AEROMODELLING CLUB

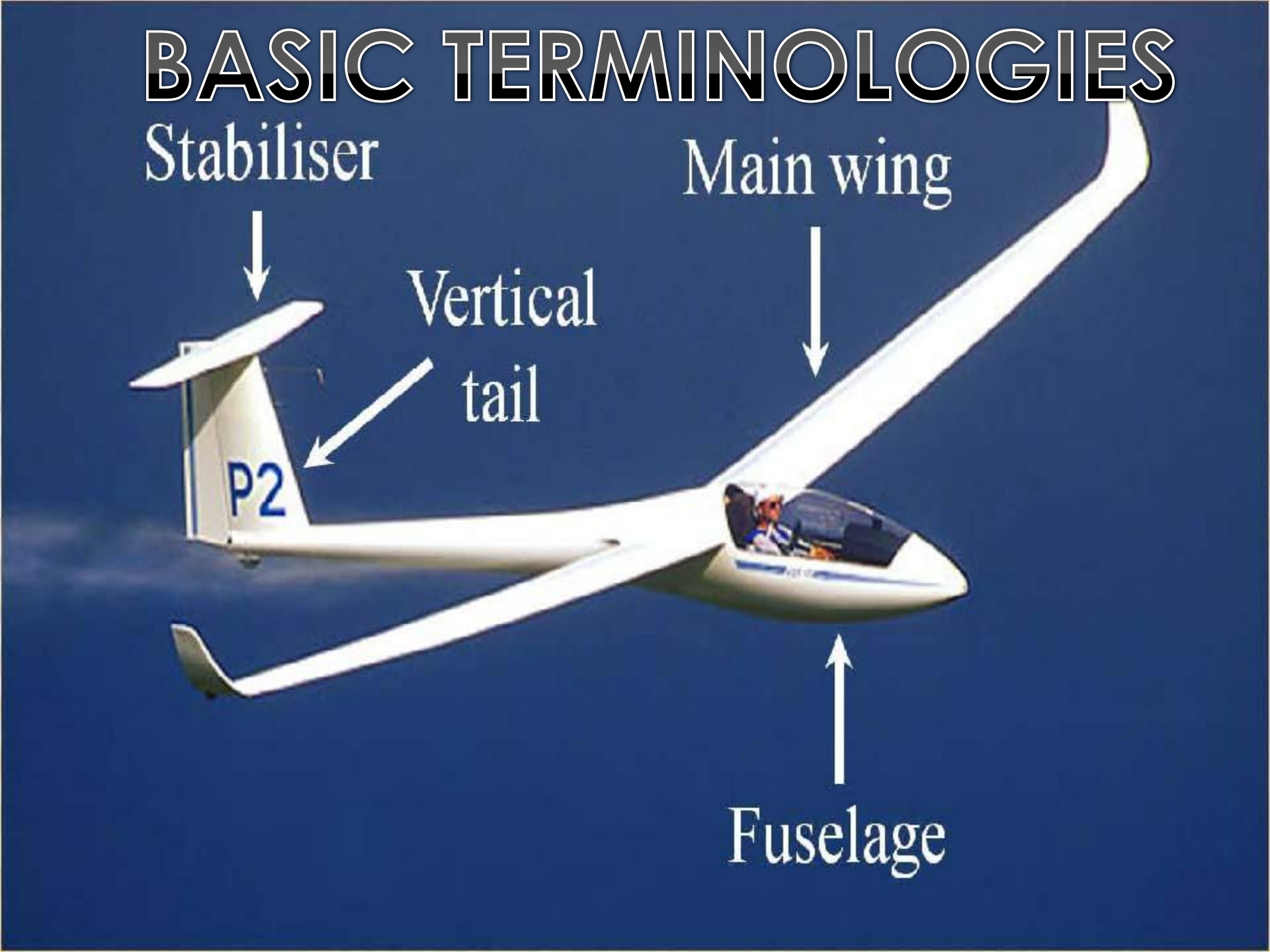
R.C. AIRPLANE LECTURE

August 11, 2011

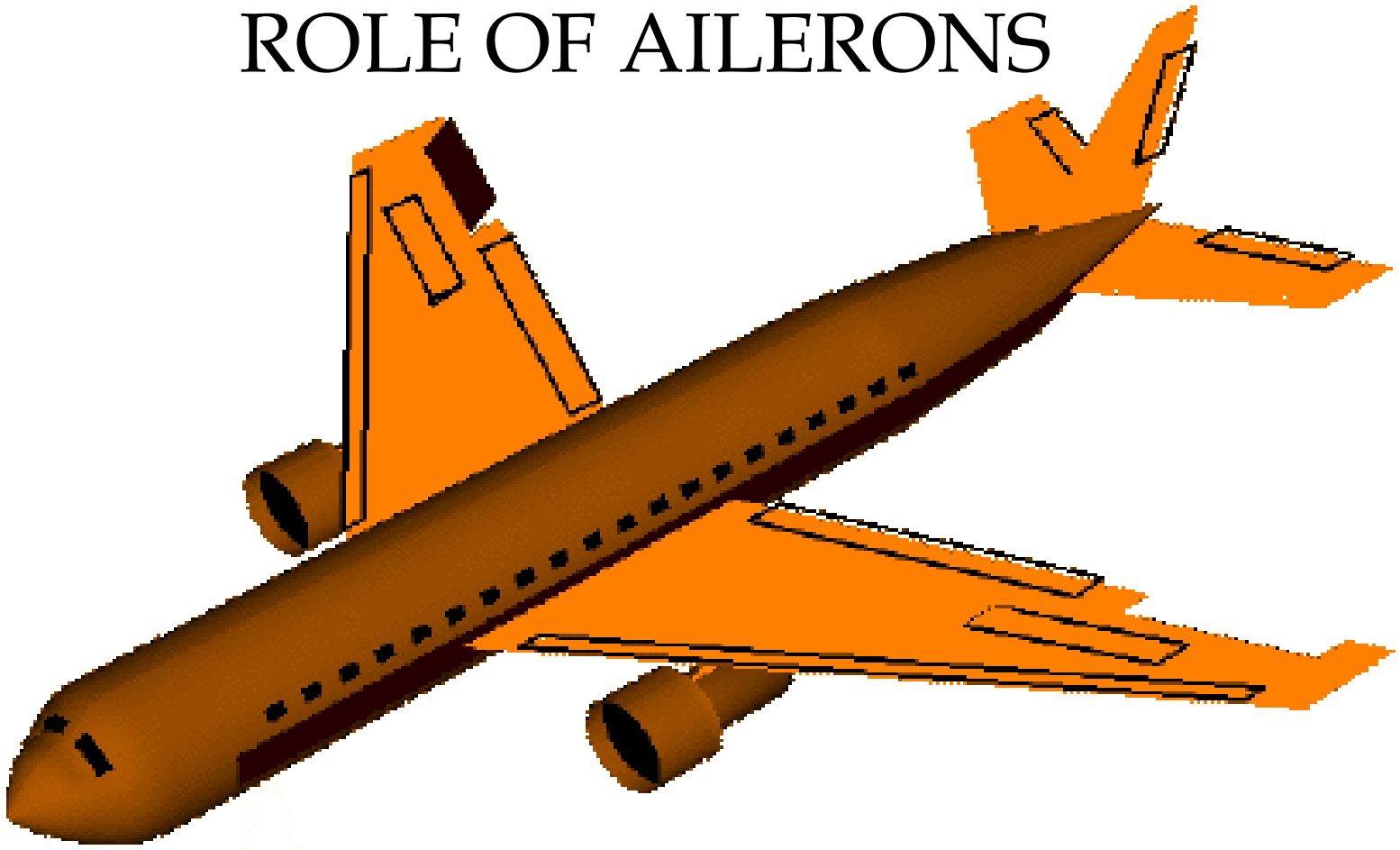
TODAY'S LECTURE

- Terminologies Revision
- Control Surface Revision
- Construction Materials We Use
- Types of Wing Construction
- Airplane designing
- Electronics We Use
- Accessories
- Contacts

