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

- Stabiliser
- Main wing
- Vertical tail
- Fuselage
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
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 to 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.
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 things 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.
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 upset = Unstable

Leading edge

AC

25% of the wing chord
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!!!
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.
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.
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
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!