AEROMODELLING CLUB

R.C. HOVERCRAFT

REAL HOVERCRAFT

R.C. HOVERCRAFTS

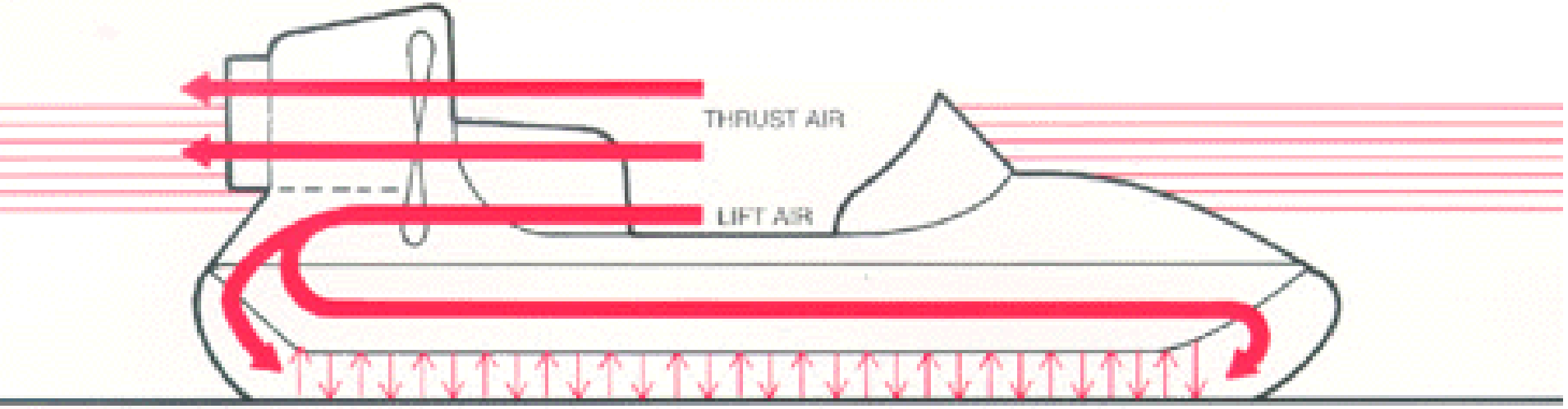
TODAY'S LECTURE

Topics to be covered in the following sequence:

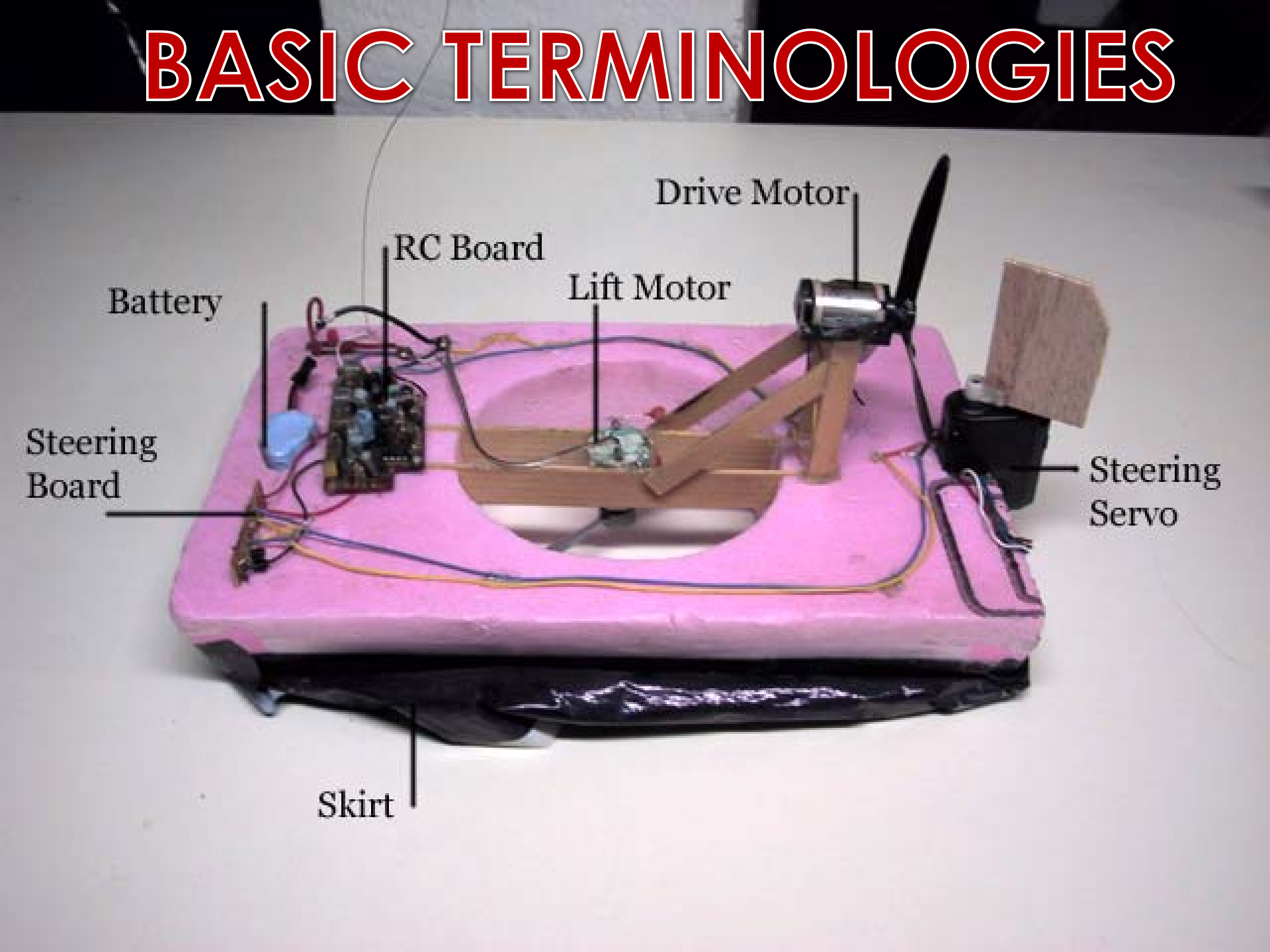
- Definitions & Terminologies
- Forces on the craft
- Types of RC hovercrafts
- Hovercraft Controls
- Skirt Design and Lift Generation
- Propulsion design
- How to make your hovercrafts(motor mount, servo mount)
- Duct designing
- Few other designing tips
- Our team

WHAT IS A HOVERCRAFT?