BASIC TERMINOLOGIES

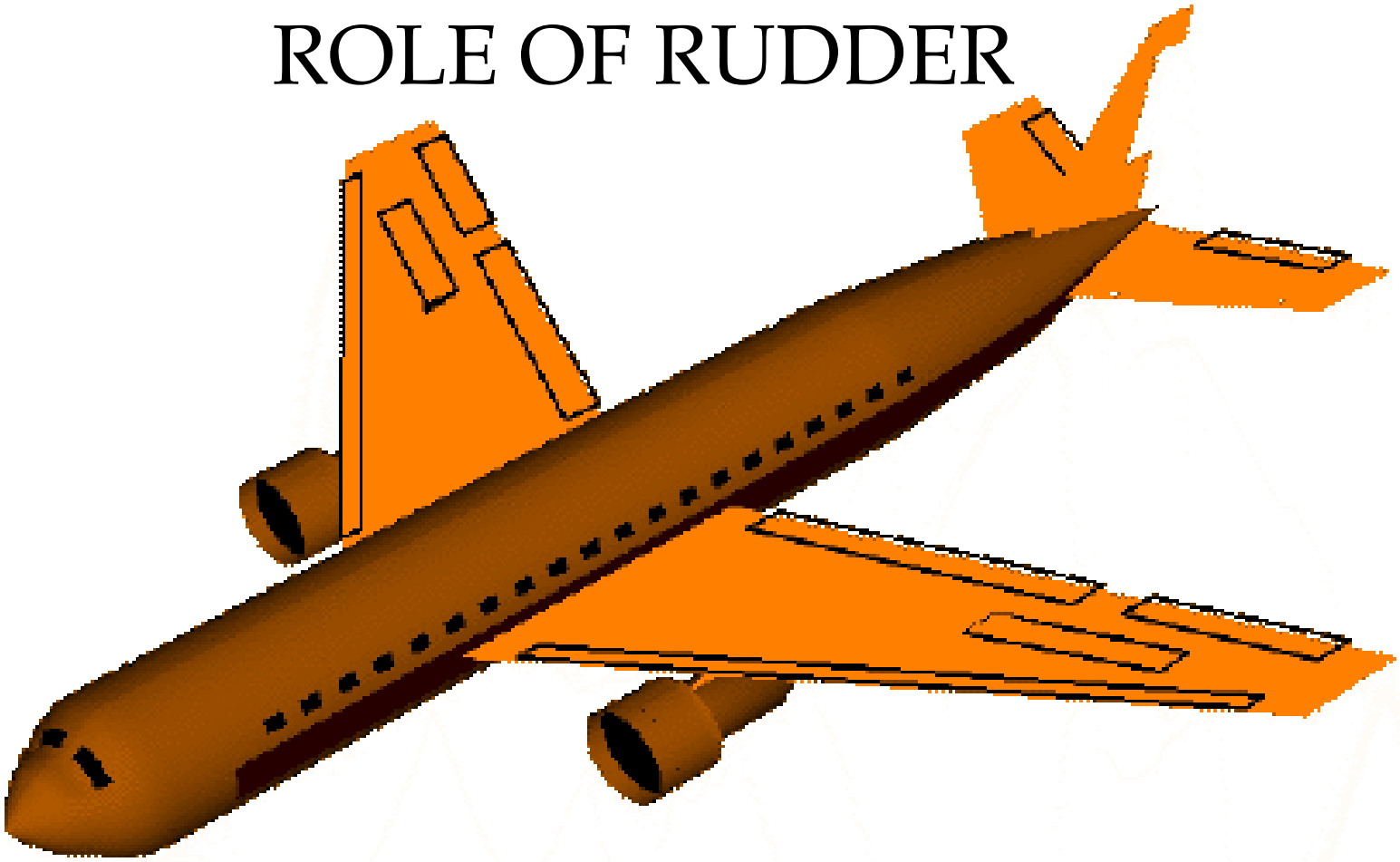


ROLE OF AILERONS



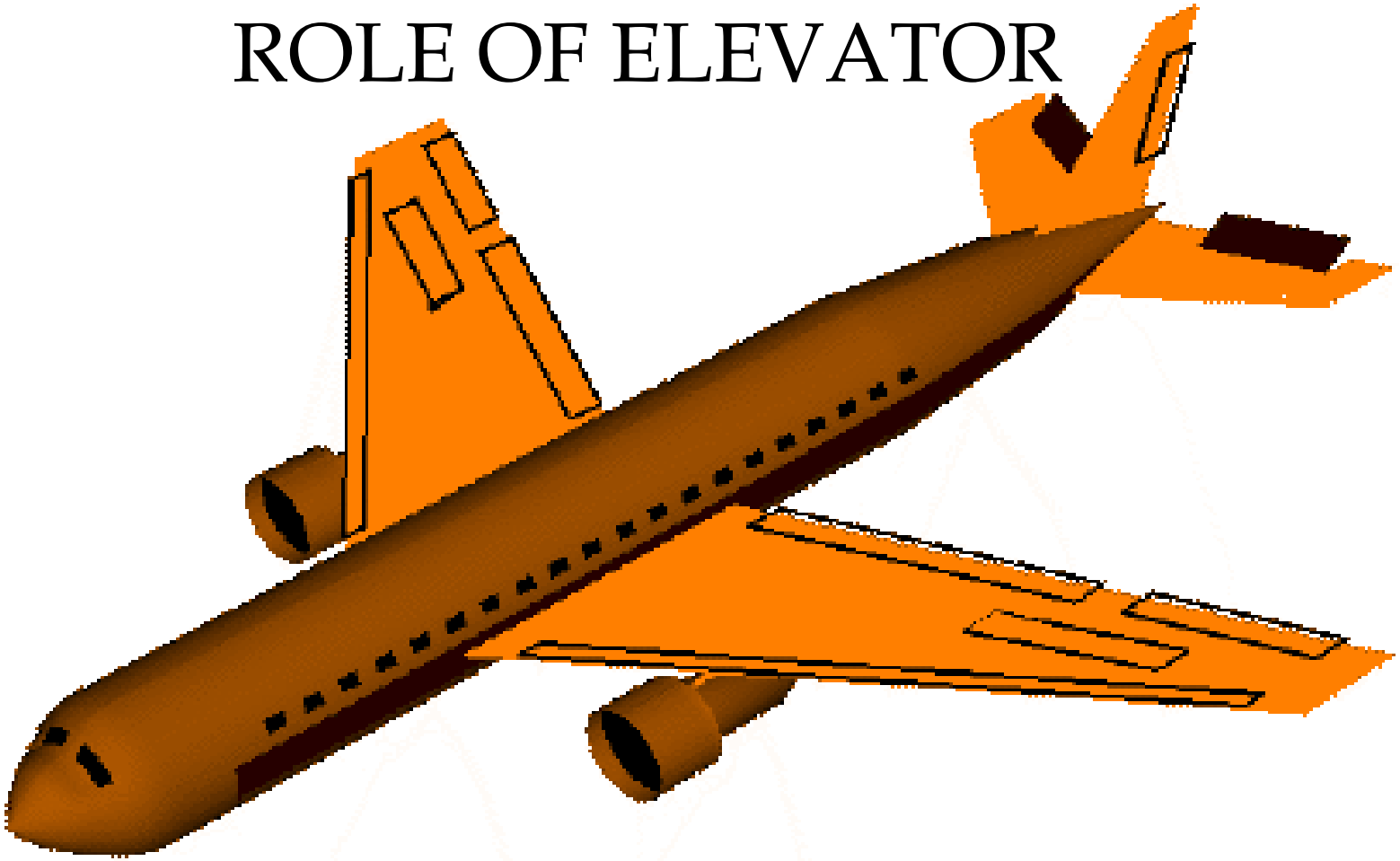
- To provide rolling motion

ROLE OF RUDDER



To provide yaw motion

ROLE OF ELEVATOR



To provide pitching motion

CONSTRUCTION MATERIALS WE USE

Balsa Wood:

- Light-weight wood.
- Stronger than coroplast, but not crash proof though.
- Stiffer than other available materials.

Styrofoam:

- Similar to thermocole, though smaller grain size.
- Easier and faster to work on compared to balsa.
- Can we wire cut to get the wing in one piece.
- Needs proper strengthening by use of balsa and tape.

