Aeromodelling

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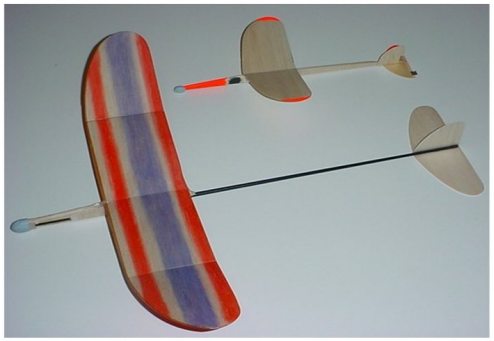
First Powered Flight

First powered flight on 17 December 1903, for 120 feet (36.5 m) in 12 seconds, at a speed of only 6.8 mph over the ground.

Outline

Types of Flying Models



1. Free Flight Models.
   - Chuck/catapult Gliders.
   - Rubber Powered.
   - Tow-line Gliders.
2. Control Line Models.
   - Trainer.
   - Stunt and Combat.
3. Radio Control Models.
   - Free Flight (2 Channel Control).
   - Three channel and four channel

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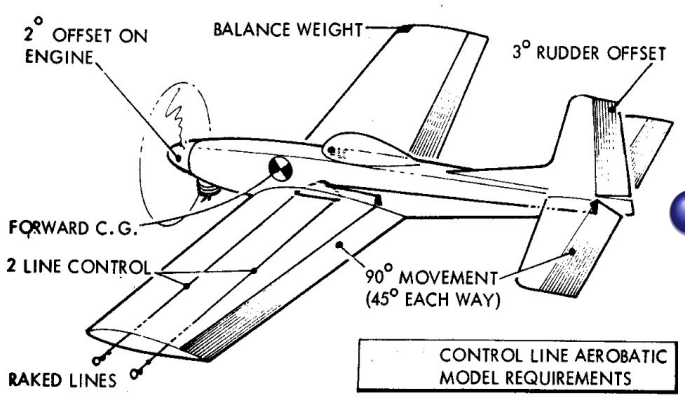

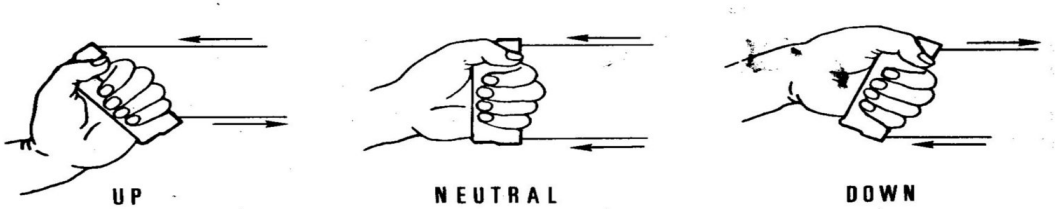

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Power sources used in Aeromodelling

Generally two types of continuous power sources are used in aeromodelling

- Electricity from rechargeable batteries and
- IC engines.

Except the above power sources **rubber band** powered and **compressed air** powered models are also very popular.

Outline

Materials

Various types of materials are used to build a model. Selection of material depend on the size shape and type of model. Some of the commonly used materials are listed below.

1. Balsa wood strips, bamboo sticks
   etc.
2. Thermoplastics.
3. Polystyrene; commonly known as Thermocol.
4. Composite (glass or carbon fibre reinforced).
5. Japanese tissue, bamboo paper and silk as covering.
6. Adhesives like Feviquick, Balsa

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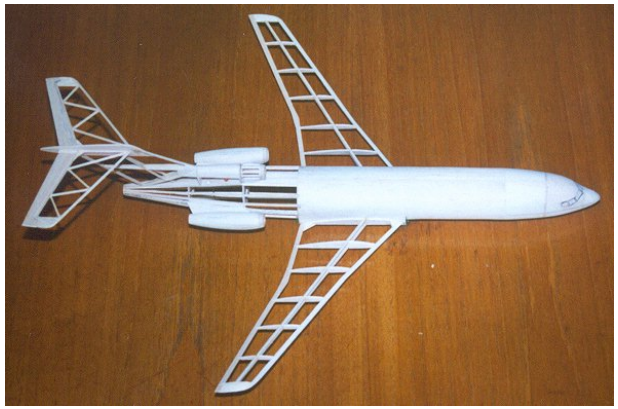

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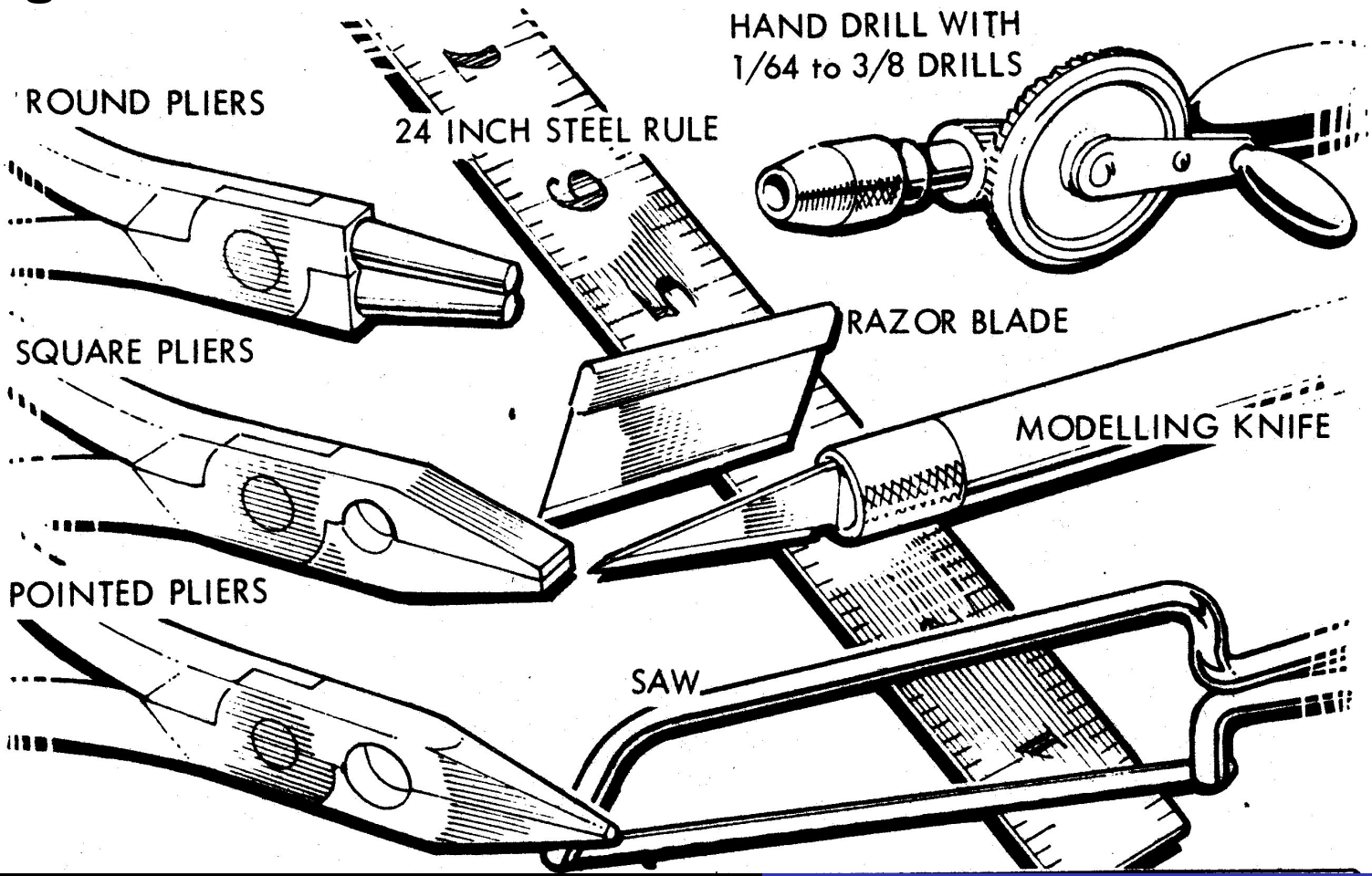
Tools

Some of the tools used to build a model is shown in the figure below.



Outline

Rechargeable Batteries

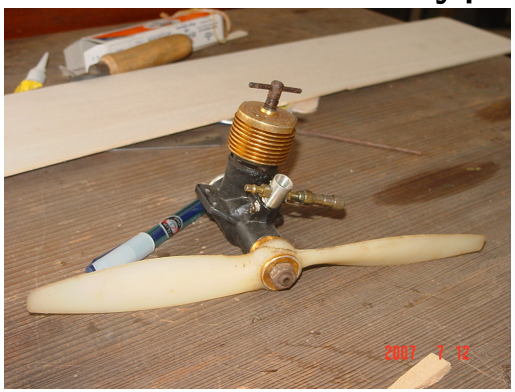
Rechargeable batteries and **Electronic Speed Controller** (ESC) are used to drive motors of a model aircraft. Two different types of batteries are used in aeromodelling.

1. **Ni-MH batteries**, cell voltage is 1.2 V, in series connection of 8 to 9 cells are generally used.
2. **Lithium-Polymer batteries**, cell voltage is 3.7 V.

In recent years Li Po batteries are more popular in aeromodelling because of less wight and faster discharge rate.

IC engines

Two different types of IC engines are used in aeromodelling.



1. Diesel engines (compression ignition) and
2. Glow Plug engines or Petrol engines.

Diesel Engines

- It is a **two-stroke** diesel engine. An **adjustable compression ratio** helps the ignition.
- **Fuel:** A mixture of **ether, kerosene and lubricant** (castor oil or synthetic oil.)
- Available from as small as 0.01 in^3 to over 1.0 in^3 (0.16 cc16 cc).

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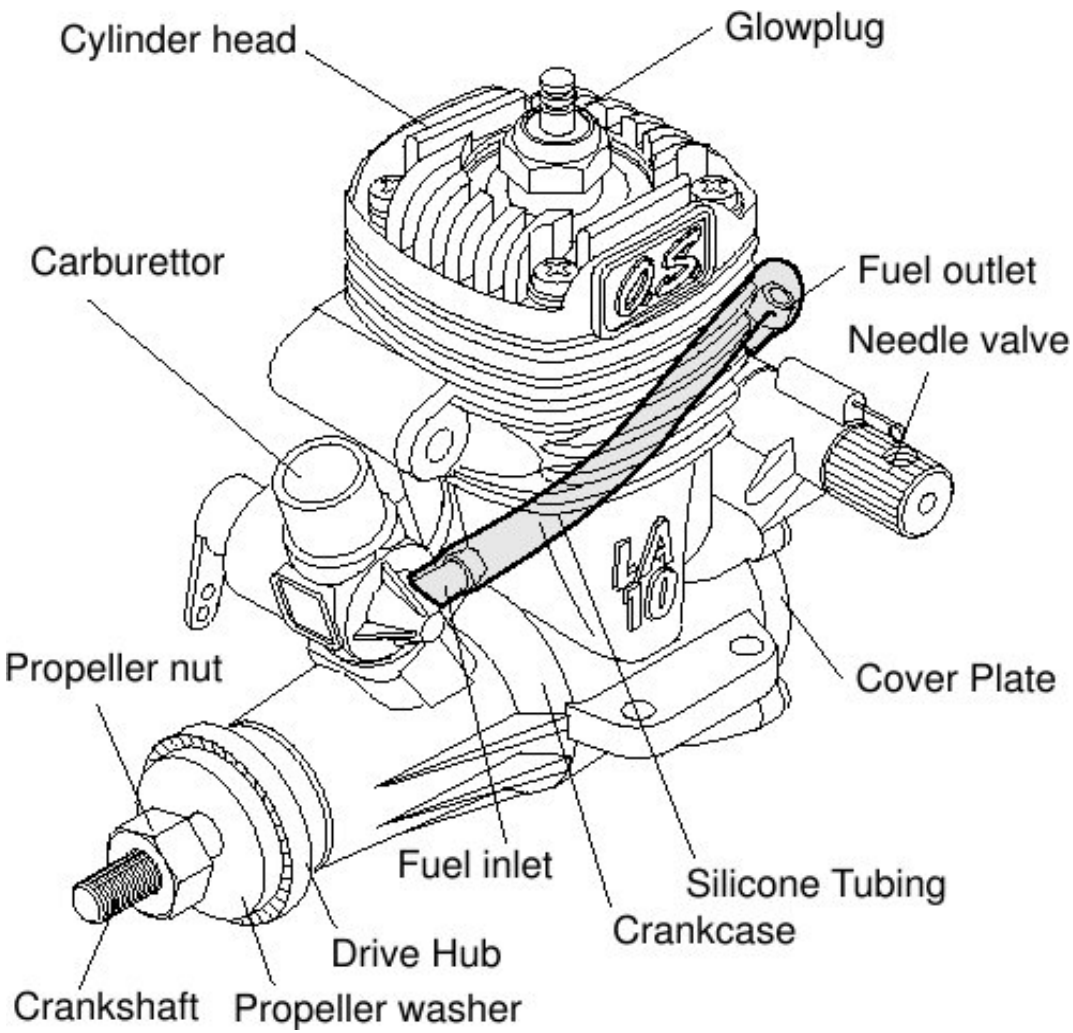
Glow Plug Engines