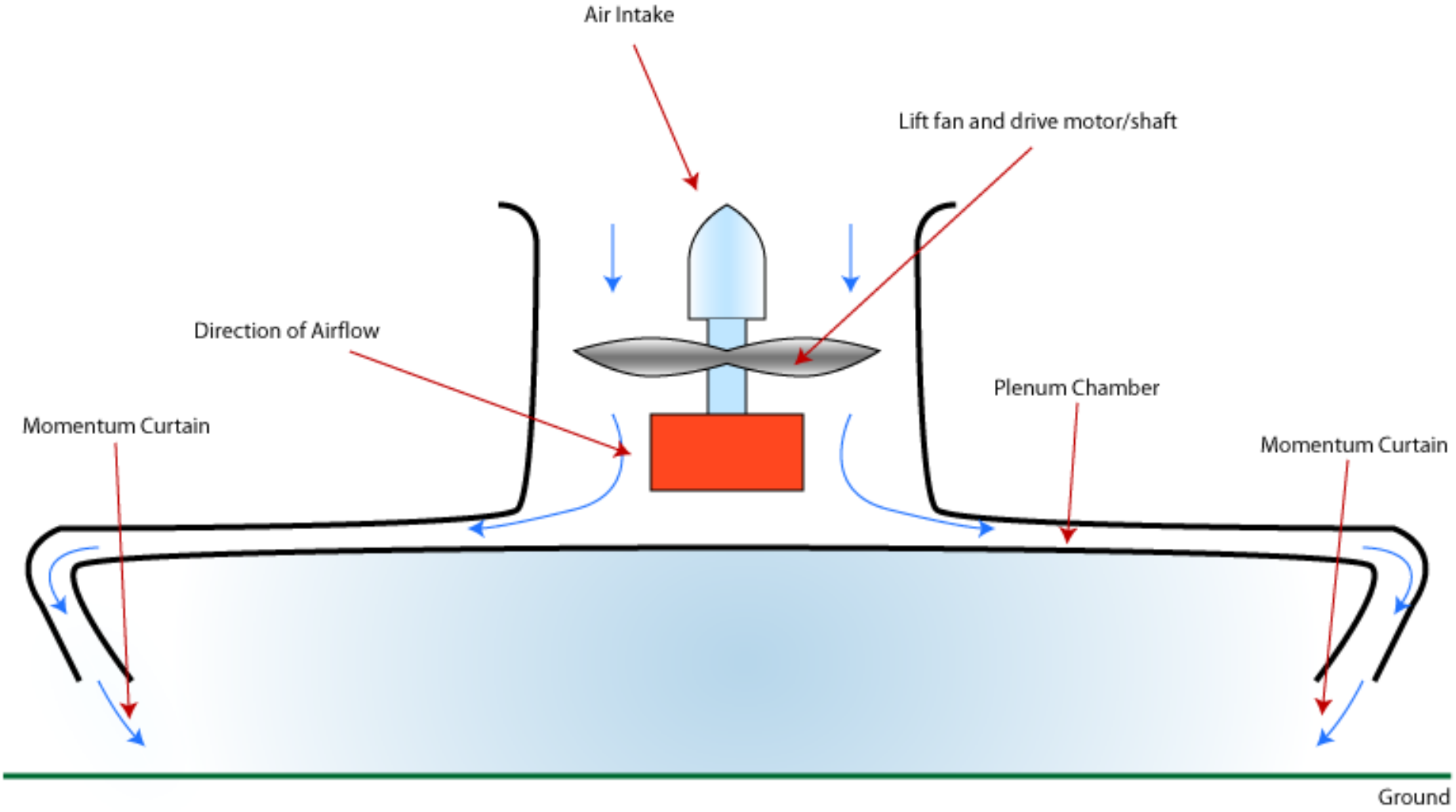
- A vehicle capable of travelling over surfaces on a cushion of slow moving, high-pressure air.
- The air is ejected against the surface below and contained within a ***skirt***.
- A propeller *in the vertical plane* used to provide the thrust, to move forward.



BASIC TERMINOLOGIES



FORCES ON A HOVERCRAFT



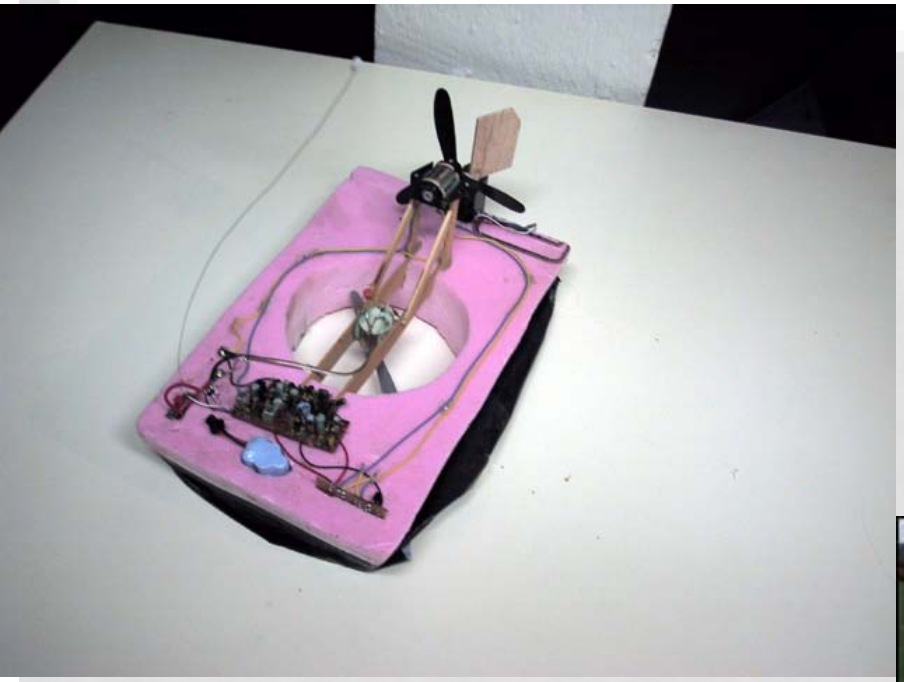
Basic Principles of the Hovercraft:
The Momentum Curtain effect