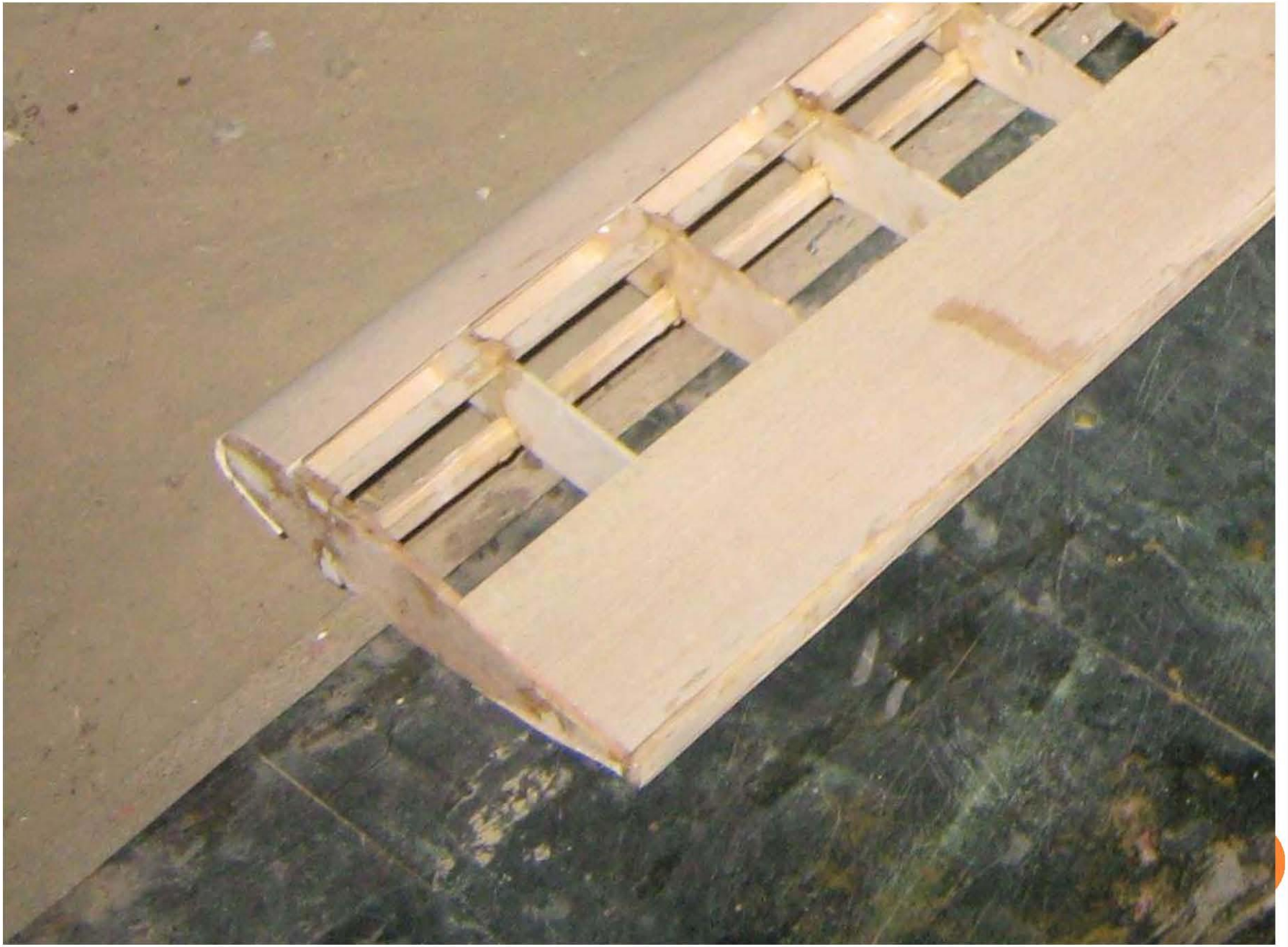
Coroplast (Sun pack)

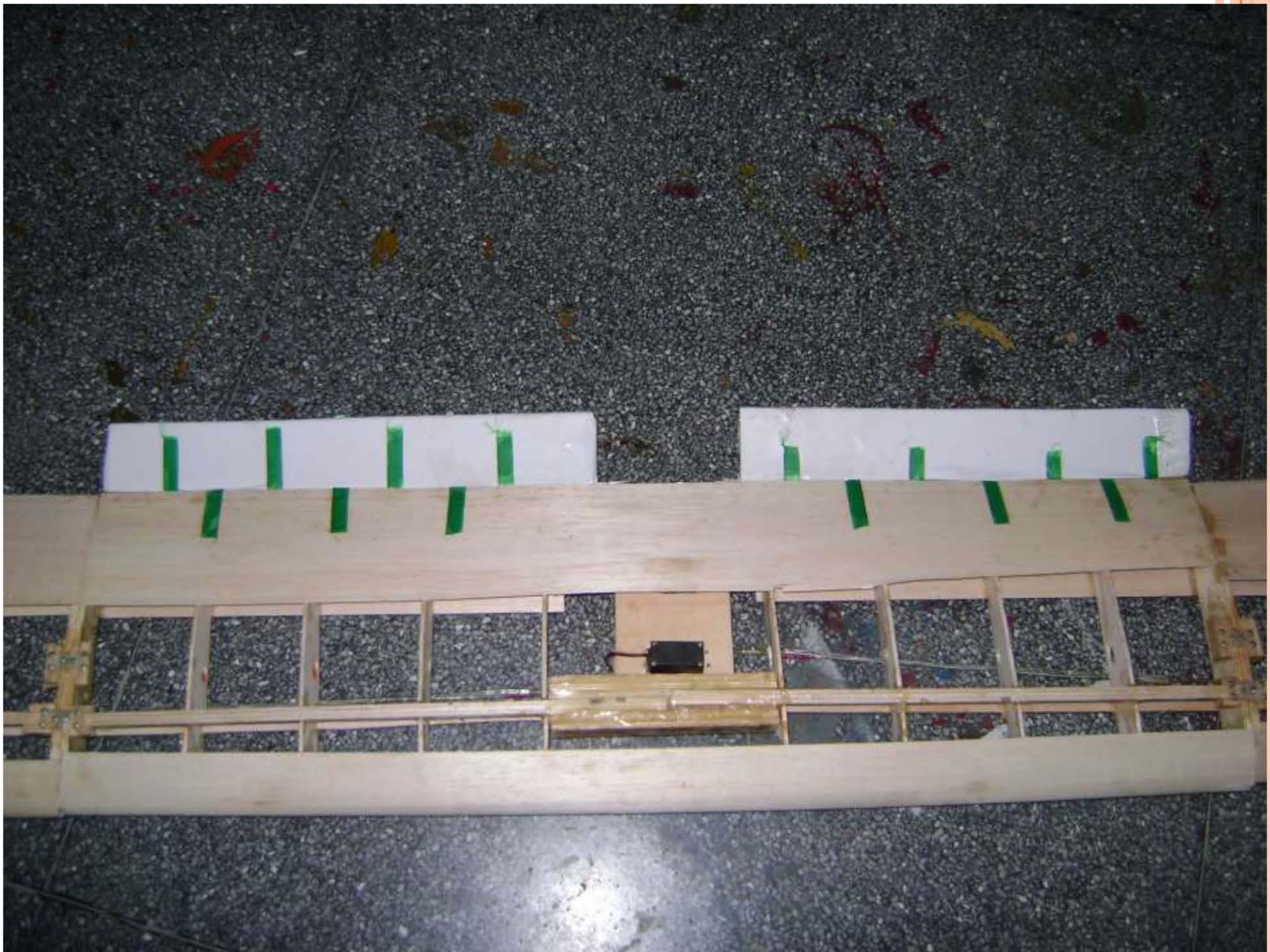
- Durable material.
- Stronger than styrofoam but a bit heavier.
- Good choice for fuselage and crash-prone areas

