during gluing the pieces of wood.

Cutting the sail:

The sail was cut from the laminated cloth as a triangle. Then by sawing it; it has been set to the mast and the boom.

Inserting the mast and shrouds:

The hardest part is to insert the mast to the hull. To help the mast the stand still tooth string shrouds have been used. Two sides (starboard, port side); one on the front (forestay); one on the very back (backstay) are made of dental floss to hold the mast.

Presentation of the boat:

Since the boat does not float, and cannot stand on itself; a stand is designed. The stand is composed of a flat wood. The wood is drilled so that the mast would fit in. The mast is inserted in the stand.

PRECAUTIONS:

- 1) The weight distribution has not been taken under consideration.
- 2) The motors should be much smaller to reduce the power in order to increase the precision of trimming and tiller control. (Decreasing the voltage of the battery or adding resistances to the motor might be solutions.)



Figure 1: General view

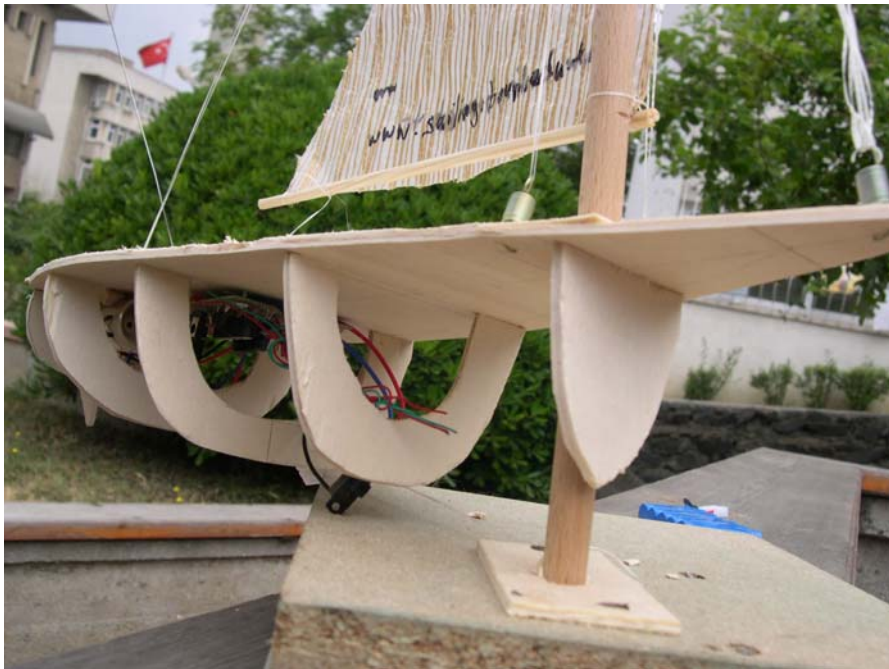


Figure 2: General view from bottom front

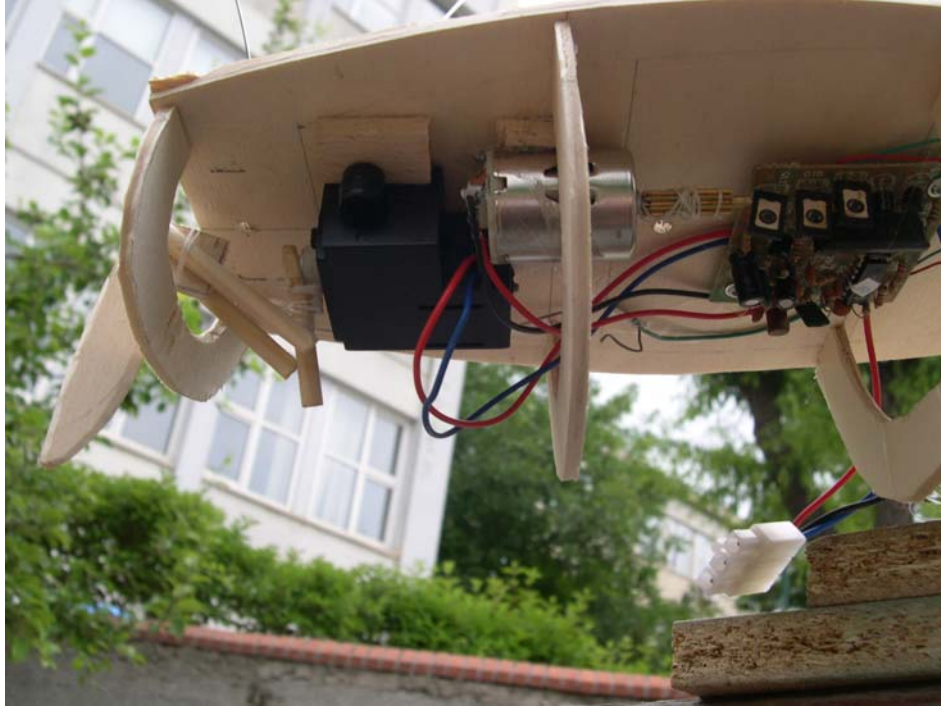


Figure 3: Electronic system on the bottom

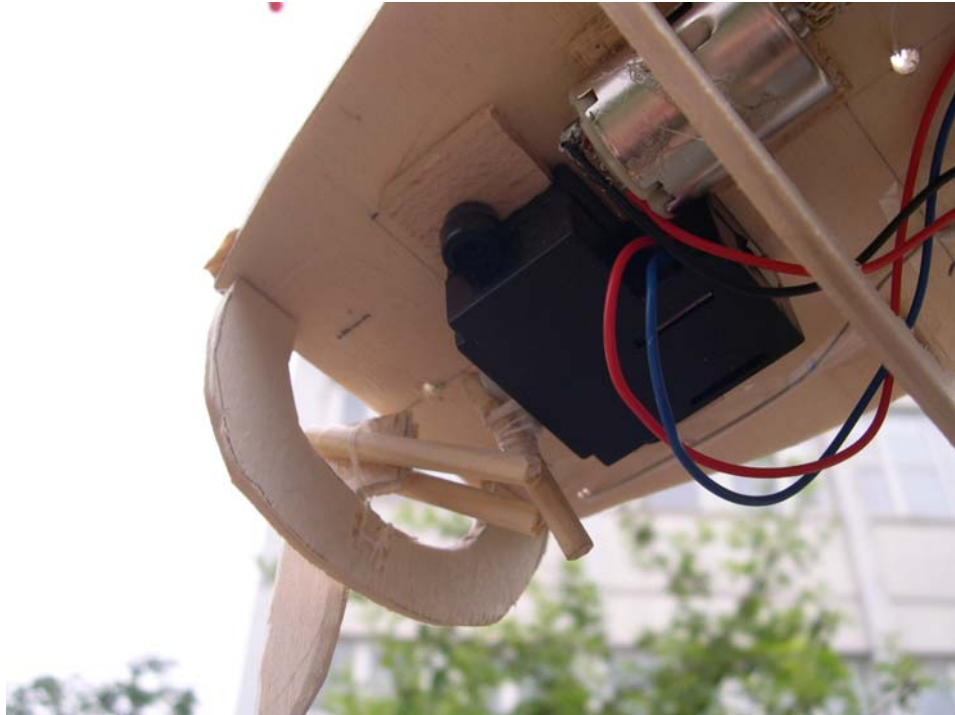


Figure 4: The rudder motor and the tiller. (As the motor shaft turns, it moves the tiller right and left)