LIFT

HOVERCRAFT THRUST

- Propeller motor system in the vertical plane produces thrust.
- *Thrust mechanism can also be integrated with the lift mechanism of the craft.*

TYPES OF R.C. HOVERCRAFT



TWO PROPELLER TYPE

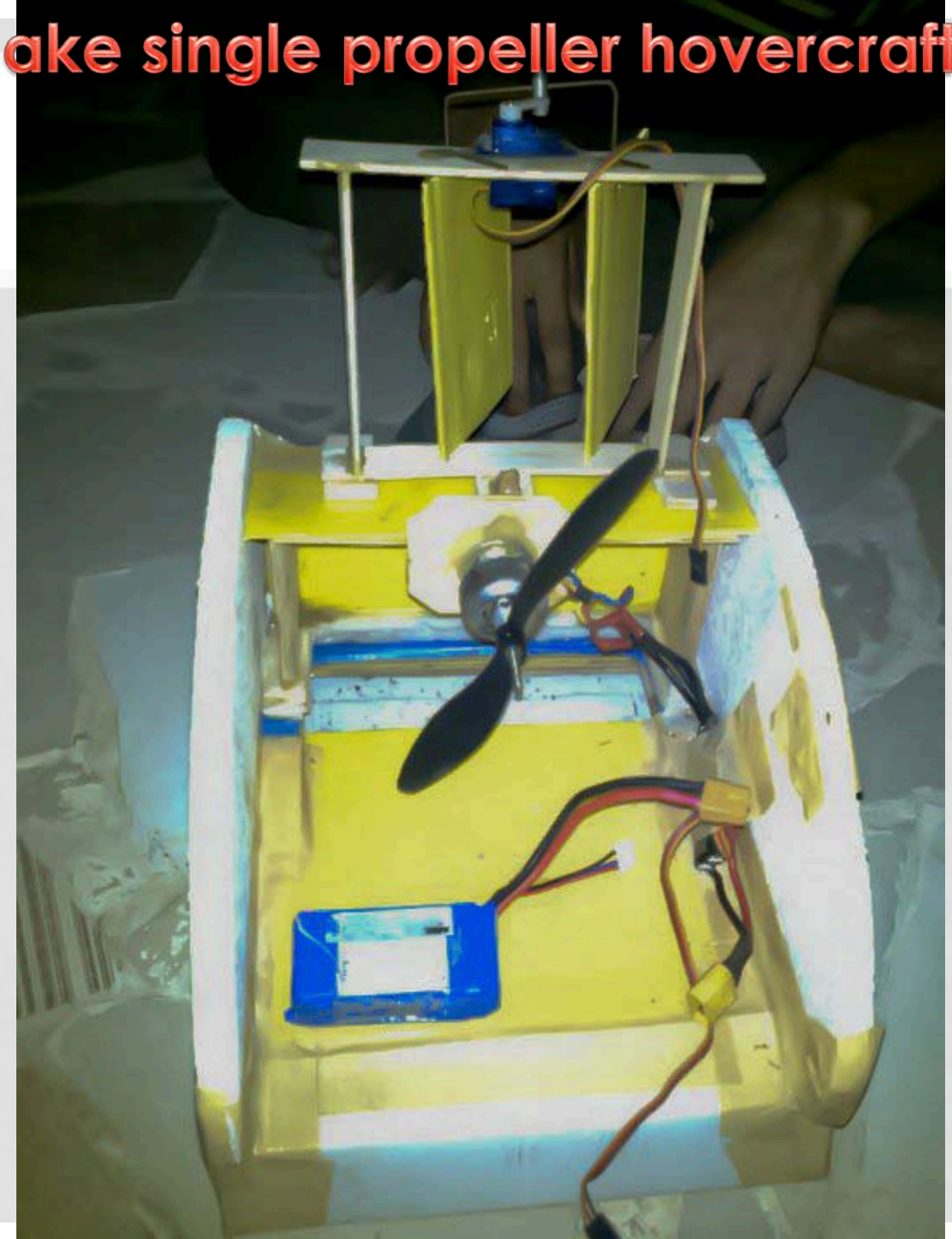
- 2 different motor-propeller systems for Lift and Thrust mechanisms.
- Has the ability to hover at a place!
- Amount of lift independent of the amount of thrust.
- Horizontal plane – lift mechanism.
- Vertical plane – Propulsion mechanism, integrated with controls.
- *Generally used for large scale purposes.*

SINGLE PROPELLER TYPE

- Lift and propulsion mechanisms integrated.
- A vertical/slightly inclined motor propeller system.
- Duct provided to push some amount of air through below the mainframe into the skirt.
- Efficiency depends on better duct designing.
- Lift dependent on thrust.
- Maximizing air flow for *lift*, not compromising on thrust.