BALSA WING CONSTRUCTION

- Several airfoils are cut from balsa wood
- Airfoils are connected using balsa support rods
- The structure is partially covered with 1mm sheet balsa throughout the wing span (near the leading edge)
- Ailerons are also made in the similar way.
- Both the wings and ailerons are covered with ***heat shrink*** covering film(plastic film).

Following slides have some pictures of wings under construction:



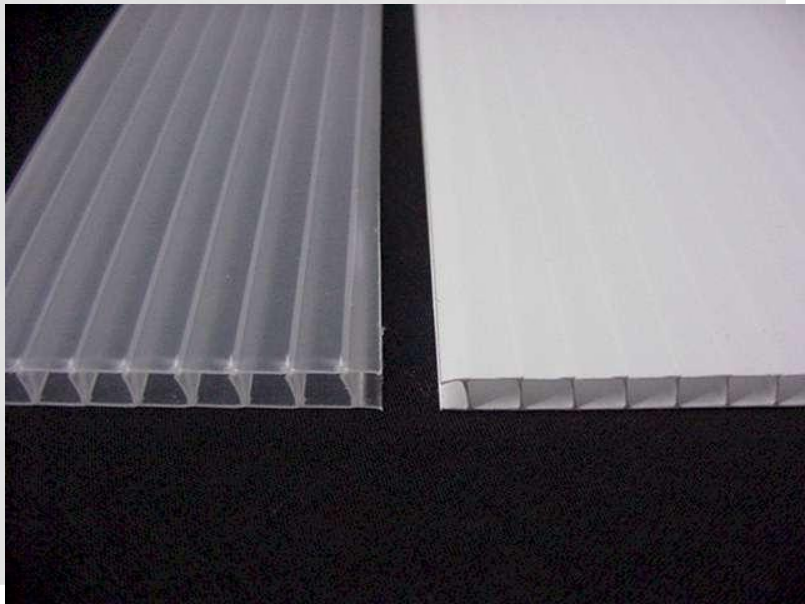


STYROFOAM WING

- Templates are cut from balsa, tin can cardboard etc. and attached two the two sides of styrofoam sheet.
- The foam is cut with a hot wire cutter. Finished with sand paper.
- *Like you did in the "Styrofoam Glider Workshop"*
- Strengthened by providing wooden spar or Carbon Fiber rod (you can use other materials also).
- Taping is done to the whole wing surface in the spanwise direction.

COROPLAST/SUNPACK WING

- The easiest and the quickest way.
- Just cut out the wing planform. Be careful that the coro flutes are oriented along the spanwise direction.
- Provide strengthening by using wooden or CF rods.




6EX
Futaba

AILERON & TAIL CONSIDERATIONS

One point to be kept in mind while making the elevator and rudder is that **their area too is to be included in the area of the tail and vertical stabilizer respectively.**