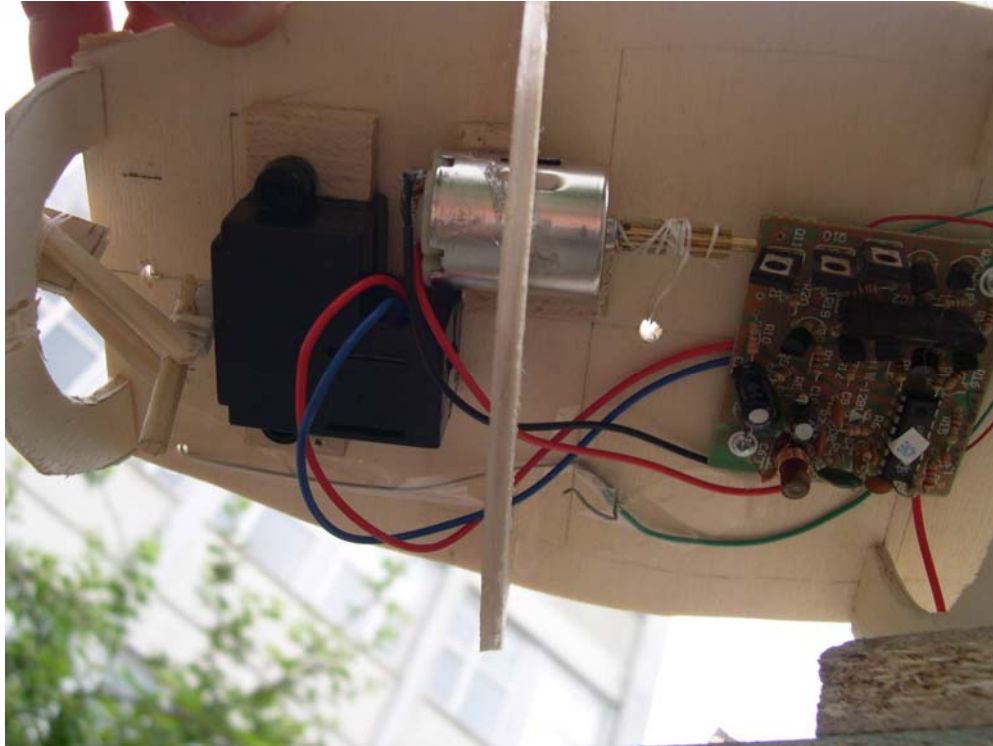


Figure 5: The main sail trimming motor (As the main motor turns, it either winds or unwinds so that the sail is either eased off or trimmed in)



Figure 6: The inserted mast and shrouds

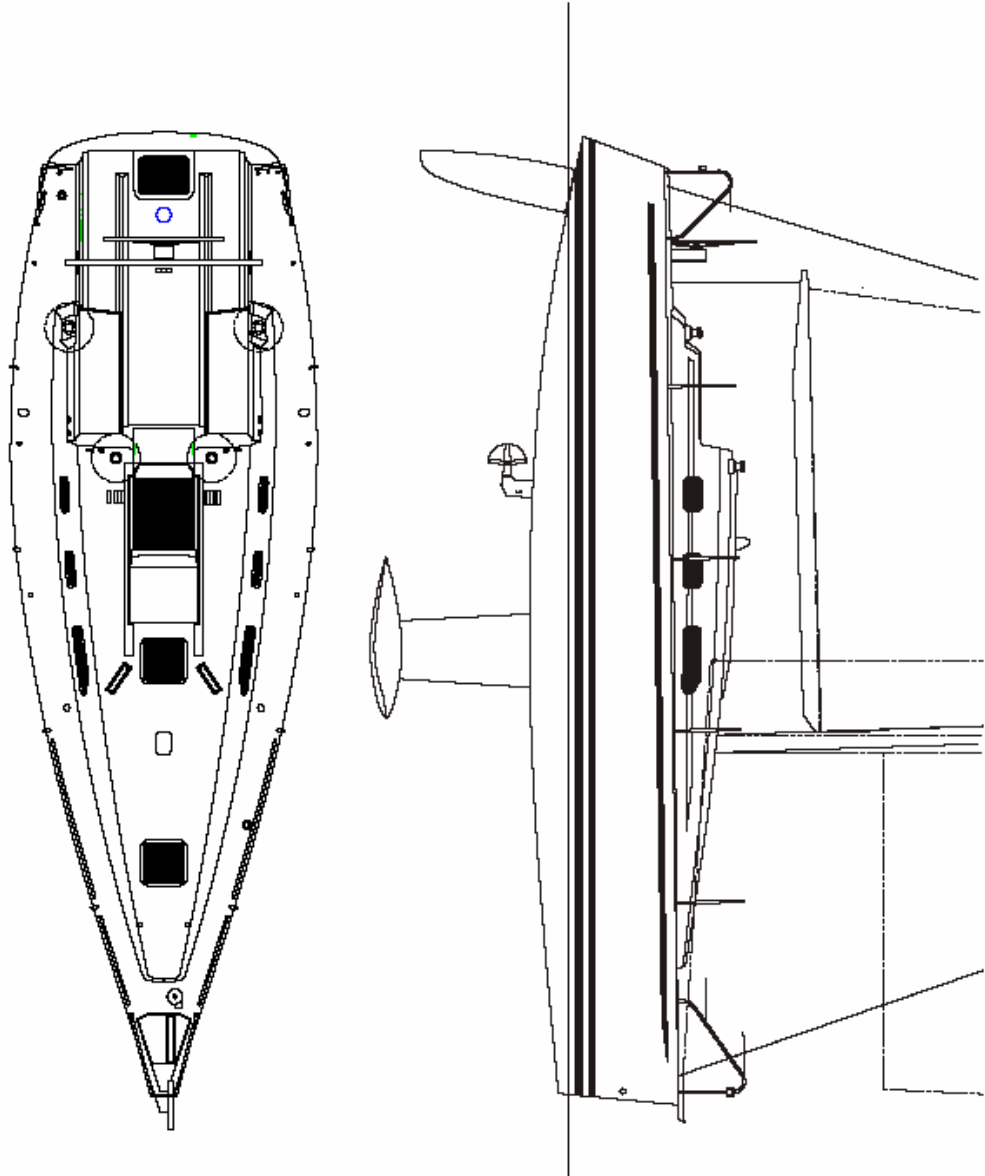


Figure 7: MAT 10 Boat; front and side view.
Ref: www.mat.com.tr