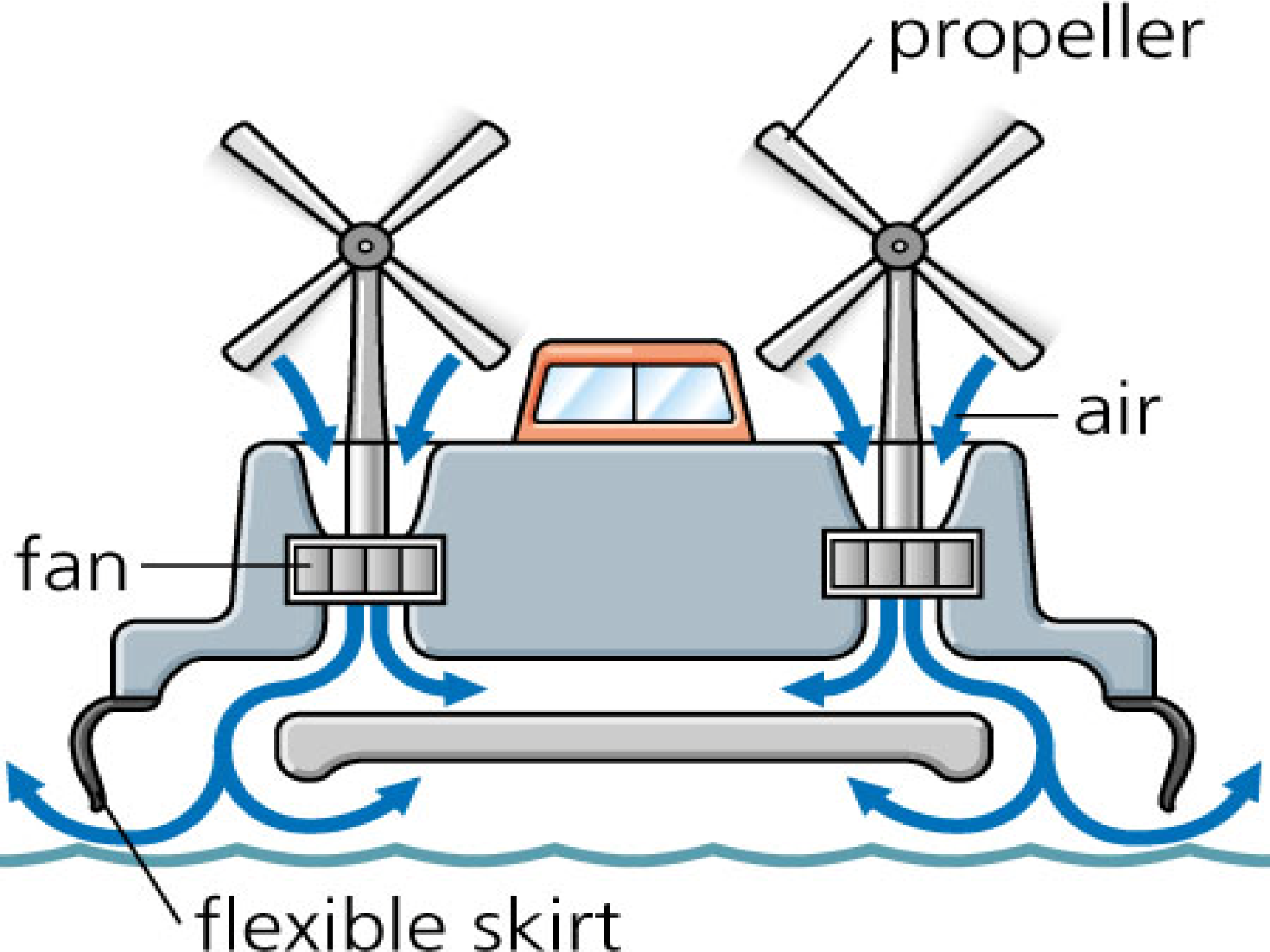
- ***Can it hover at a place???***

You will make single propeller hovercrafts tomorrow



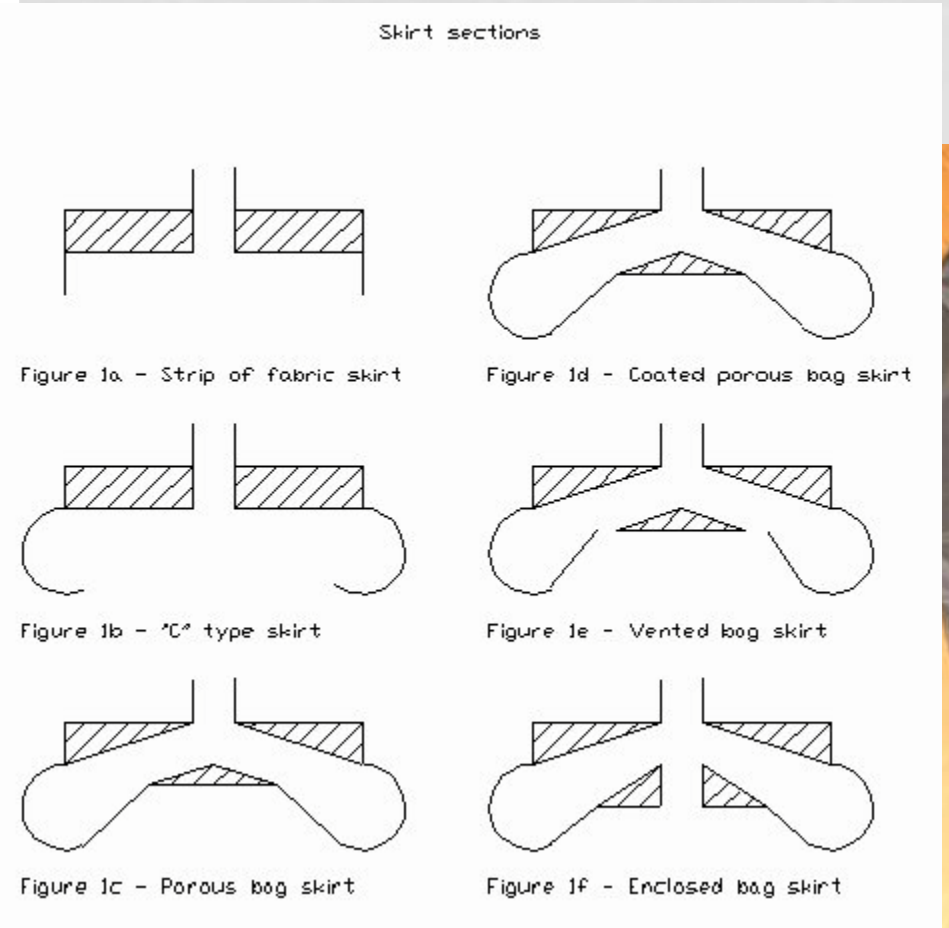
HOVERCRAFT CONTROLS

- Speed i.e. throttle depends on the rear vertical motor.
- In case of single propeller crafts, it affects the lift too.
- ***Rudder*** attached, behind the thrust motor to maneuver.
- ***Thrust Vectoring*** can also be used.
- ***Twin thrust motor*** with/without rudders are also used.
- Any other mechanism you might think!!!