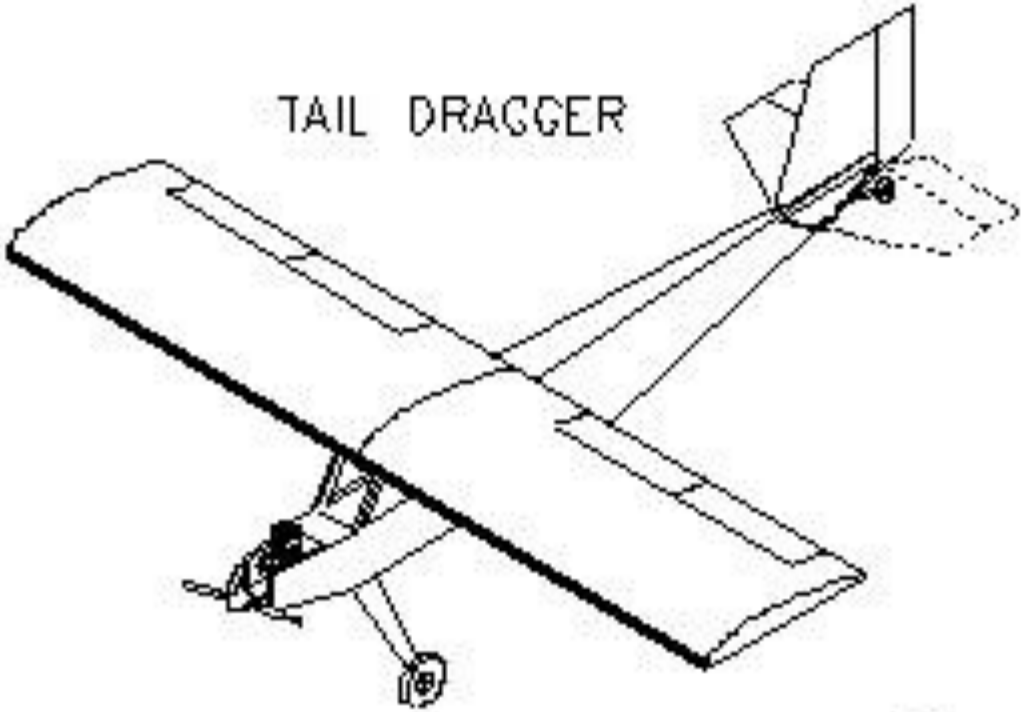
FUSELAGE/MAIN BODY STRUCTURE

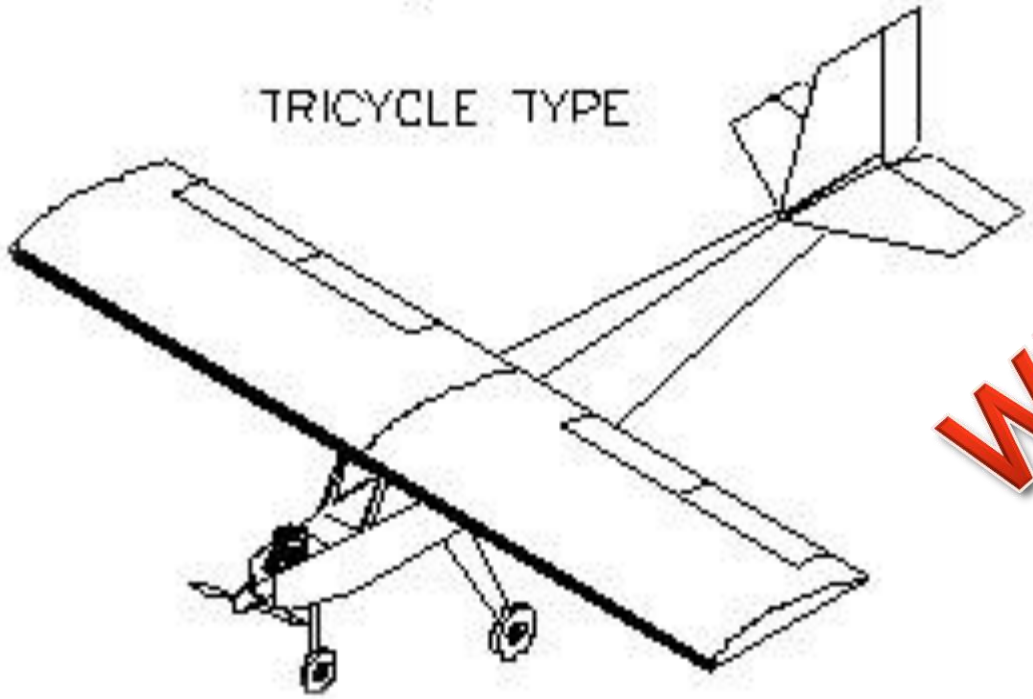
- Everything is attached to fuselage: Wings, motor/engine, battery/ fuel-tank, servos, other electrical components, etc.
- Must have ***proper strength at proper place***. More strength at the front than the tail.
- Should have proper space for the servos, battery receiver, esc, etc.
- Servo arms, control rods should not clash with each other.

What can be these things??

THE TAIL


COROPLAST FUSELAGE
Under construction





LANDING GEAR

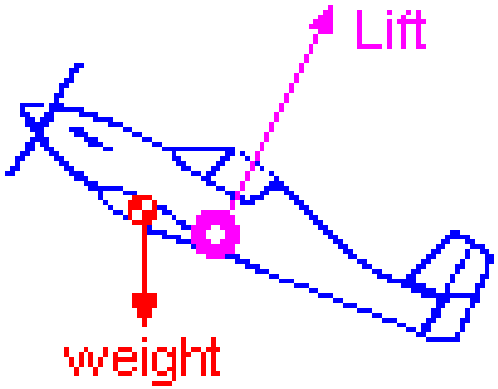
Why 2 types???

LANDING GEAR

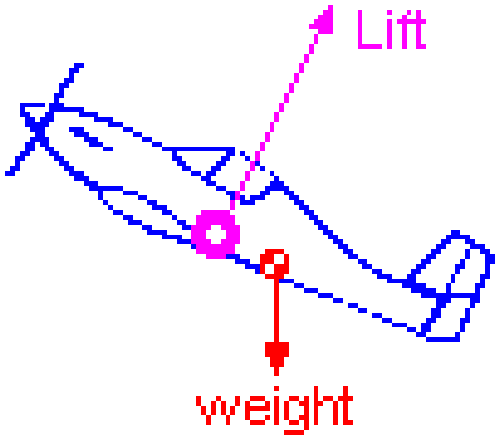
FINDING THE POSITION OF WING

- One of the most important thing is to find a suitable position for the wing.
- For if the centre of gravity of the entire system is not in between the aerodynamic centre and the tail then the plane will not be stable.
- We try to keep the position of centre of gravity at a distance of 0.1c to 0.2c from the aerodynamic centre.
- The aerodynamic centre is located at a distance of 0.25c (approximately) from the leading edge of the wing for subsonic speeds.