- It is a **Two-Stroke** petrol engine. A **glow-plug** helps the ignition.
- **Fuel:** A mixture of slow burning **methanol, nitromethane and lubricant** (castor oil or synthetic oil.)
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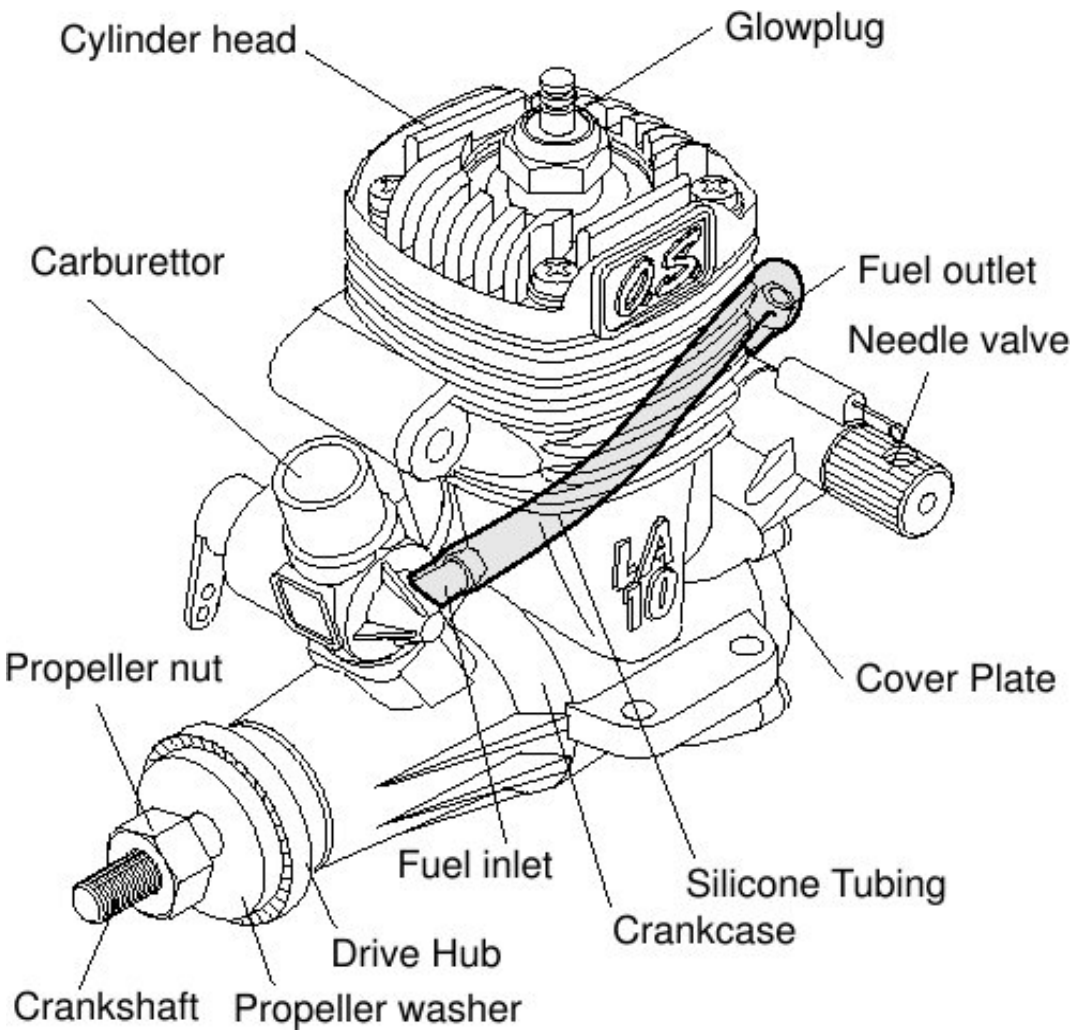

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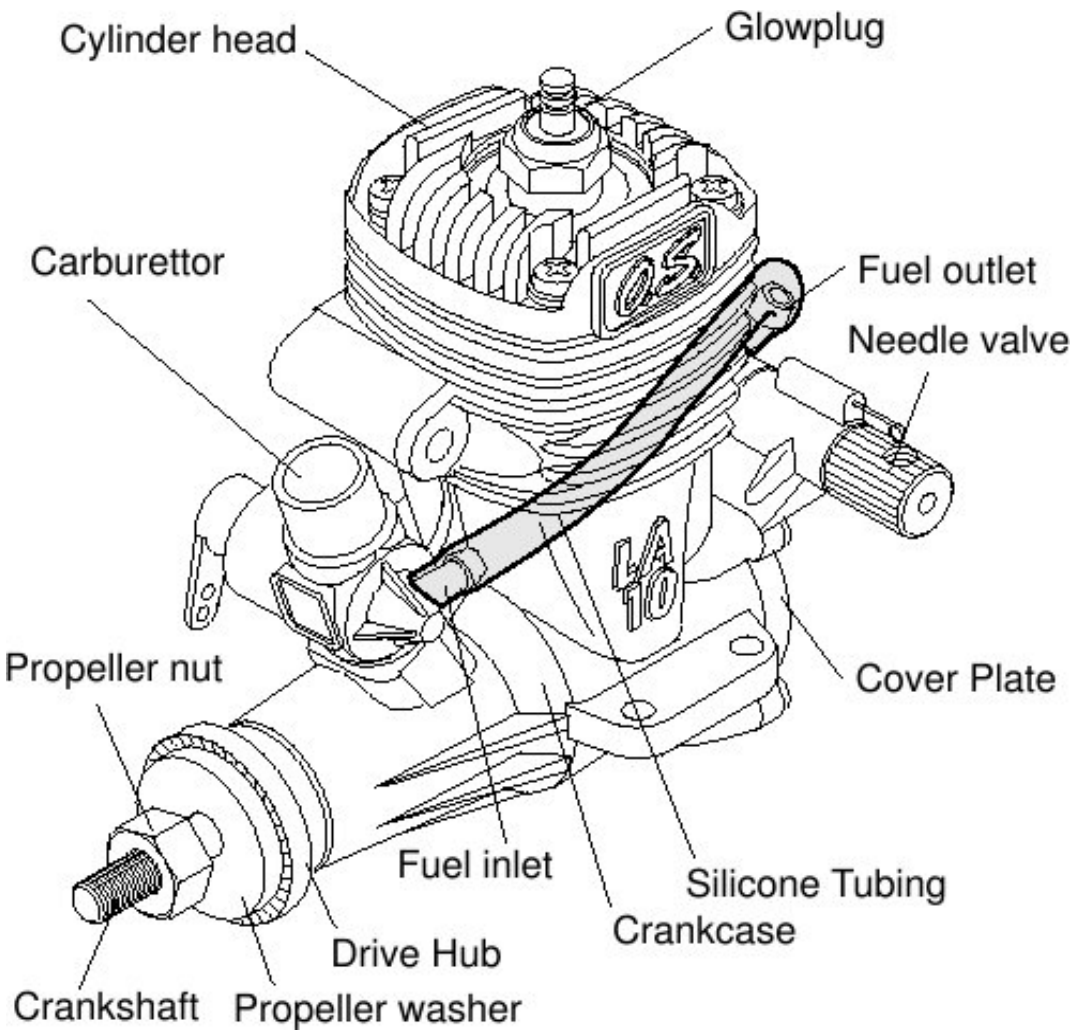

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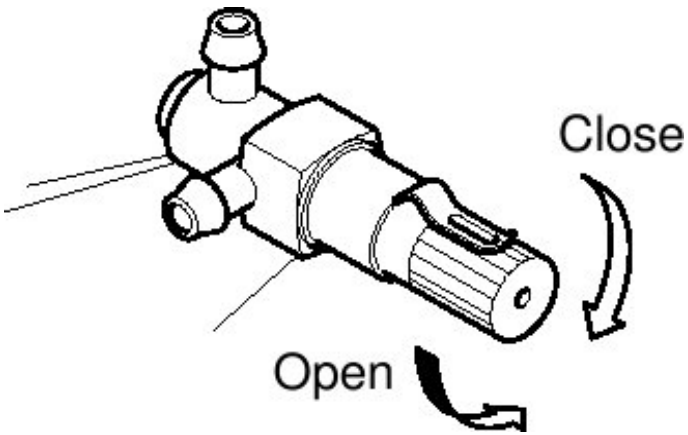
Starting a Glow Engine

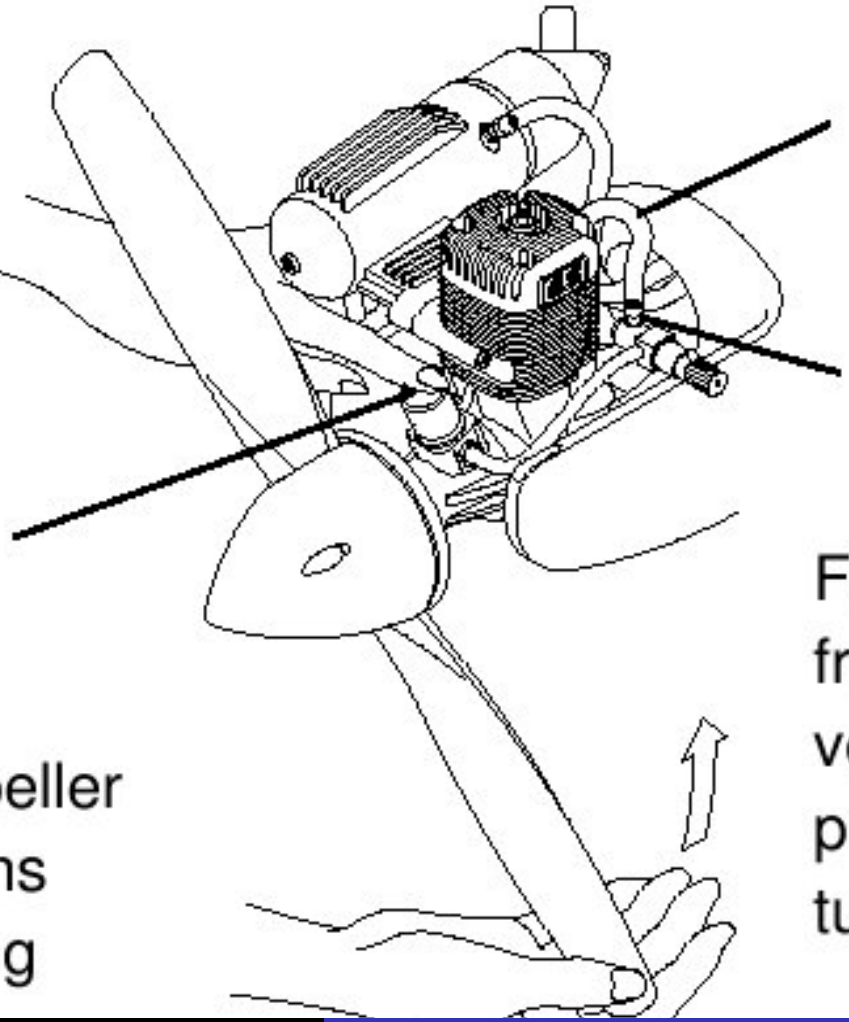
Opening of Needle Valve



- Open the needle-valve 3 turns (for 15LA-S), 1 - 2 turns (for 25,40,46LA-S) in the direction of arrow from the closed position.