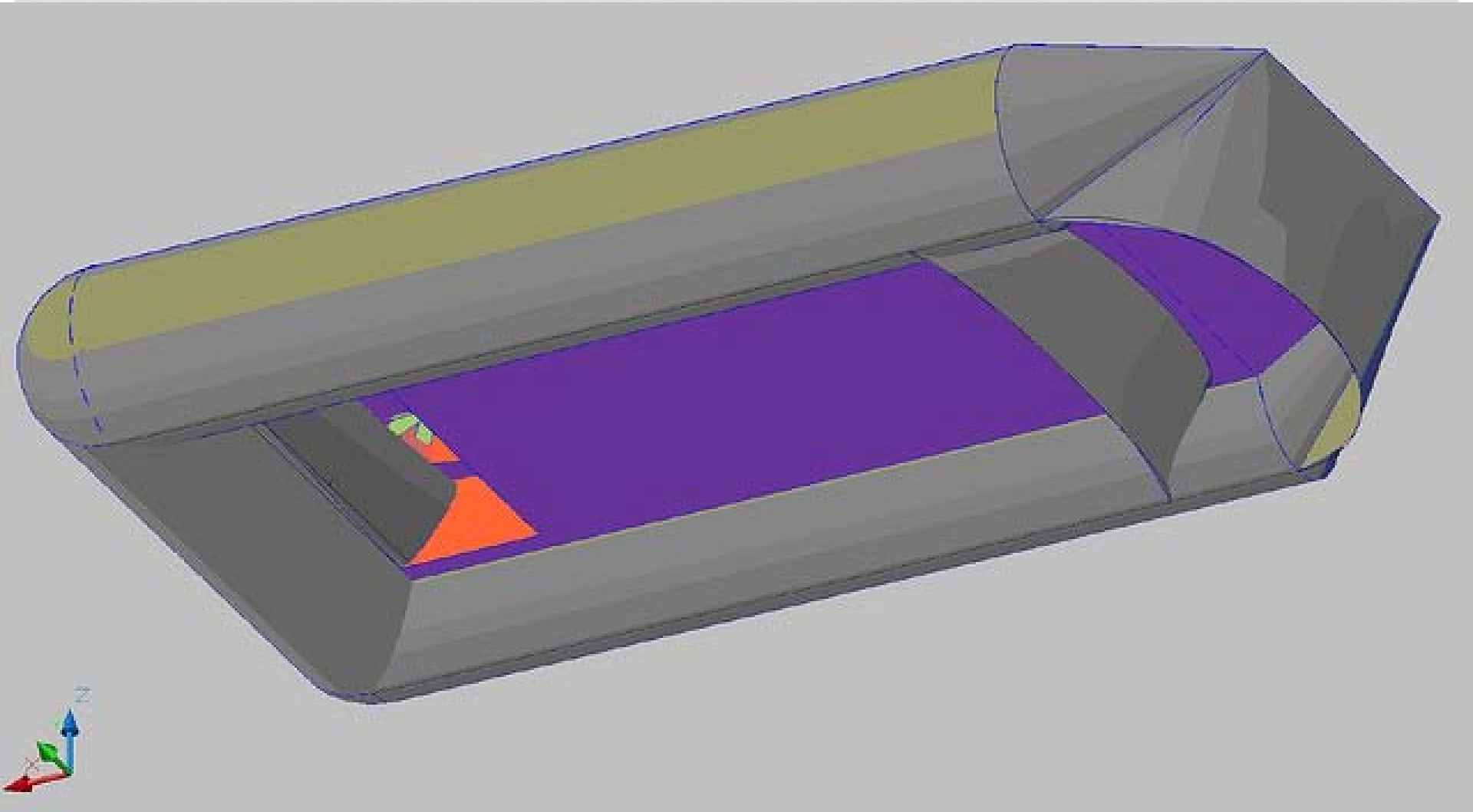

propeller
air
fan
flexible skirt

HOVERCRAFT SKIRT

- Skirt is a cloth/cloth type



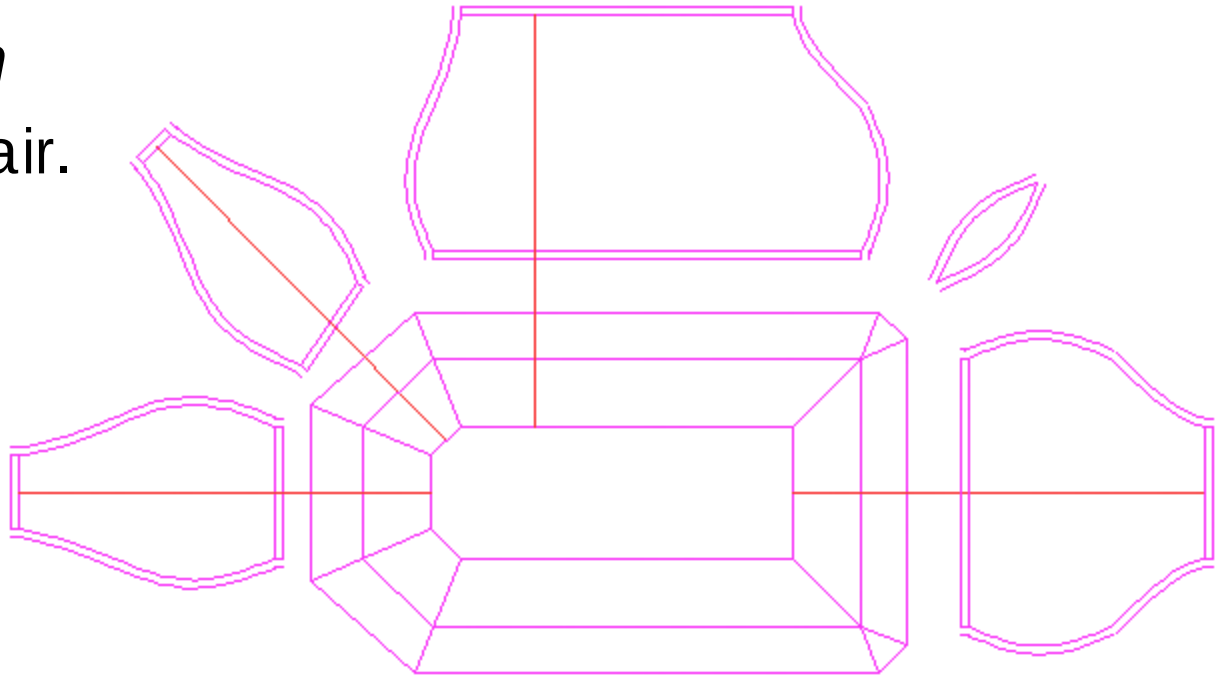
BOTTOM VIEW OF A CRAFT



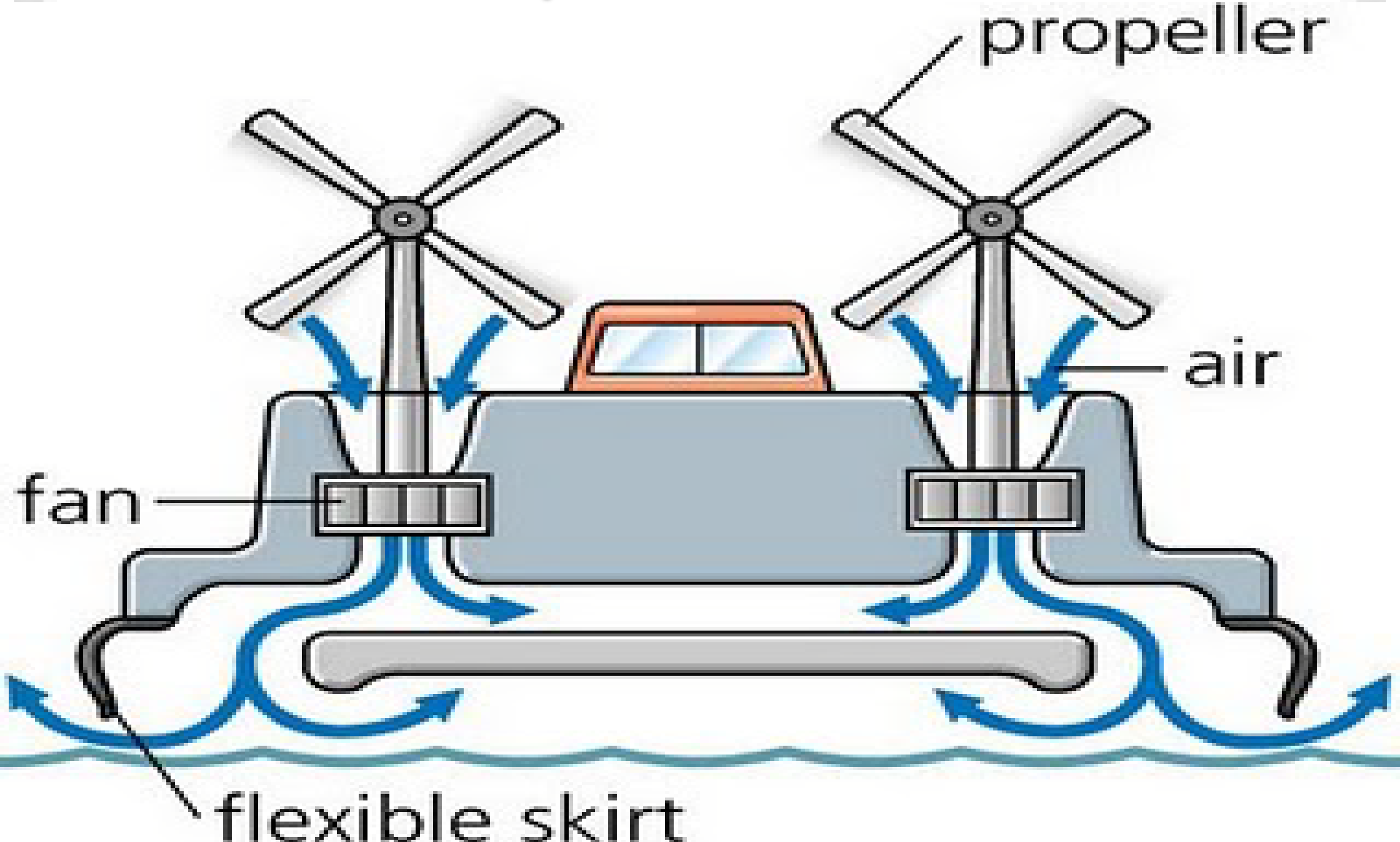
HOVERCRAFT SKIRT

- Skirt surface drawings.
- Notice the curved side parts to give it a wrinkleless blown up shape.
- Used to ***contain***

high pressurized air.



Cushion of high pressure air provides the necessary lift to keep the craft afloat.