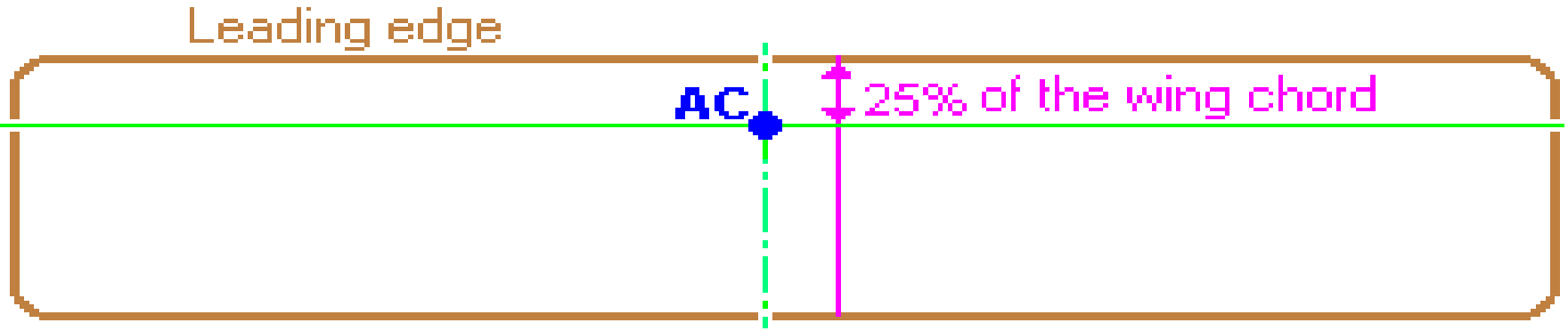
STABILITY



When the CG is ahead of NP the weight tends to correct the upset = Stable



When the CG is behind NP the weight worsens the uppset = Unstable



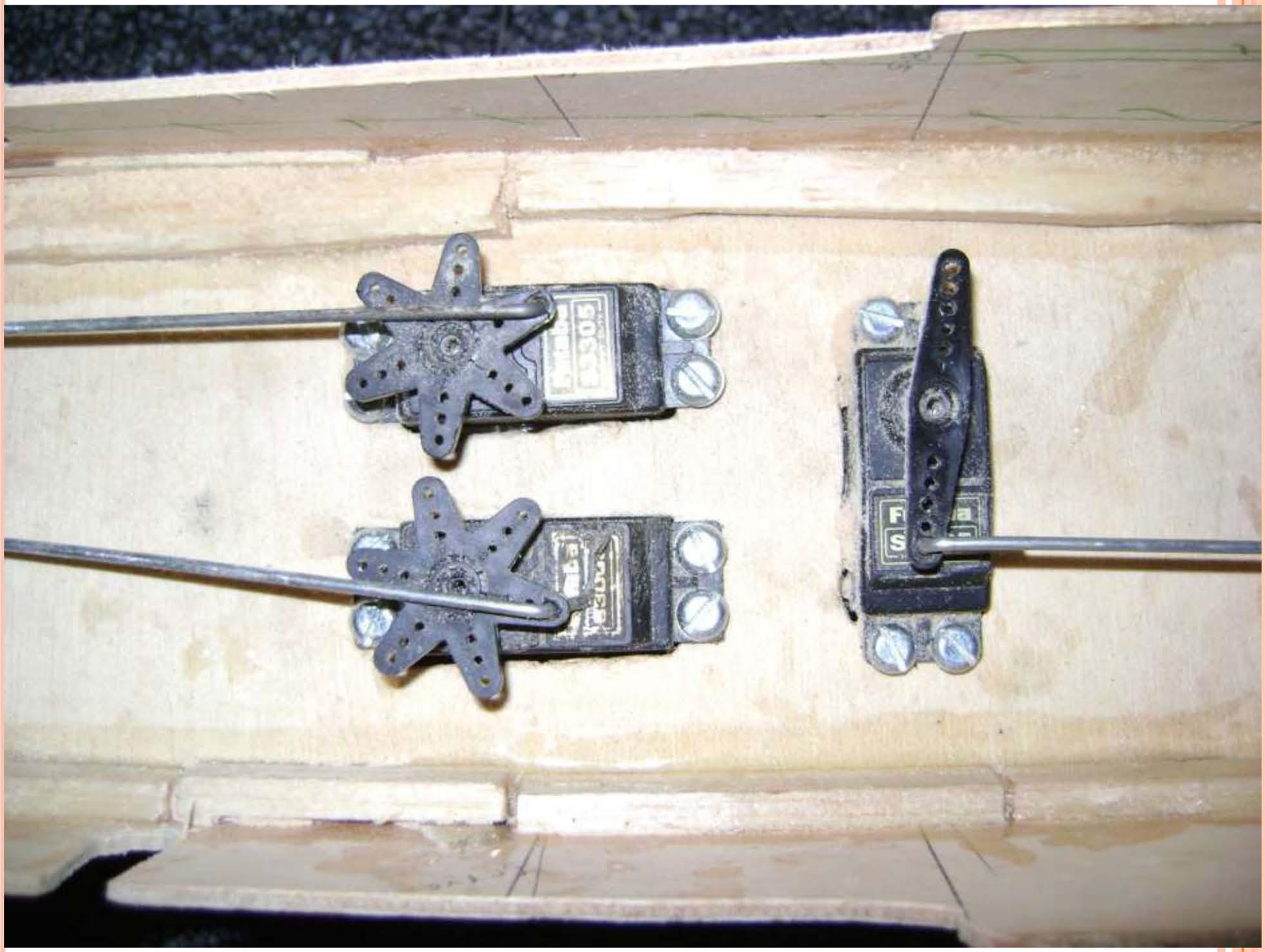
RC PLANE PARAMETERS

- Aspect Ratio = 6-7.5 (not a rule though!!!)
- ***Wing Loading*** ~ 2.5kg/sq m – 3.3 kg/ sq m
- Other parameters similar to that provided to you in the "*Styrofoam Glider Lecture*."
- Airfoils usually designed using ***DesignFoil*** software, which will be demonstrated to you at the end of the lecture.
- *Tip: for better performance, static thrust = weight. This implies that you have to select your motor according to your plane weight!!!*

SERVO

- These are responsible for controls of aero models.
- The control surfaces – ailerons, elevators, engine throttle and rudders are connected to the servos using push rods .
- All servos are connected to ***receiver***.
- Rotation of servos(torque) on receiving signal from ***transmitter*** causes the movements of control parts.
- Defined by the torque they provide.