Starting a Glow Engine

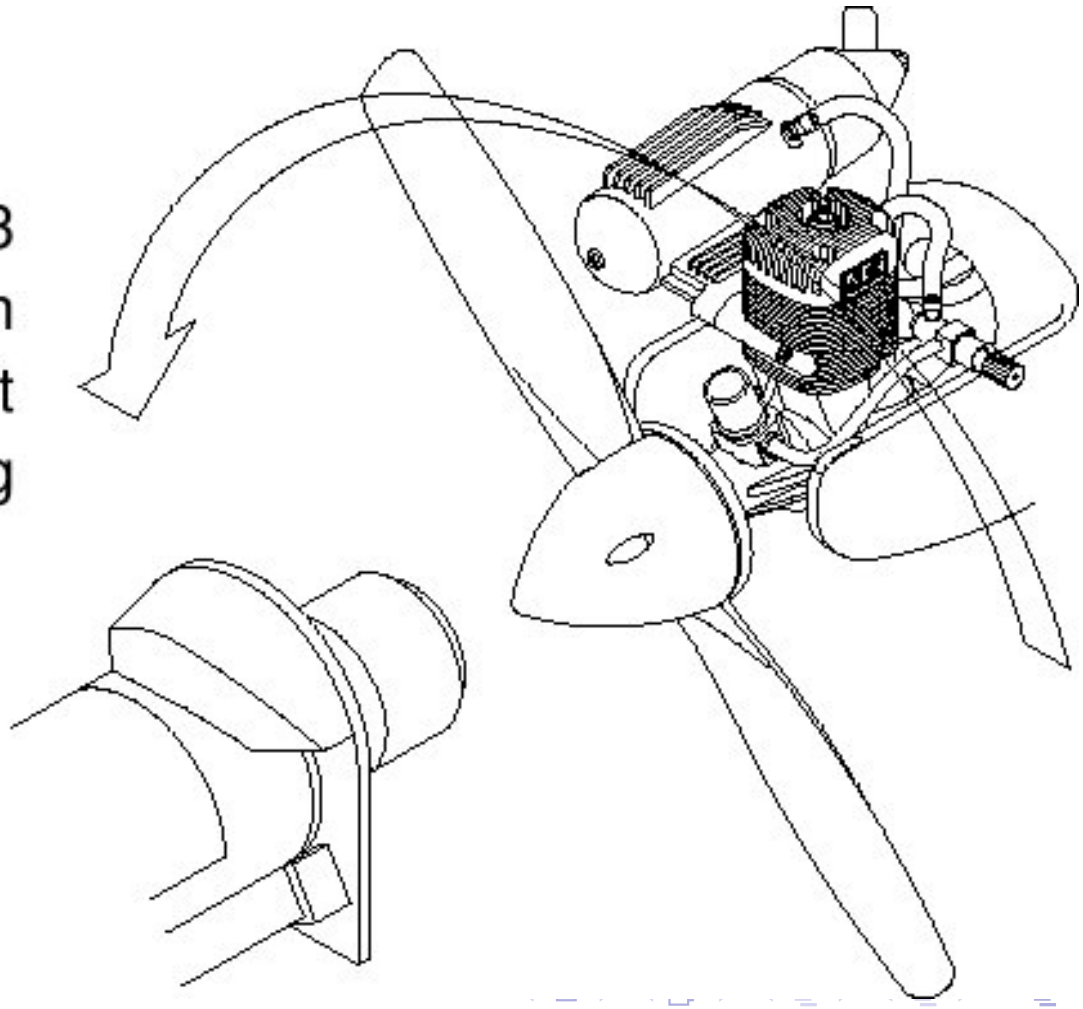
Priming



Starting a Glow Engine

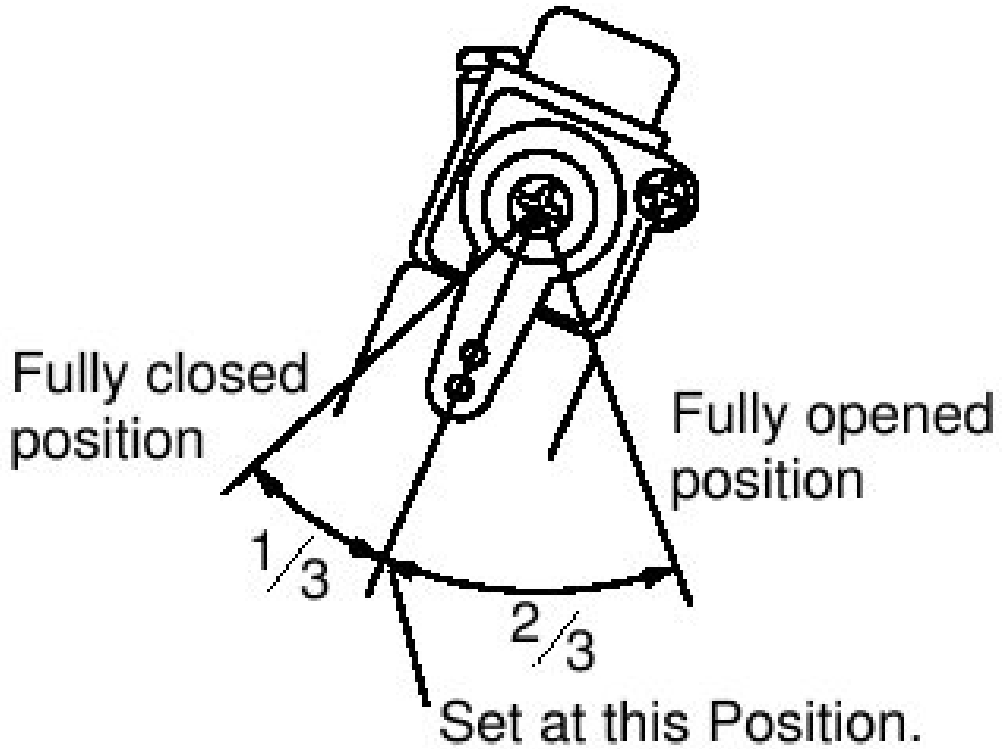
Priming

Turn the engine for 3 to 4 seconds by an electric starter without connecting glowplug battery.



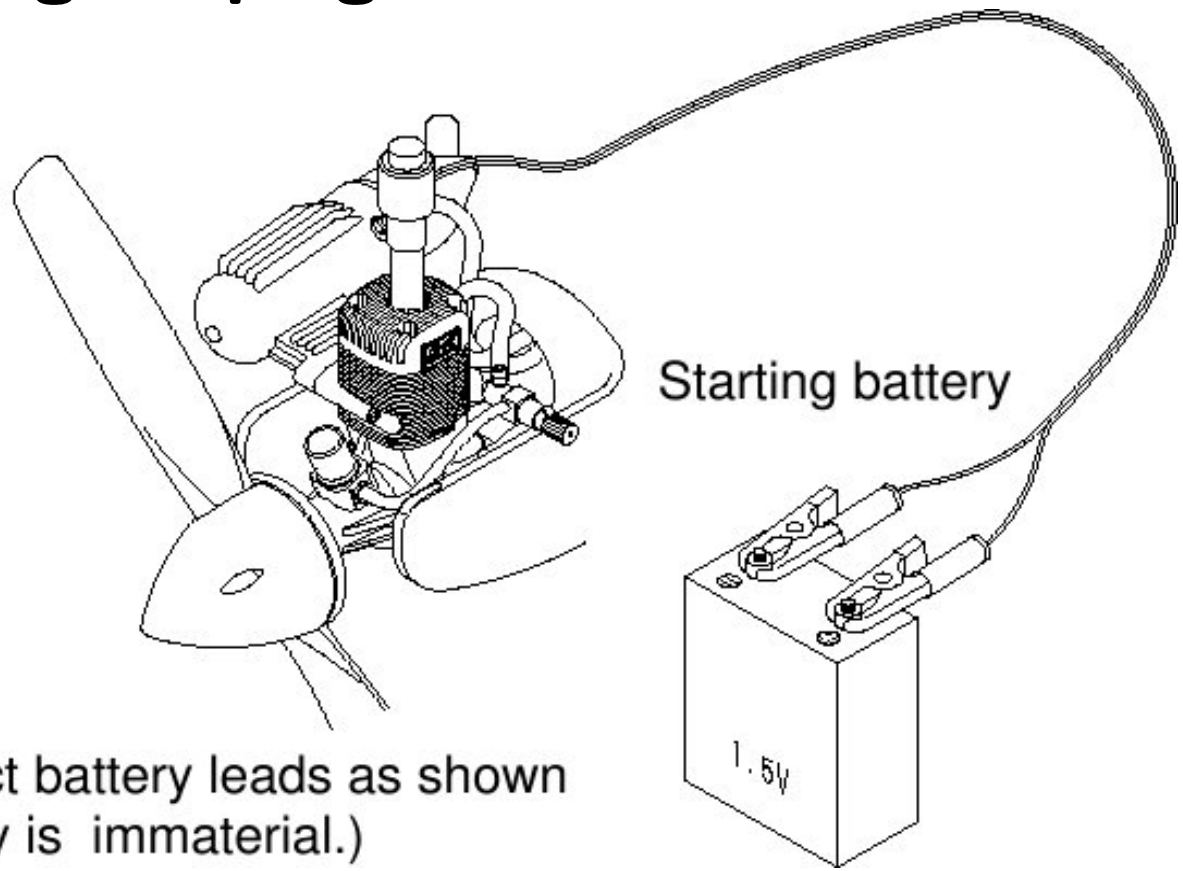
Starting a Glow Engine

Throttle Position



Starting a Glow Engine

1. **Heat glow-plug**



2. Apply electric starter to start engine.
3. Open the throttle fully.

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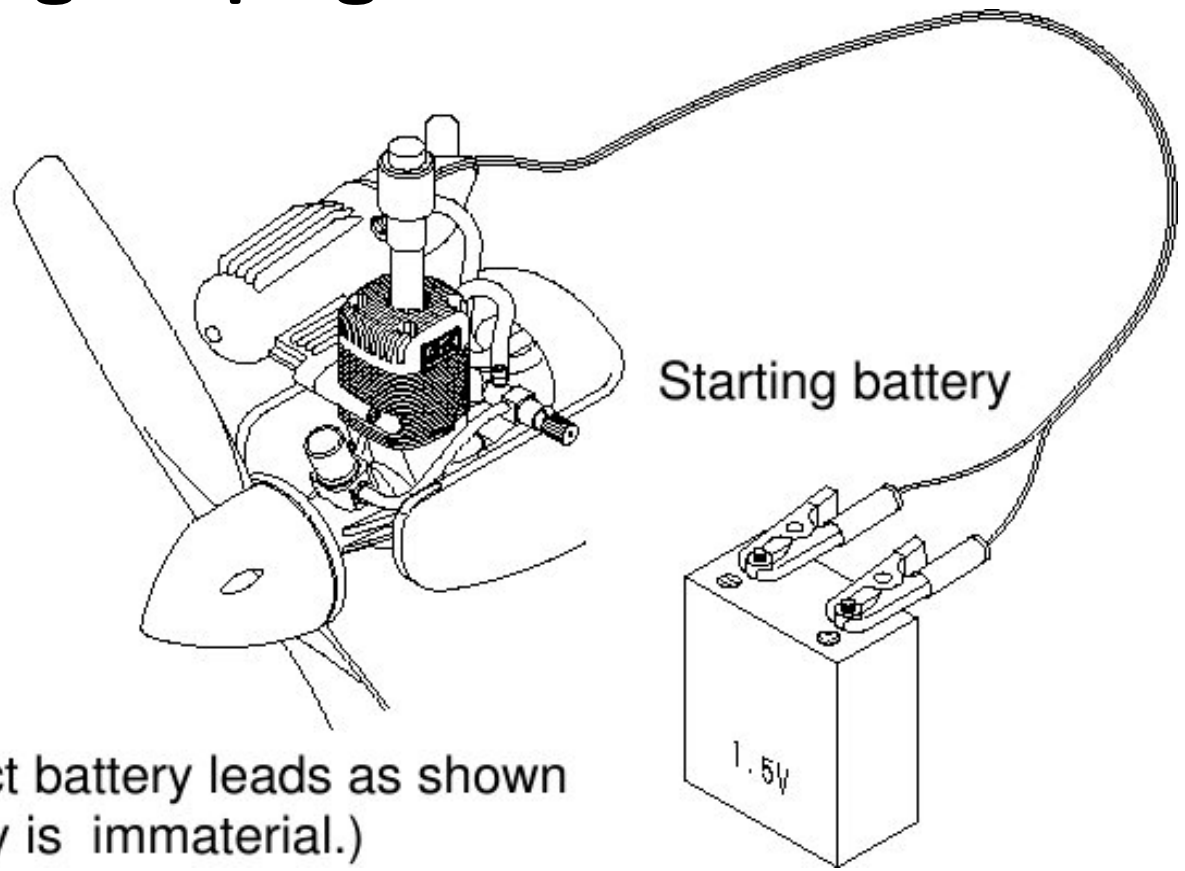

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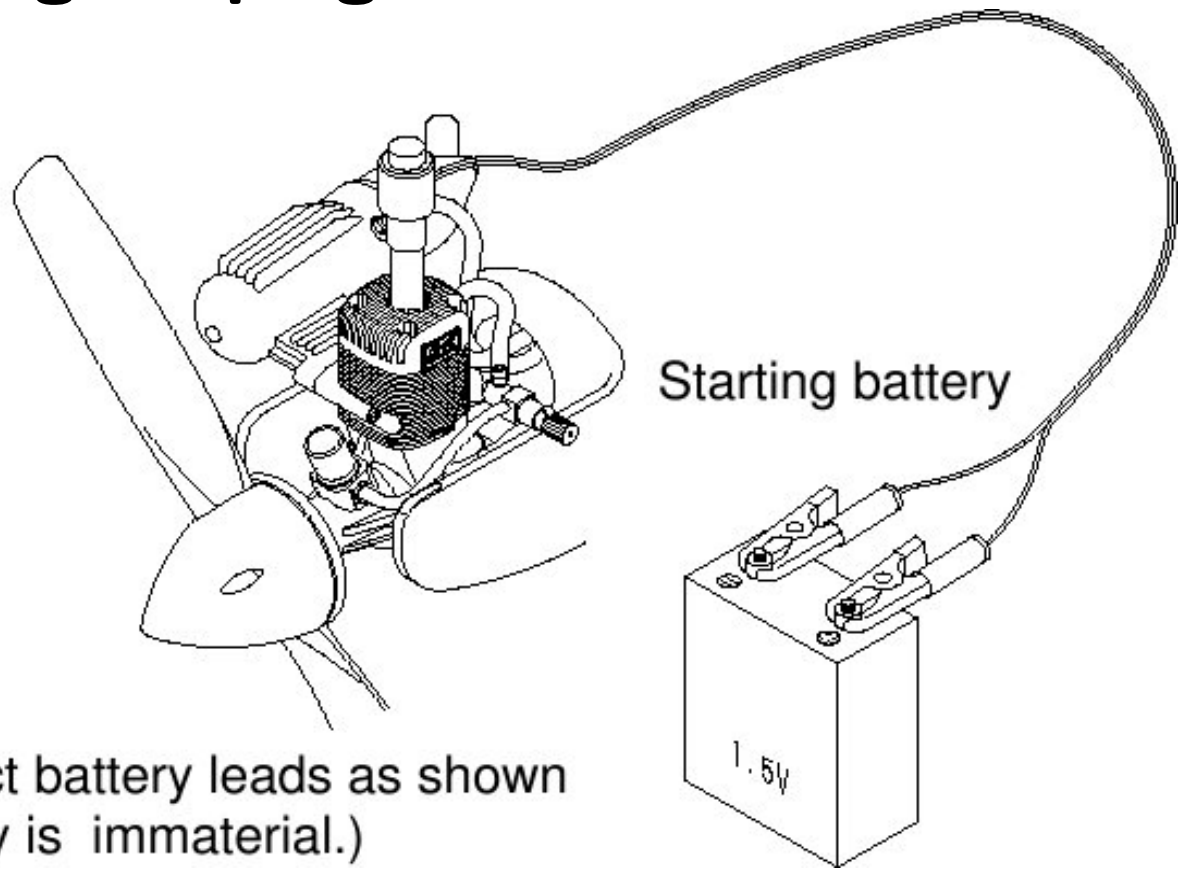