PROPULSION AND INTEGRATED CONTROLS

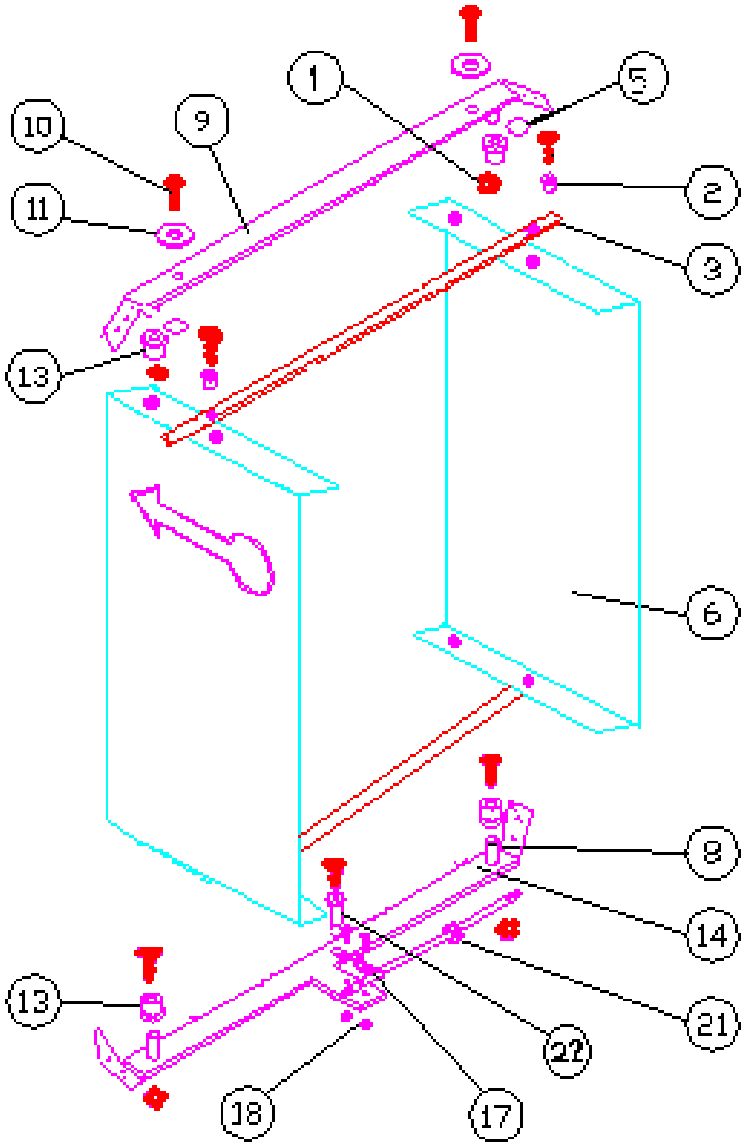
- Vertical motor-prop system.
- **Ducting** required for *increased performance!!??*
- High thrust motor-prop system should be chosen.
- Main aim = *maximize the flow of air intake to the propulsion system.*

PROPULSION AND INTEGRATED CONTROLS

- Maneuverability achieved through the use of **rudders**. (*What is a rudder by the way???)*
- Single and multi-rudder systems implemented depending on the use.
- A challenge in the multi-rudder system- *synchronization.*
- **Thrust Vectoring** also an option.
- **T.V.** integrates propulsion with controls leads to lower radii of drift.

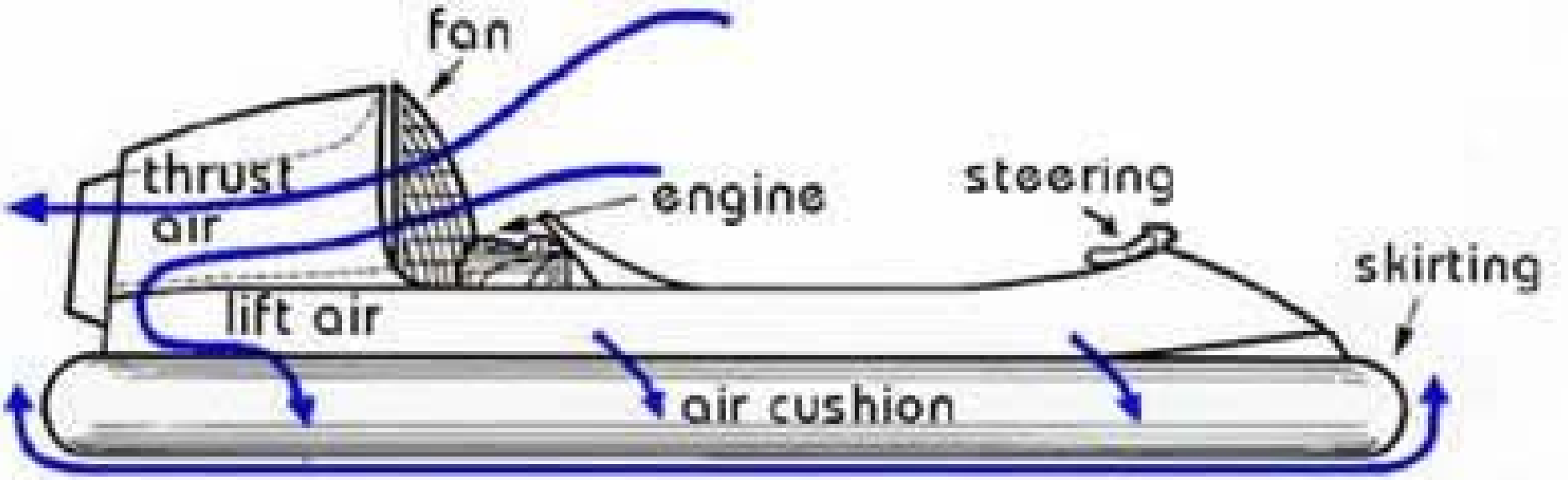
Thrust Vectoring

RUDDER ASSEMBLY



HOW TO MAKE R.C. HOVERCRAFTS IN THE WORKSHOPS?