HITEC



Servo Mounts

ELECTRIC MOTOR & PROPELLER

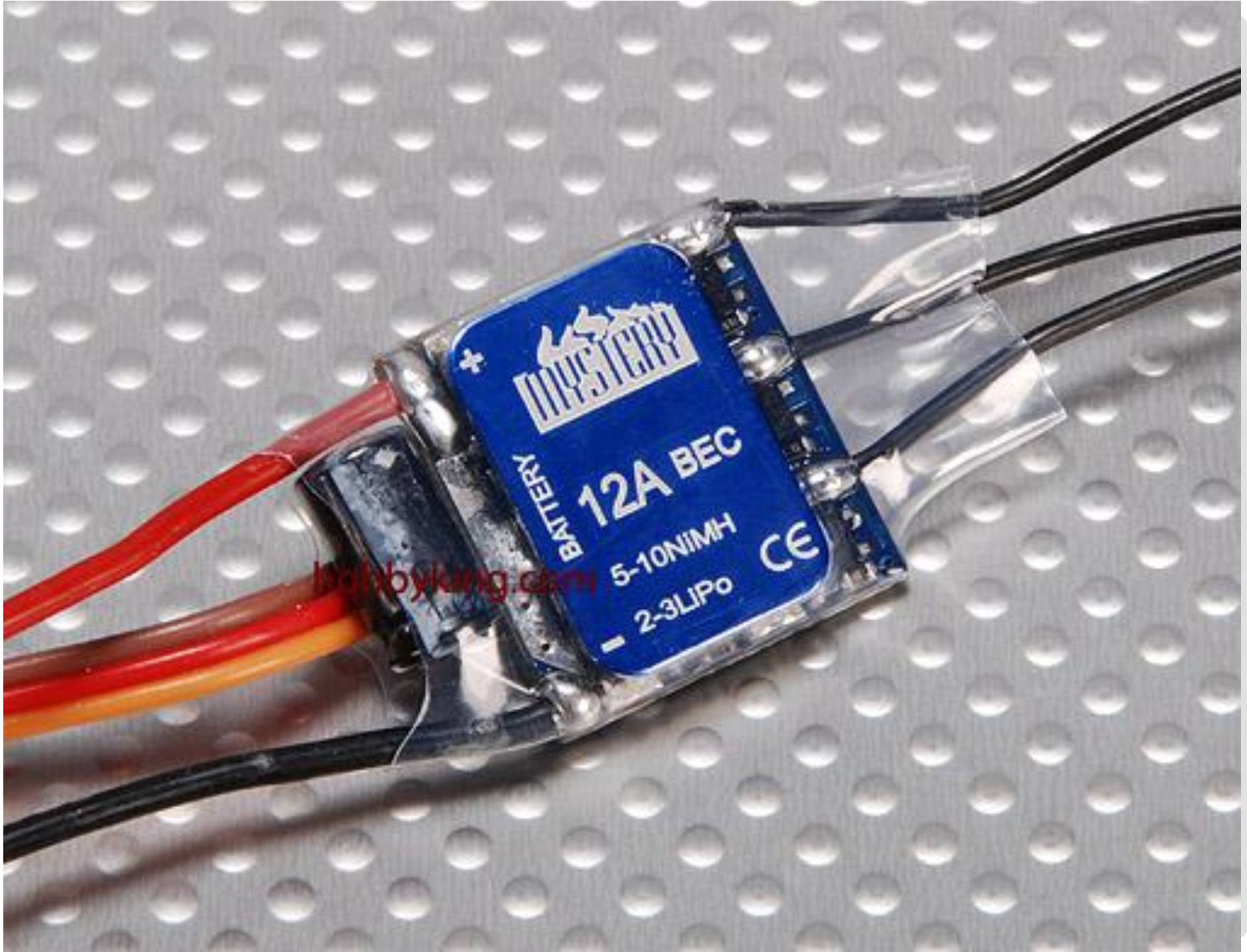
- The main propulsion mechanism of the plane.
- Connected to the ESC.
- Choice of propeller, motor depend on the thrust required.
- Motor rated as various kv ratings available.
- Propellers rated as AXB where:

  A= Diameter of the prop

  B= Pitch it provides

ESC

- Electronic Speed Control
- Manipulates the input to the motor, thereby controlling the ***throttle.***
- Connected to the motor at 1 end and receiver at the other end.
- Available as programmable and non-programmable.
- Defined by the Ampere rating.
- ESC selection should *supplement* the motor you have chosen.


MYSTERY
BATTERY
12A BEC
5-10NIMH
2-3LIPo
CE

BATTERY

- Lithium Ion Batteries used for aero modelling purposes.
- Number of cells in a battery is denoted by S rating. Eg 3S = 3 cells in series.
- Rated as 1300mAh, 1600mAh, etc
- C rating gives the maximum discharge that it can produce. Eg 1000mAh with 20C implies maximum current of 20 Amp.
- Maximum current=Rating in Amp Hr X C rating


TURNIGY
25-30C DISCHARGE
1000 mAh
1.0
MATCHED
HIGH DISCHARGE LI-PO BATTERY
2 Cell 7.4V
3 Cell 11.1V
4 Cell 14.8V
5 Cell 18.5V
6 Cell 22.2V

ACCESSORIES

Snap Connectors:

- Used for attaching control rods to the servo heads.

Horns:

- Used for attaching control rods to the control surfaces.

And many more that you will learn as you build a plane!!!


Servo, Snap connector &
Control rod

CONTACTS

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- Visit - http://students.iitk.ac.in/aeromodelling

- Details of Club Secretaries and other Senior Members are provided on the site. Contact them to discuss any problems you encounter.

For more information on RC plane concepts log onto:
http://adamone.rchomepage.com/index2.htm


Thank You!