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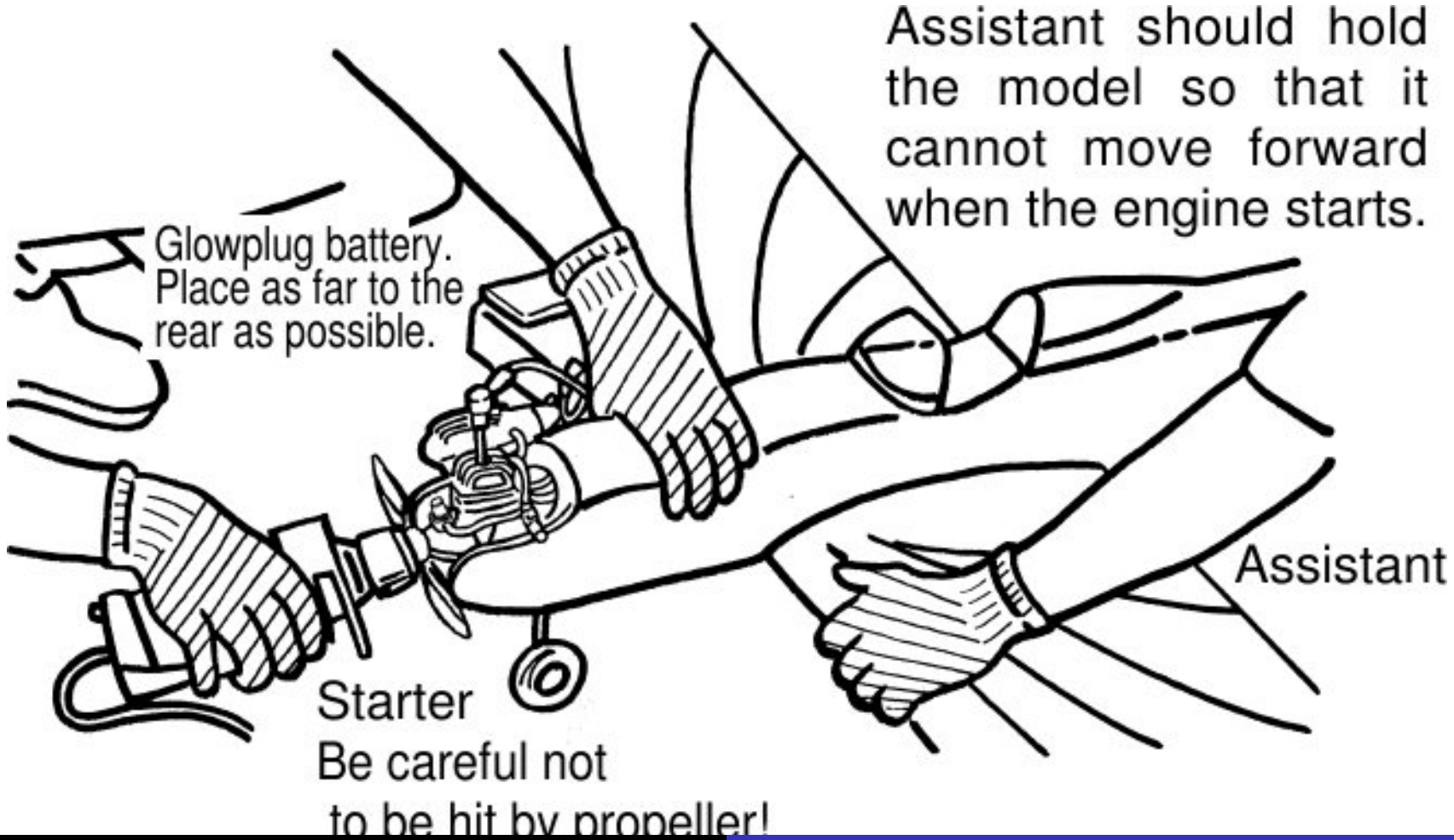
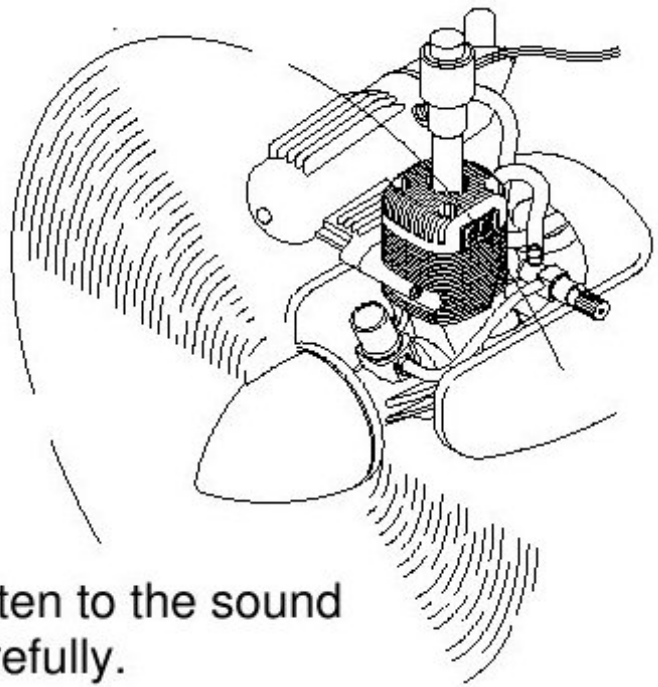
Starting a Glow Engine

Hold model securely when starting



Starting a Glow Engine

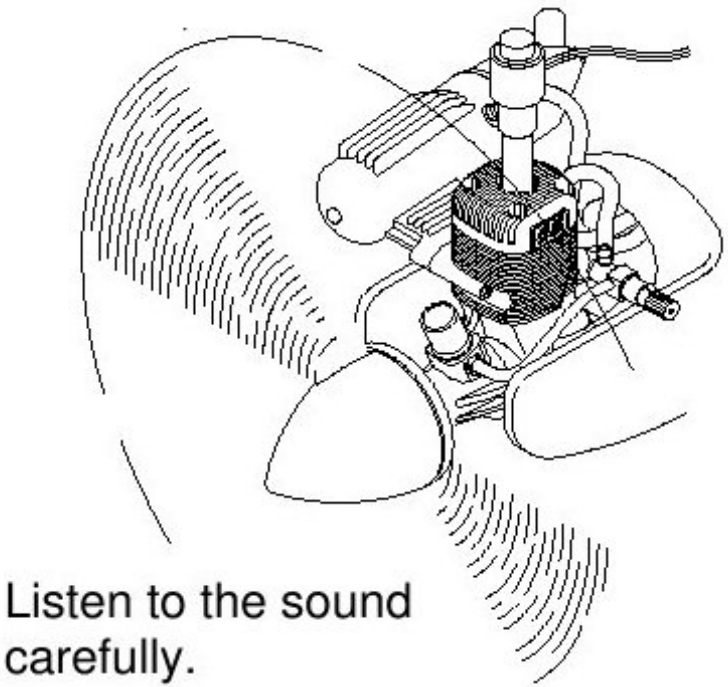
Needle-valve adjustment



- Gradually close the needle-valve until the exhaust sound changes from an irregular pitch (four-cycle) to a steady pitch (two-cycle).
- Close the needle-valve gradually until the engine sound is changing from a four-cycle into a two-cycle in pitch.

Starting a Glow Engine

Needle-valve adjustment



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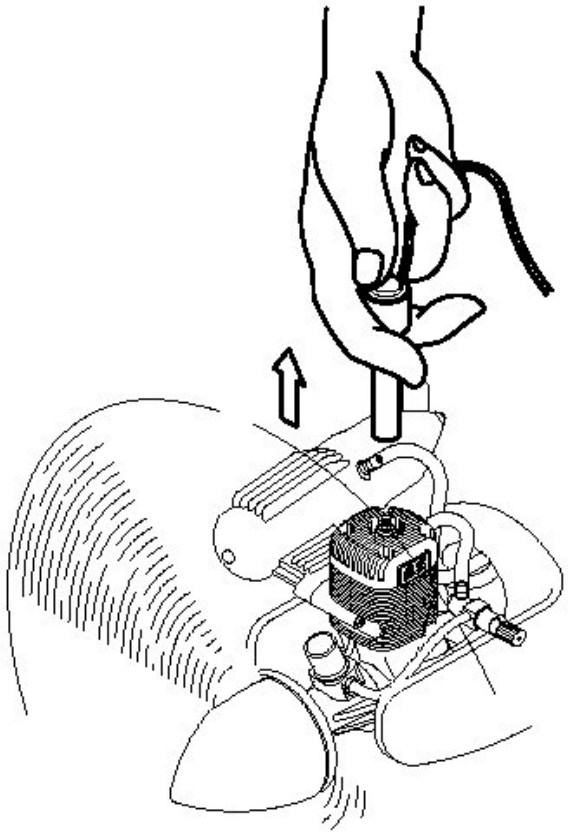
Starting a Glow Engine

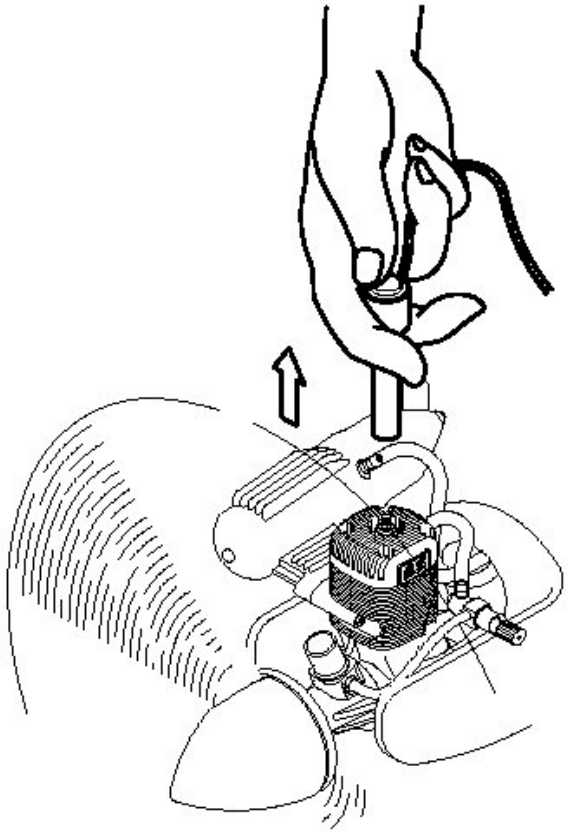
Disconnect booster



- Disconnect the battery leads from the engine with care so that the plug clip does not touch the rotating propeller.
- If the engine stops when battery leads are disconnected, close the needle-valve a little (approx. 45) further, and restart the engine.

Starting a Glow Engine

Disconnect booster



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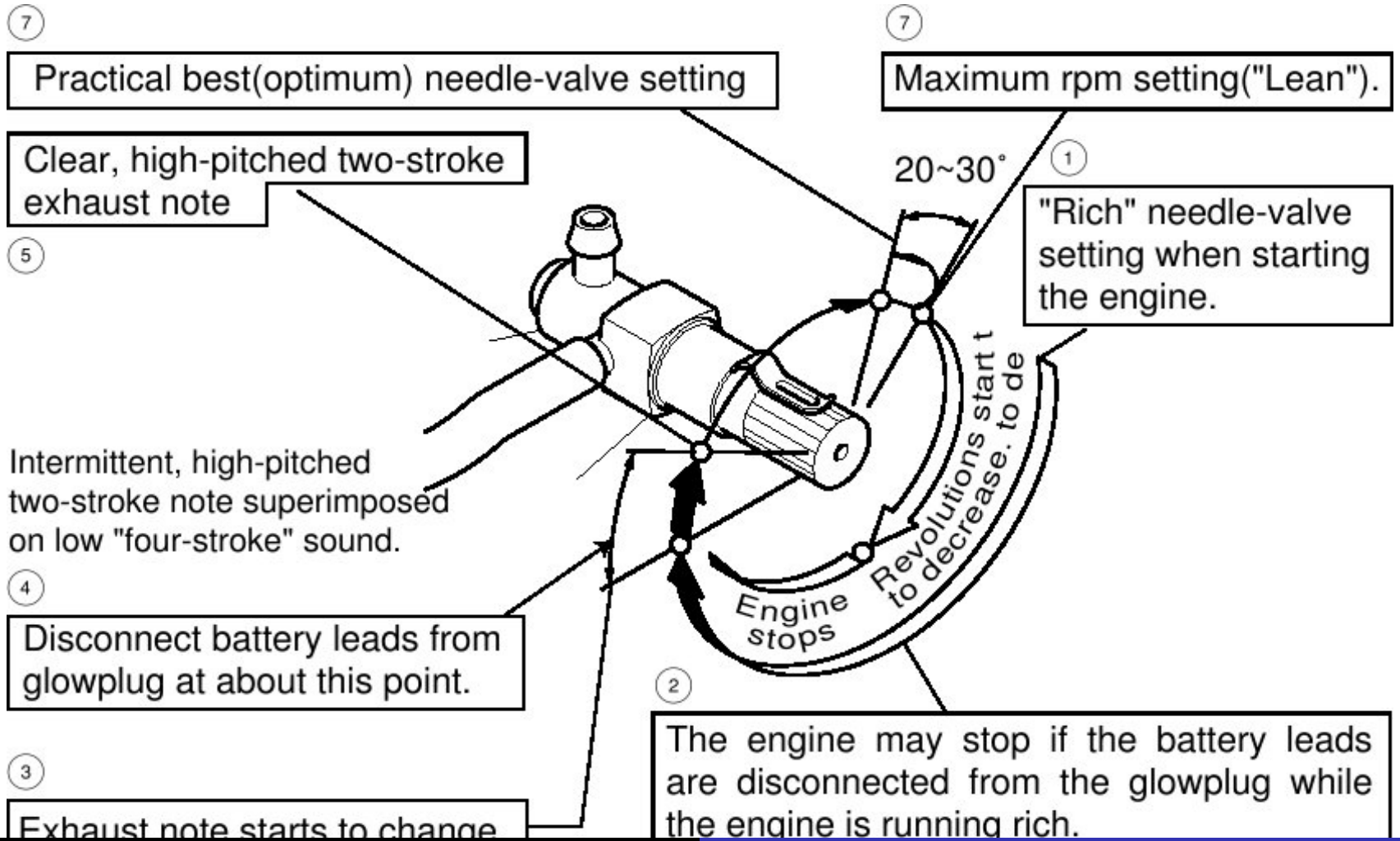
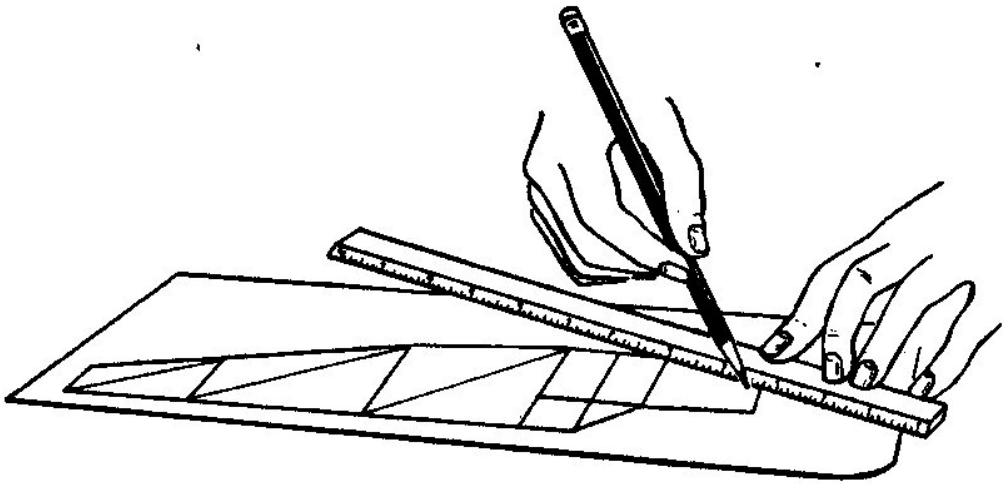
Starting a Glow Engine