- ✓Overall dimensioning
- ✓Designing (making a plan)
- ✓Part dimensioning
- ✓Duct designing
- ✓Get it verified from your *guide*



ELECTRONICS REQUIRED

- 1 Motor
- 1 Propeller
- 1 Servo
- 1 Battery
- 1 ESC
- Transmitter - Receiver

- *All these will be mounted on the craft only at the end of the workshop, during testing and removed back after the test.*

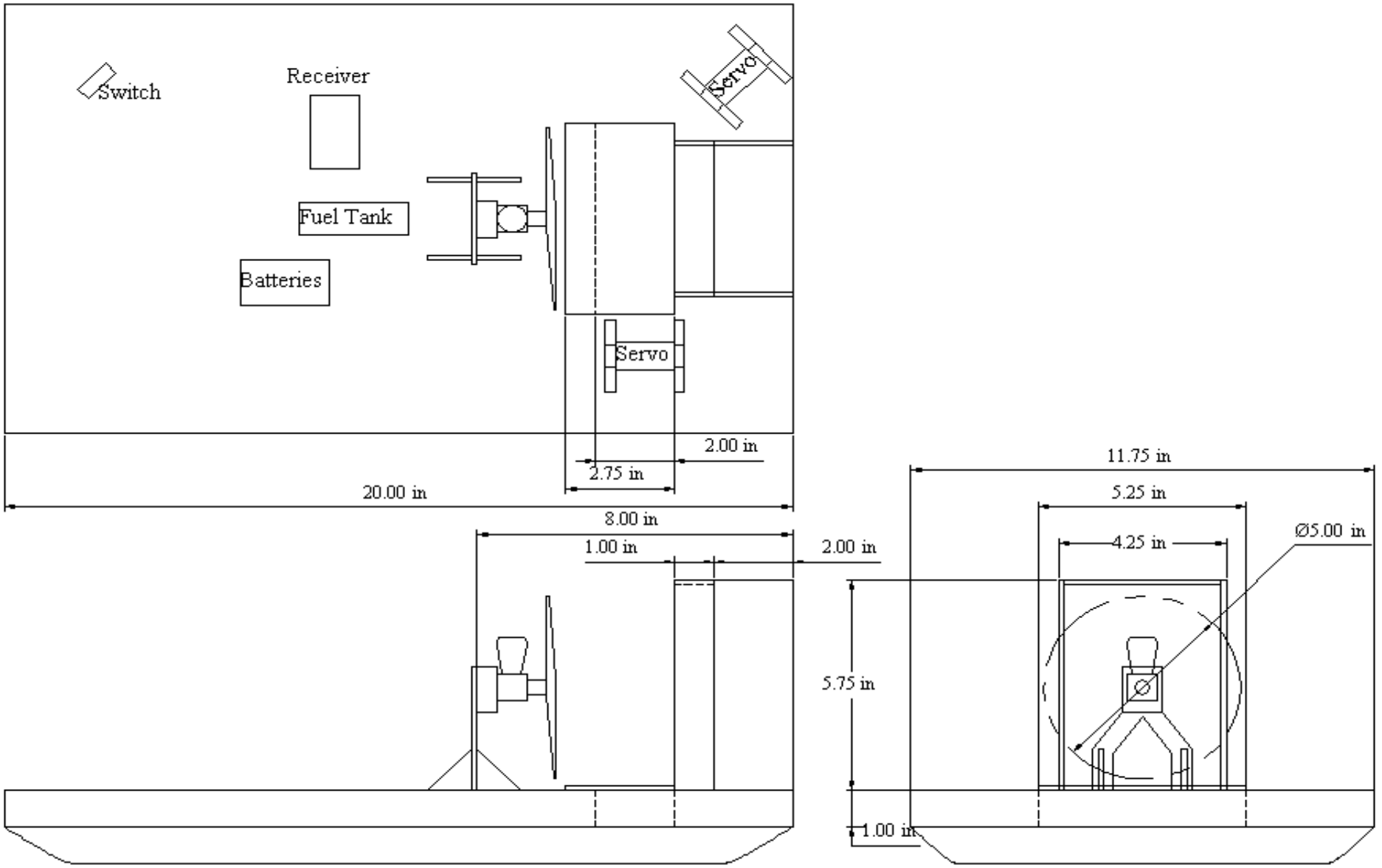
MATERIALS YOU WILL BE USING

- Coroplast – main structure, rudders, duct
- Styrofoam – skirt boundaries, duct
- Wood – motor mount, rudder structure, strengthening

Caution: Strengthening only where required.

- Adhesives – Bond Tite, Bond Quick, Tape

FIRST MAKE A PLAN



DUCT DESIGNING

- Proper intake area
- Back should not be perpendicular to the craft board. *(Why so???)*
- Below the duct will be the passage for air to go below.
- Rudders will be mounted on

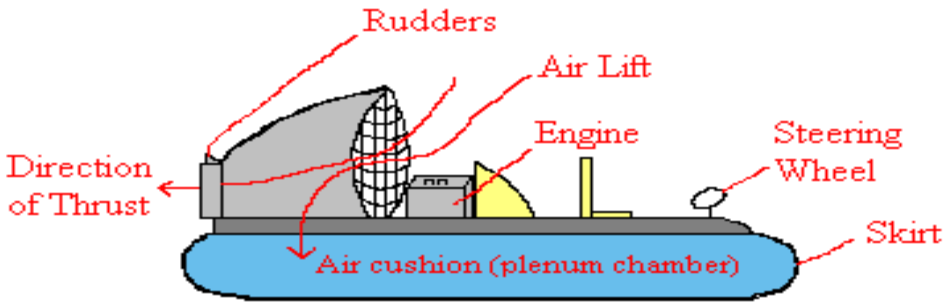
the duct

Total airflow should be well

divided between lift and thrust!!!

SKIRT DESIGN AND DUCT INTEGRATION

- Styrofoam sheet boundaries will be attached to the main-board boundaries below the craft.
- A coroplast plate-type structure can be provided just below the duct to ensure air goes elsewhere in the skirt also.



MOTOR AND SERVO MOUNT

- Motor to be mounted **ON** the duct front face.
- Servo can be on/at the side of the duct.

Remember that servos and motors are temporary. Keep that in mind while designing their mounts.

FEW OTHER TIPS

- Remember: its *Aeromodelling… so weight matters.*
- Motor mount should be strong.
- Compact is better.
- Try side walls, if time permits, to maximize air intake.
- Ducted Fans can be used for better performance.

- *Any thing that increases air intake.*

CONTACTS

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

Slots will be mailed to you.
Check your webmail tomorrow morning positively


Thank You!