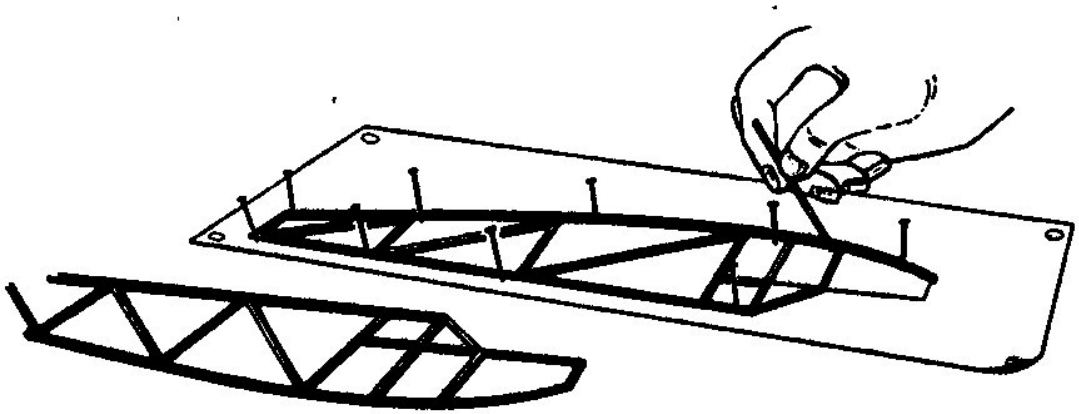
Needle-valve adjustment(Summary)



Outline

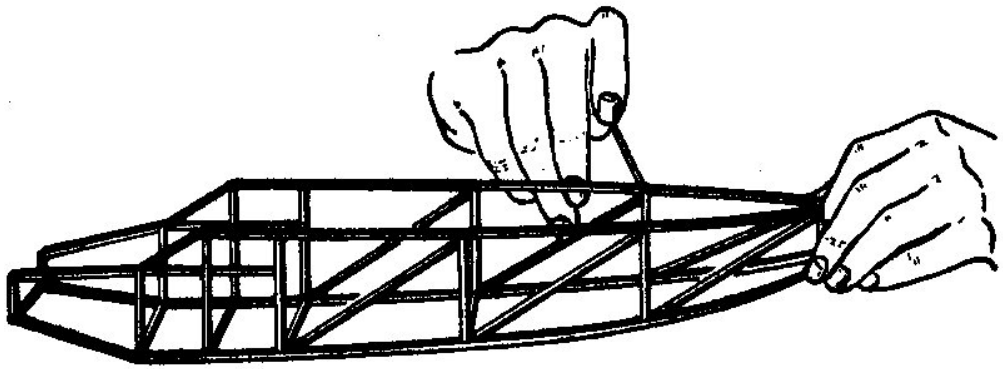
Side-frame type Fuselage

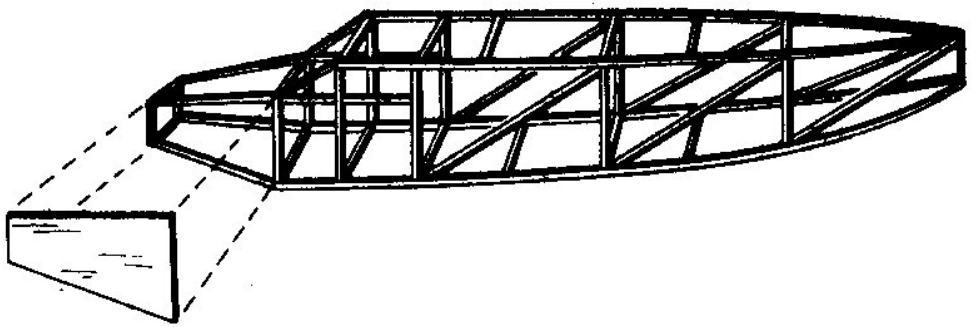




- Take a proper plan and fix it on a board. Use pins to fix the balsa strips in proper place. Now glue it to get the shape.

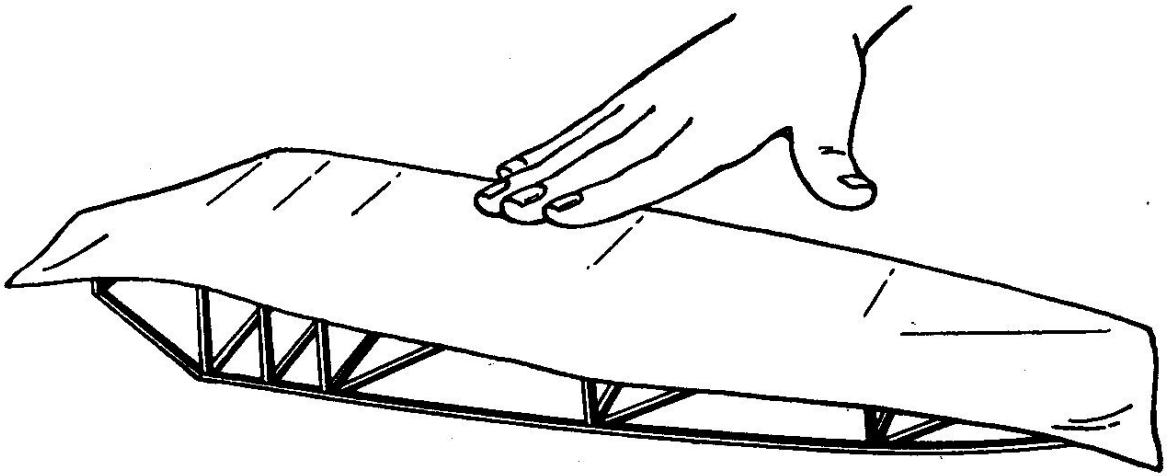
Side-frame type Fuselage

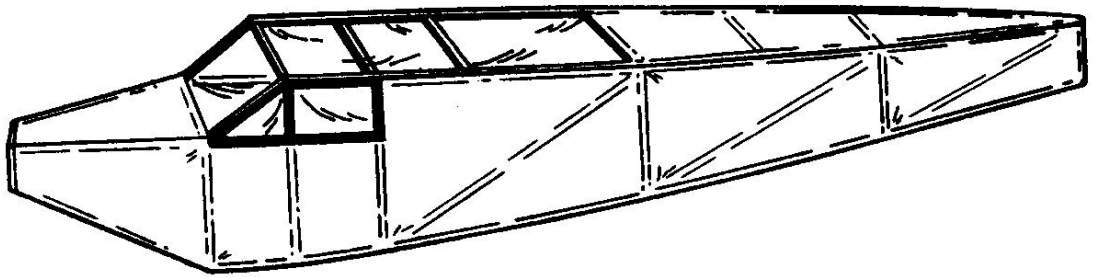




- Once one side is prepared build the other side top of it. Separate it with razor blade and give it a proper box type shape.

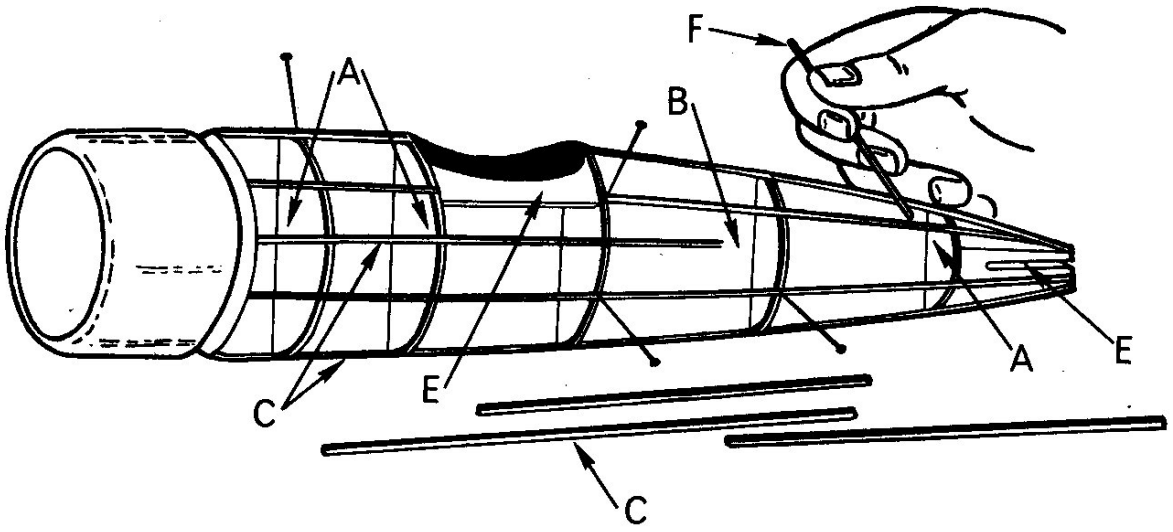
Side-frame type Fuselage





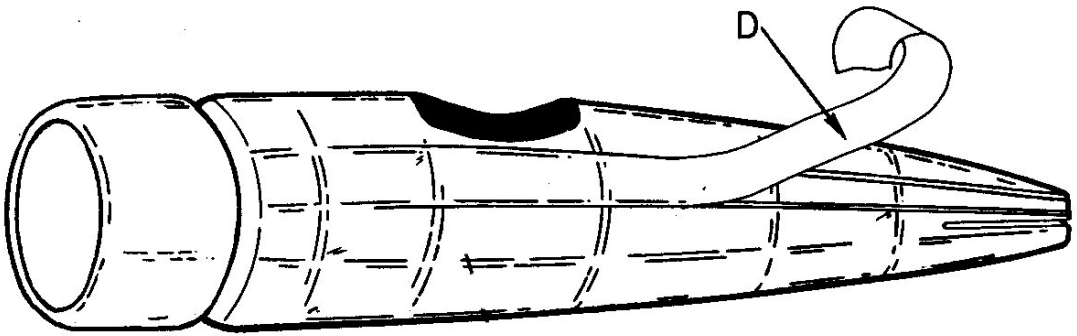
- Now cover it with Japanese tissue.

Bulkhead-stringer Fuselage



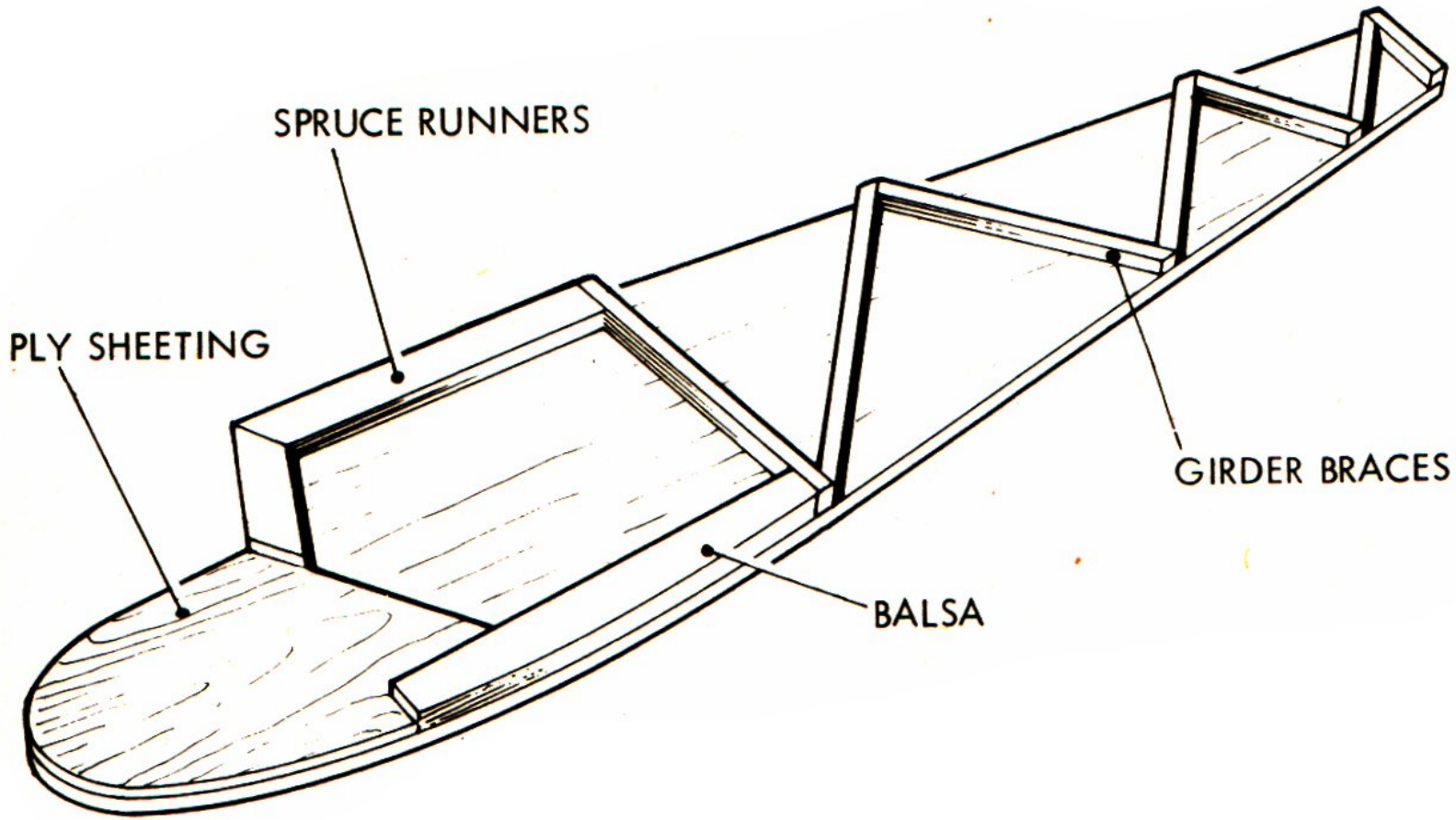
- Glue the bulkheads (A) to the vertical keel (B). Now glue the stringers to the proper position.

Bulkhead-stringer Fuselage

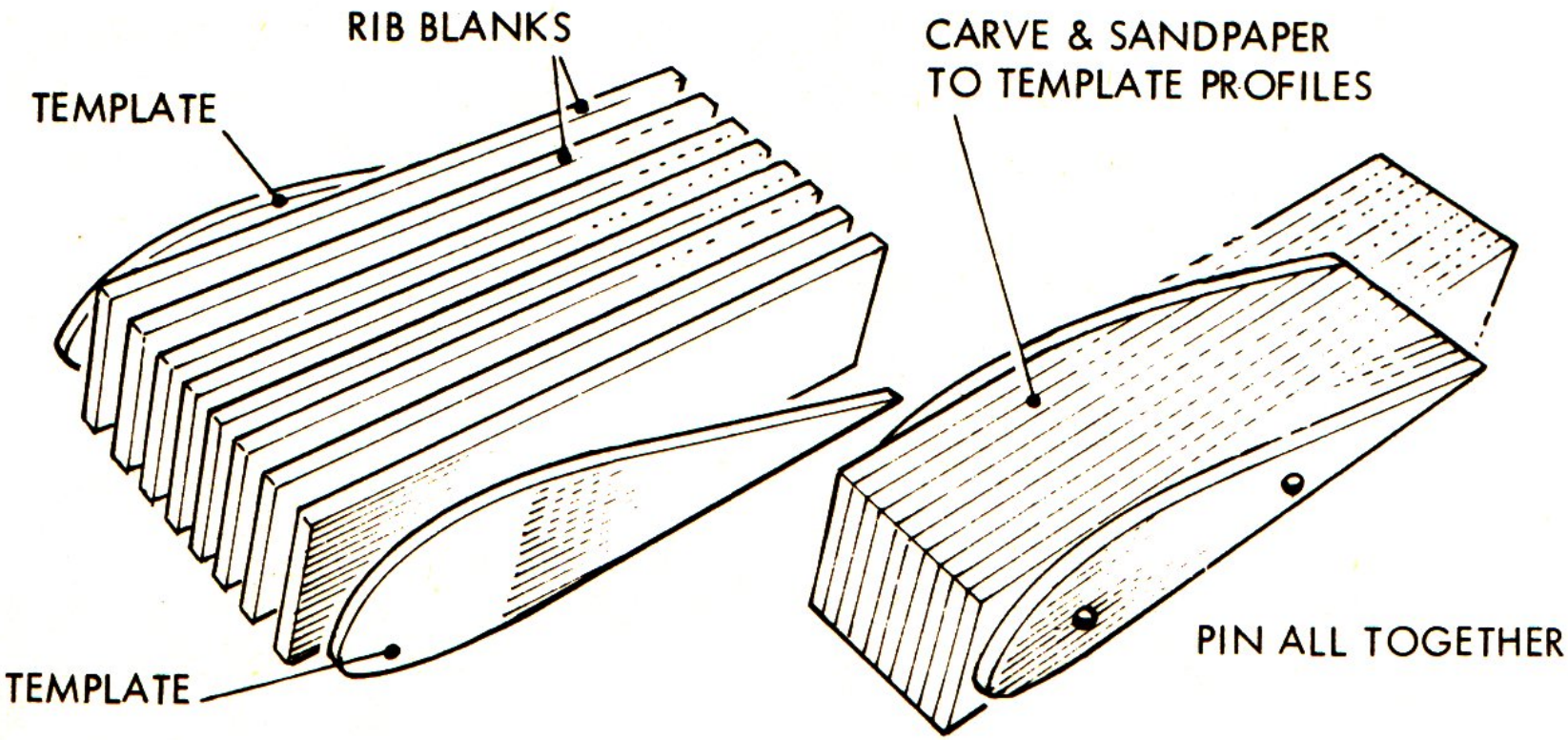


- Cover the structure with silk tape or Japanese tissue.

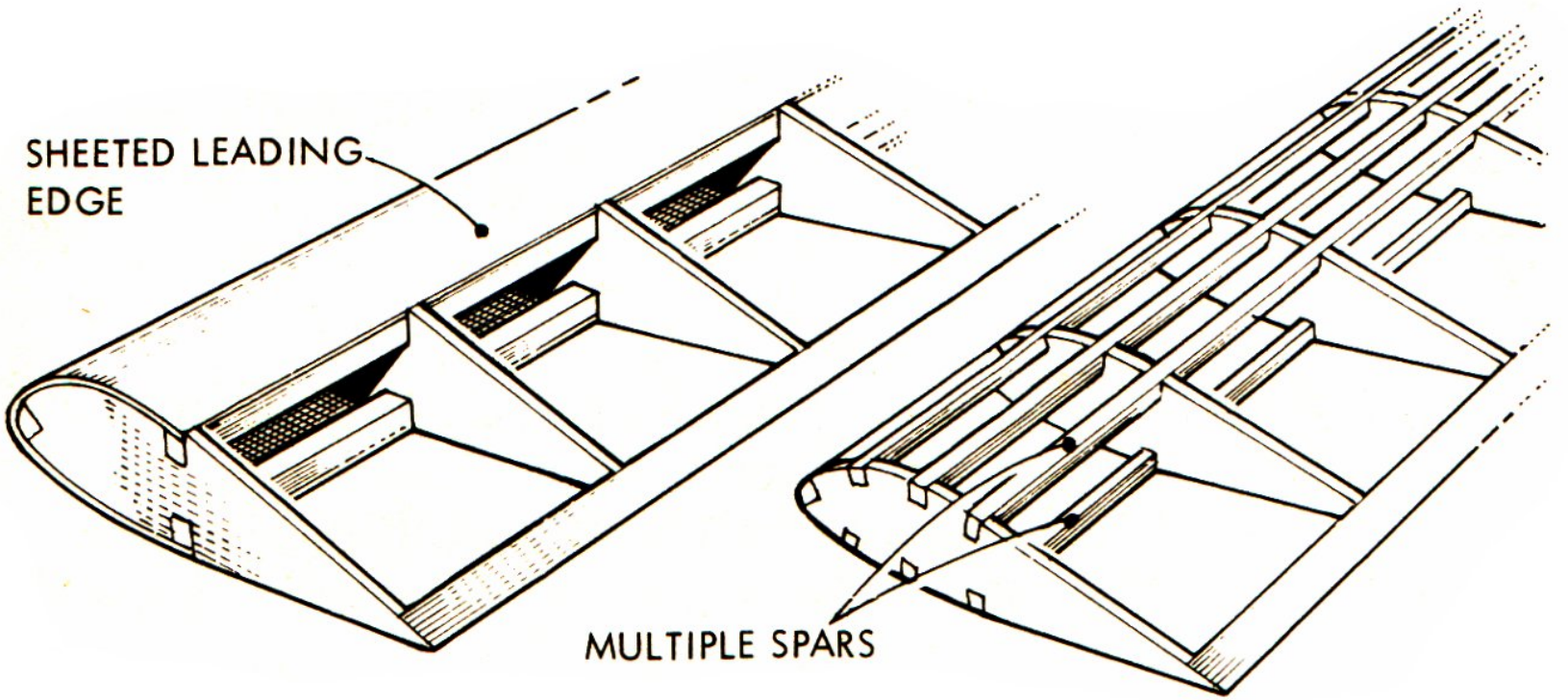
R/C Model



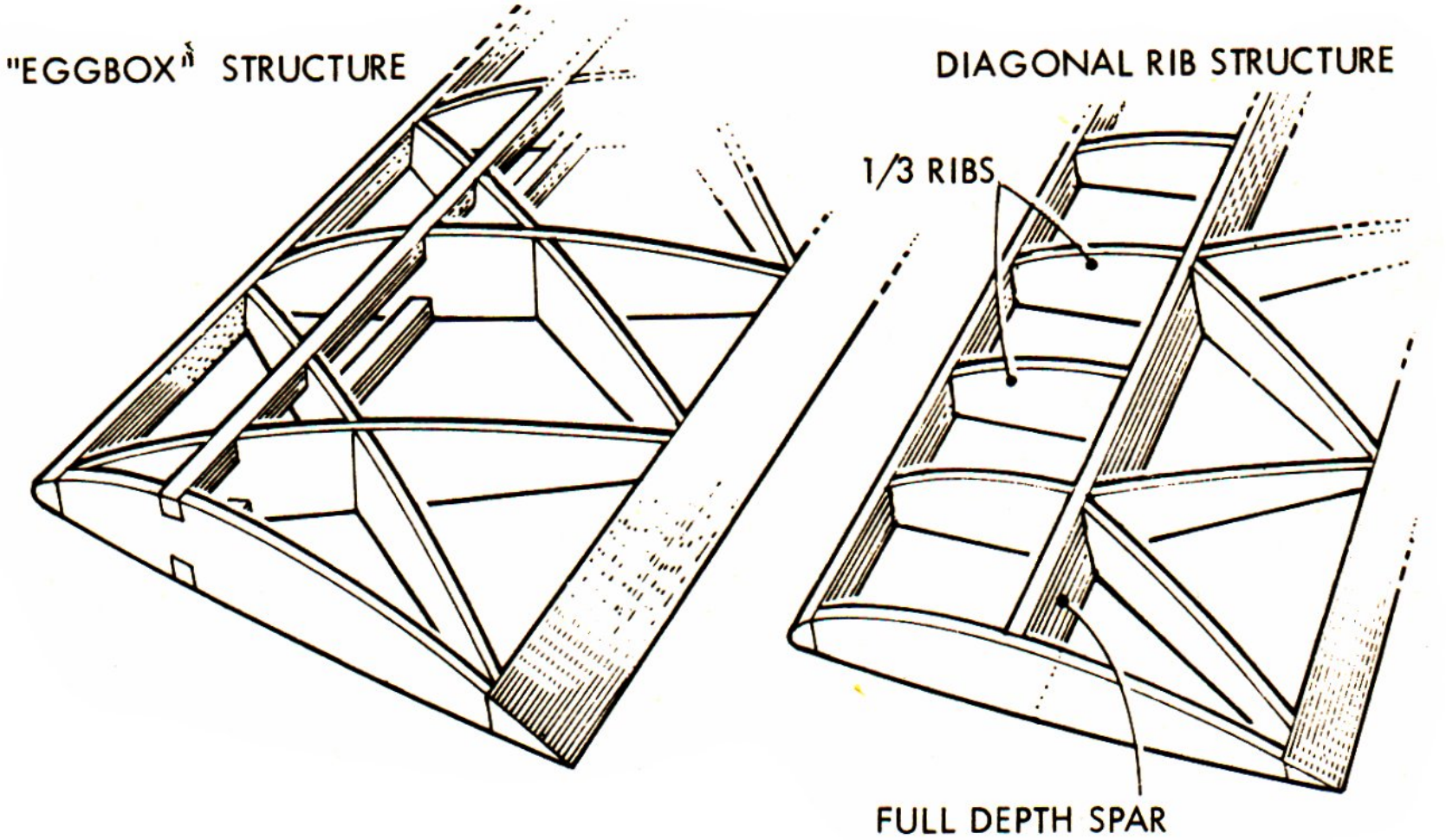
Shaping of Wing Ribs



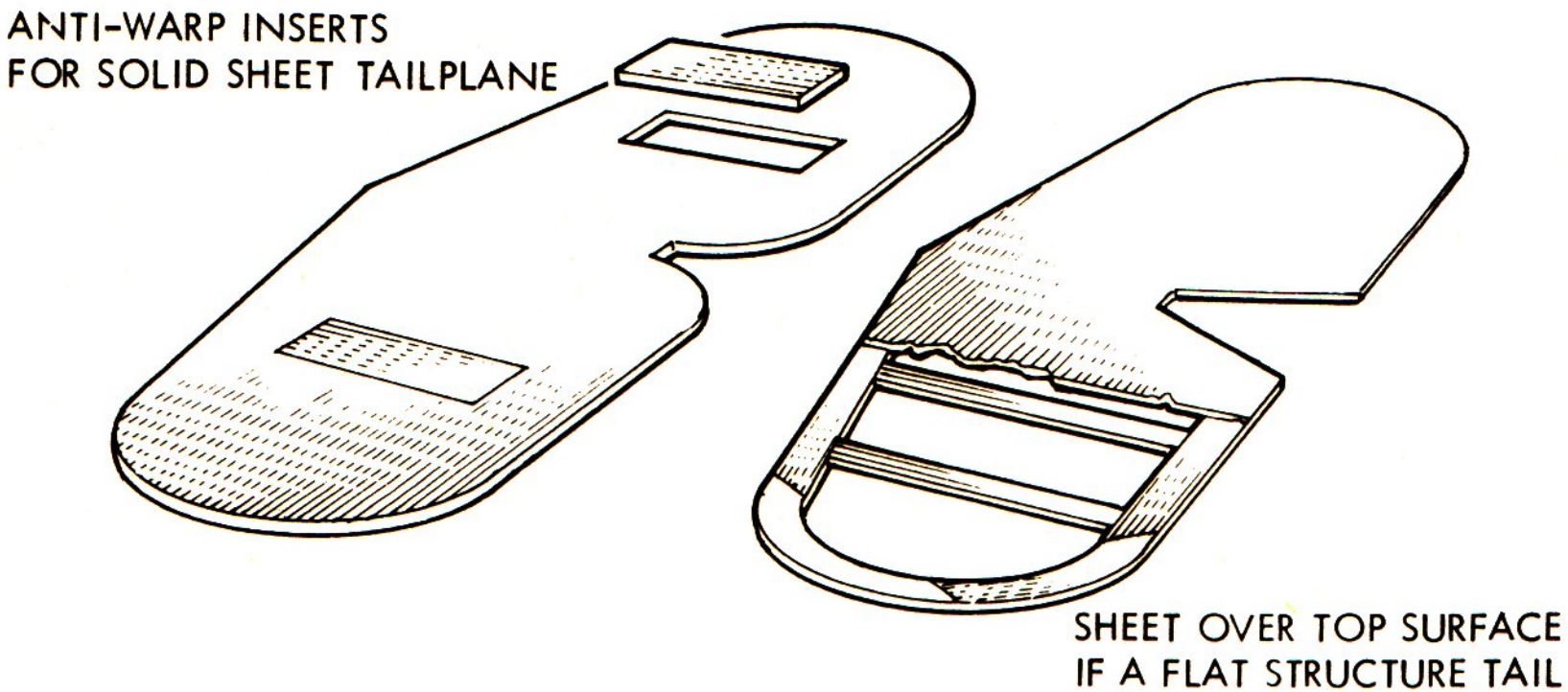
Wing Details



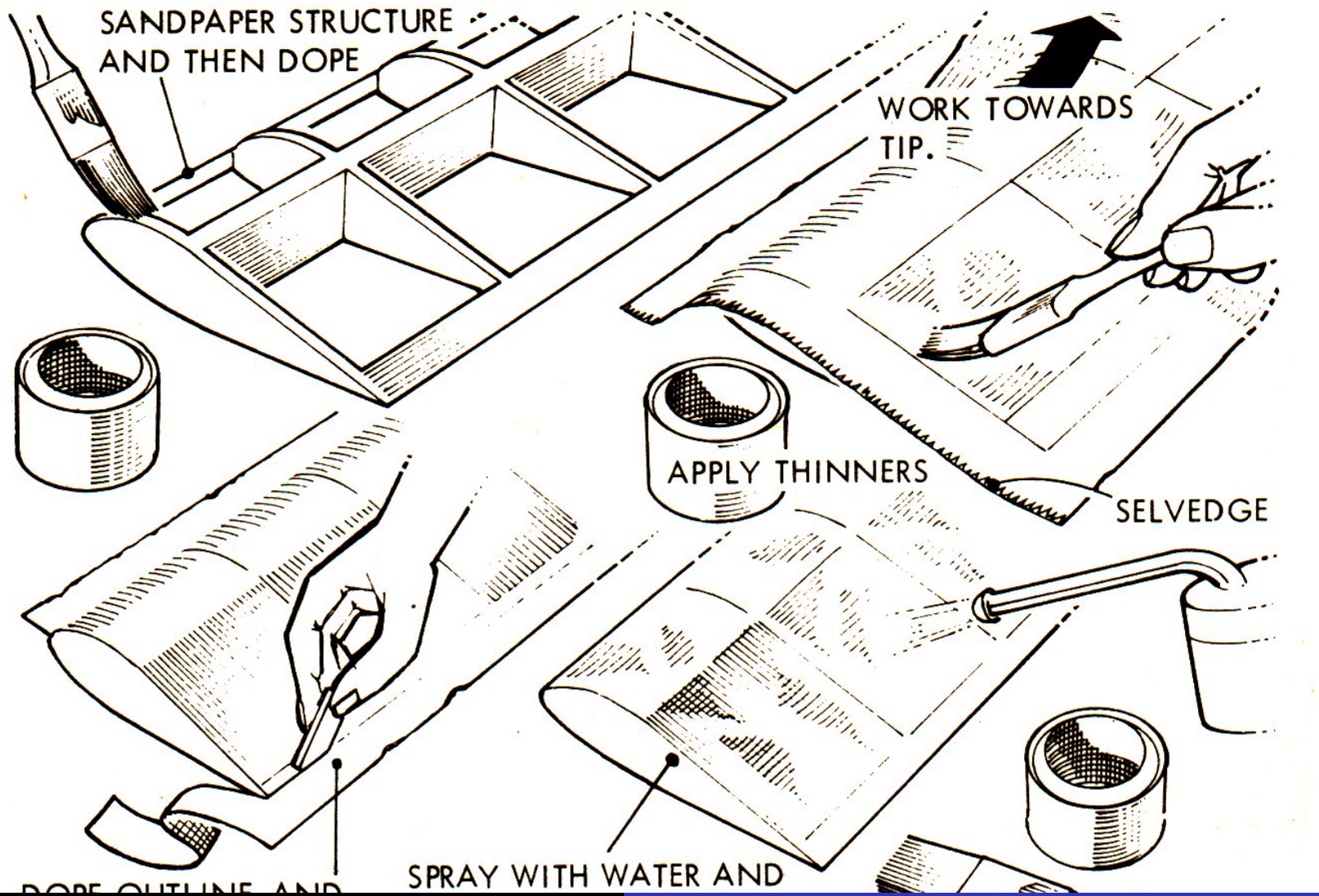
Anti-Warp Type Wing



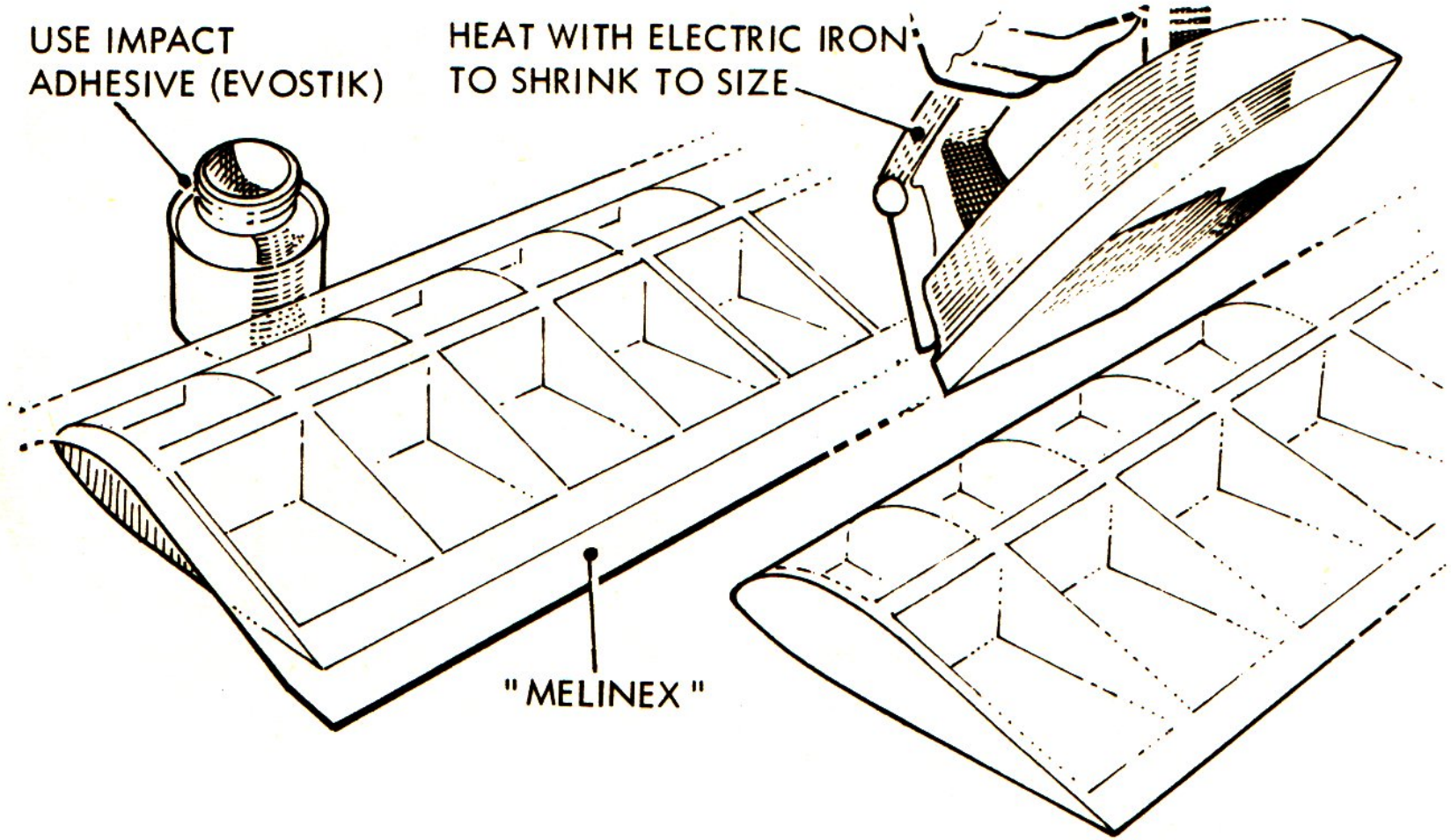
Anti-Warp Type Tail



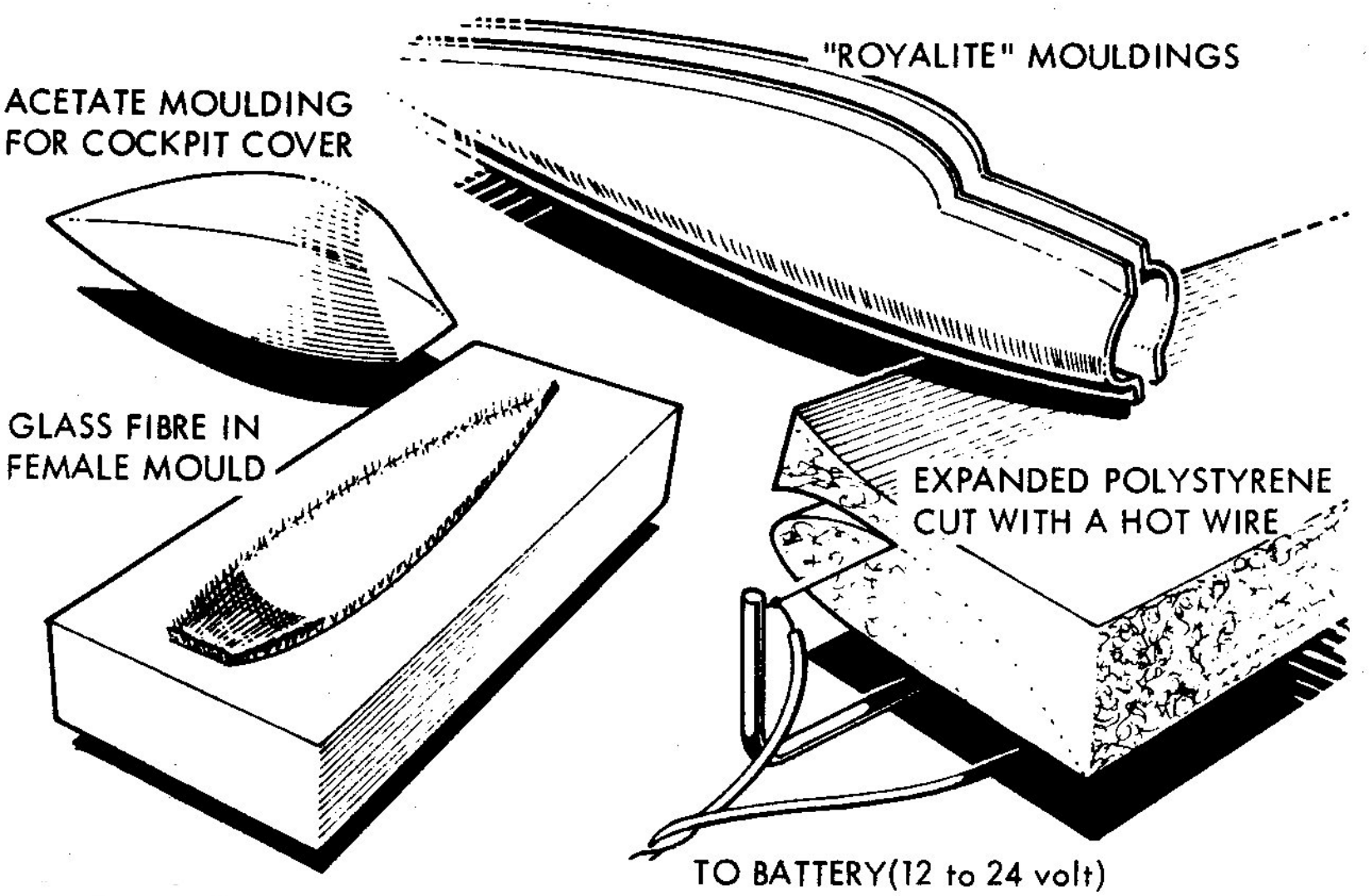
Covering of Wing by Tissue



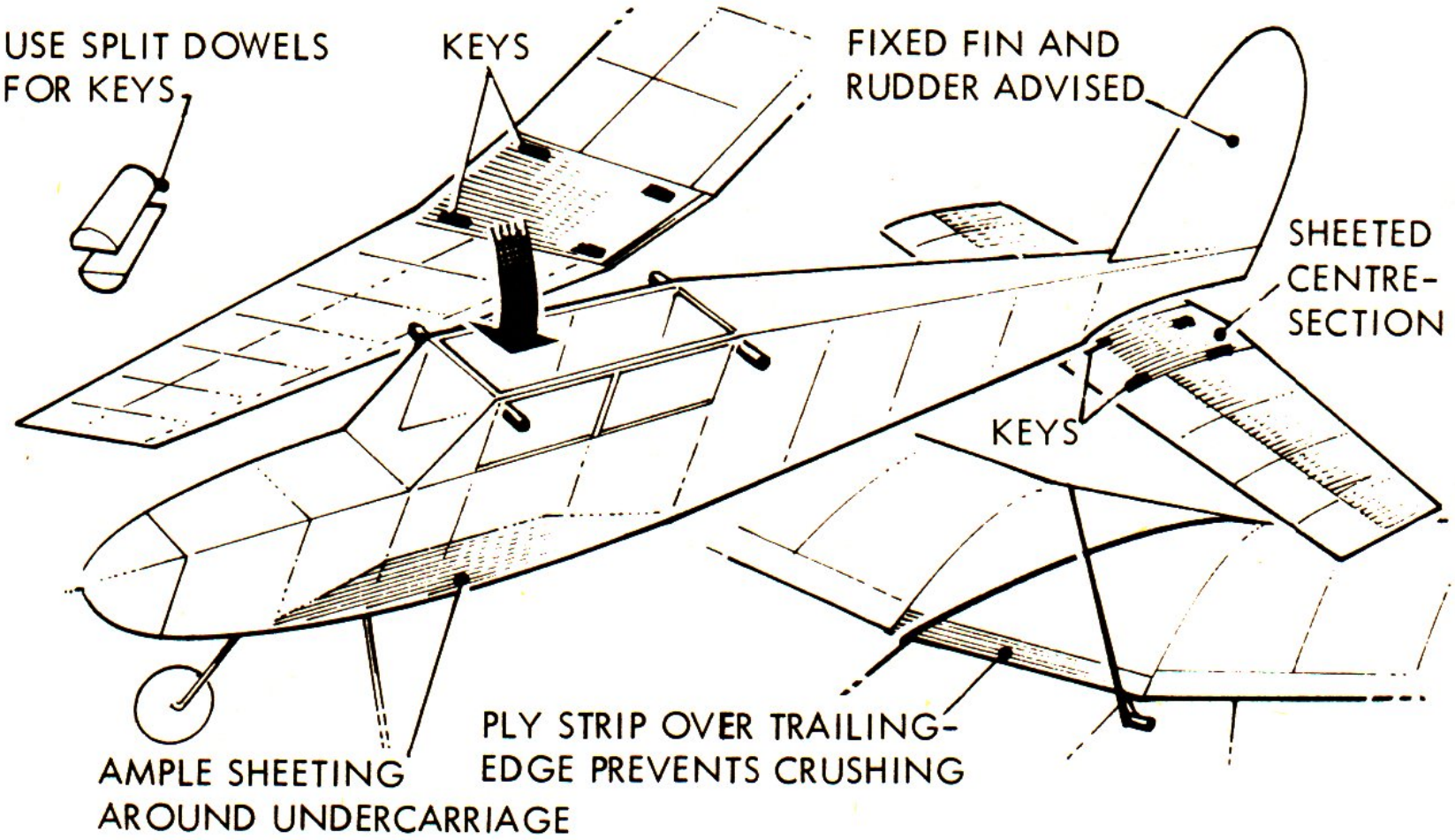
Covering of Wing by Plastic Sheet



Use of Plastics and Thermocole



Assembling of Model



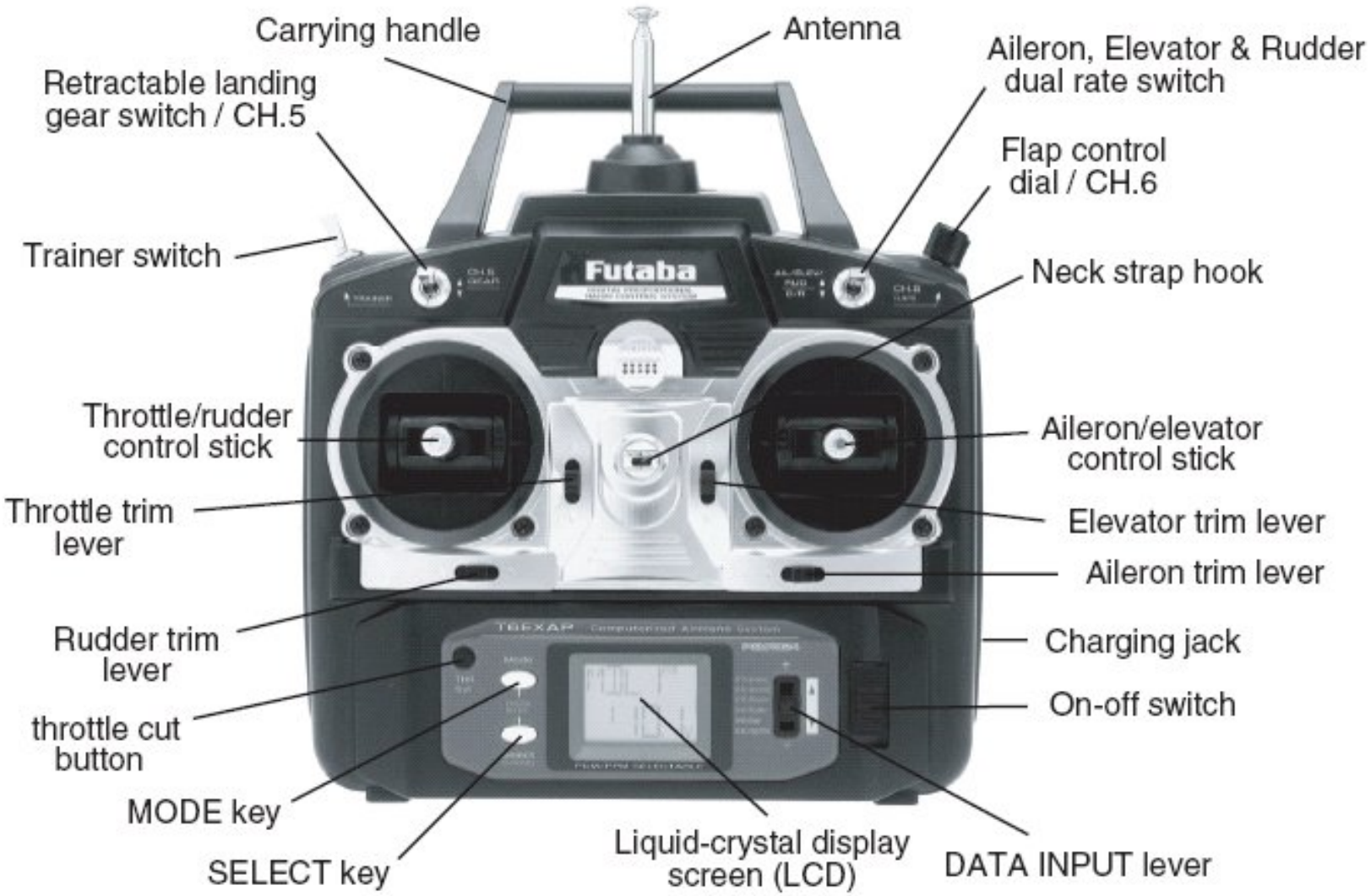
Outline

Radio Control

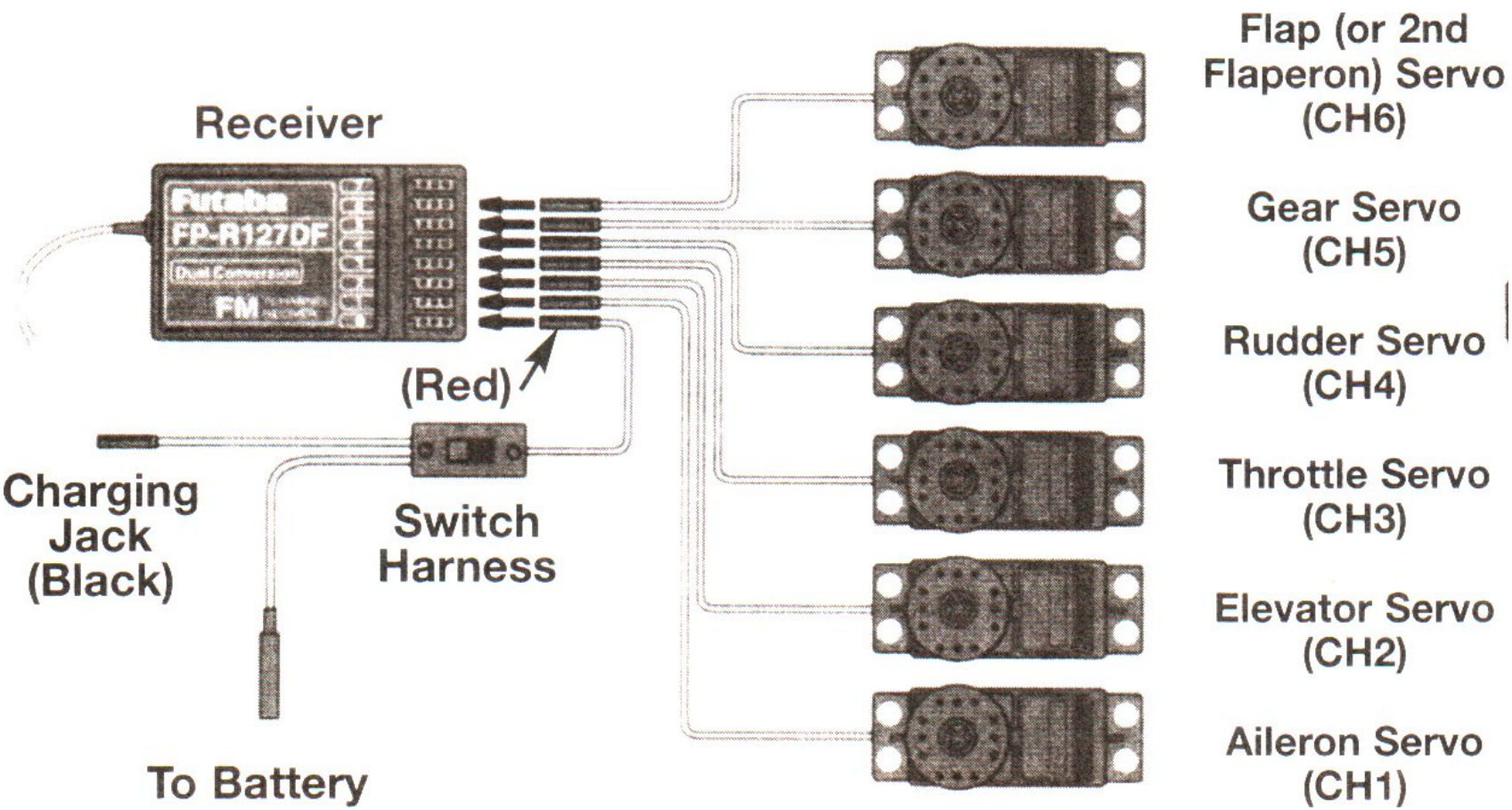
A Radio Control consists of following three parts:

1. Transmitter,
2. Receiver and
3. Servos.

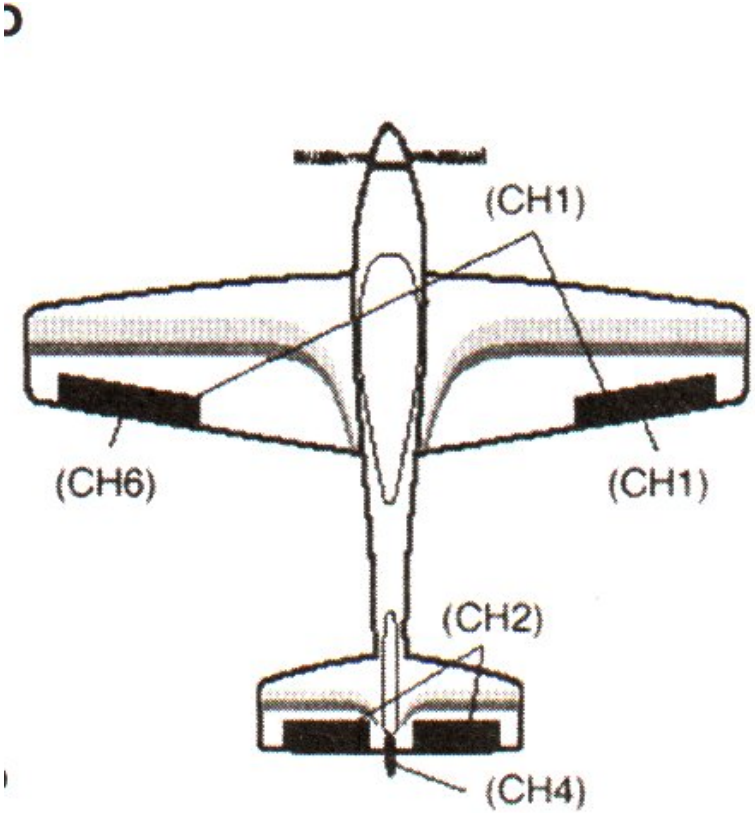
6 Channel Transmitter



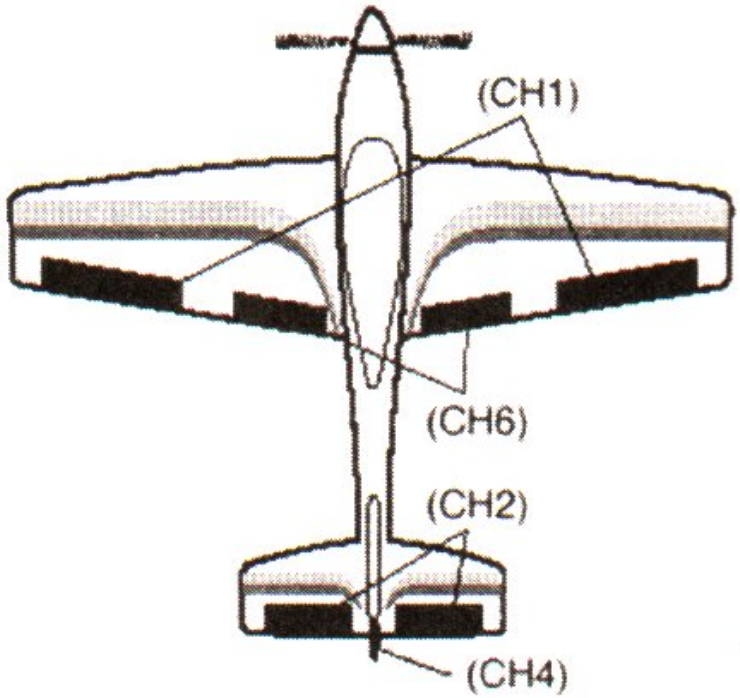
Receiver and Servos



Servo connection



Flaperon Mode (Dual Aileron Servos, CH1 & 6)



Independent Aileron & Flap

A Few Thumb Rules for Model Making

1. Wing aspect ratio (b^2/S) should be within **6 to 7.5**.
2. Fuselage length 2.5 to 4 times wing chord.
3. Horizontal tail area 18-22 % of wing area.
4. Horizontal tail aspect ratio 3 to 5.
5. Vertical tail area 8 to 12 % of wing area.
6. Vertical tail aspect ratio 1.5 to 3.
7. Initially, Wing incidence may be within 0^0 to 2^0.
8. Provide dihedral of 0^0 to 2^0.
9. Horizontal tail plane incidence angle may be 0^0 to -3^0.
10. Make the thirst line about 0^0 to 2^0 downward.