

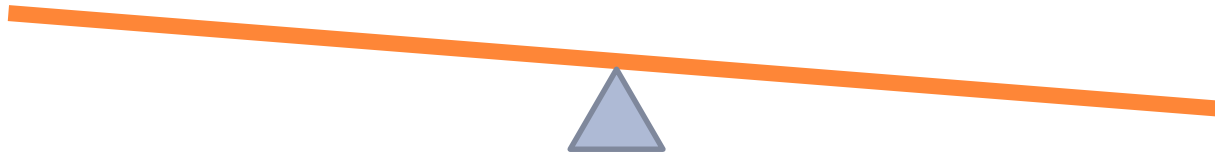
1.4 FINDING CENTER OF GRAVITY

How does CG affect the flight of an airplane?



What is Center of Gravity?

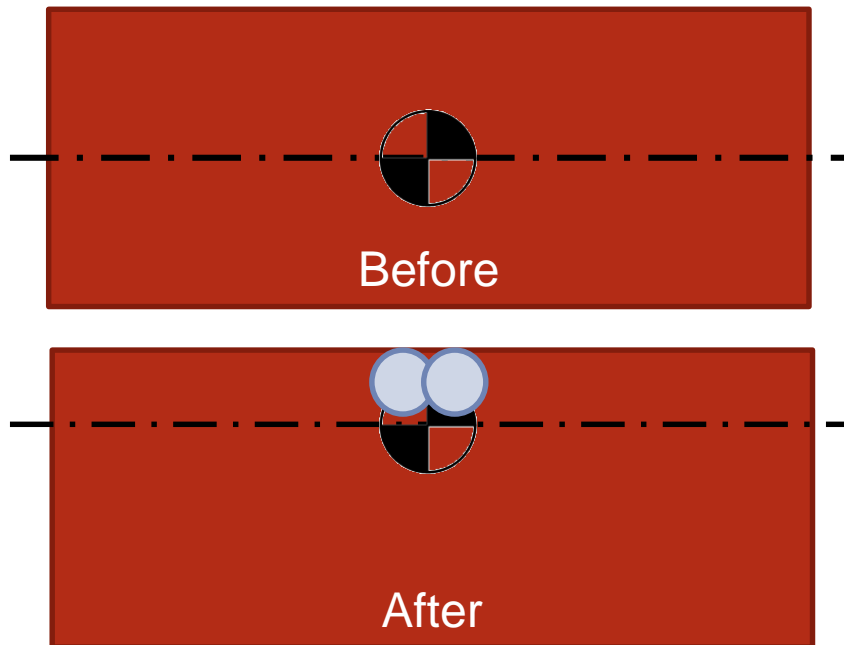
- Center of Gravity (CG) is imaginary point where the airplane balances.
- It works like a see-saw between the front and back of the aircraft



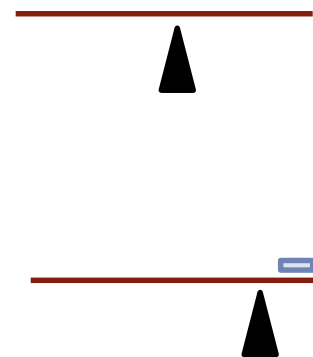
Where should the CG be?

- You want $\frac{1}{4}$ of the area of airplane in front of the CG and $\frac{3}{4}$ behind the CG
- You need to add weight to the nose of the plan to move the CG forward to the correct spot

Top View



Side View



How do you calculate the CG

- Find the surface area of your plane
- Find the line that has $\frac{1}{4}$ of the area in the front, and $\frac{3}{4}$ in the back
- Balance your plane by adding nose weight until it balances on the line

How do you find the Surface Area?

Mathematically

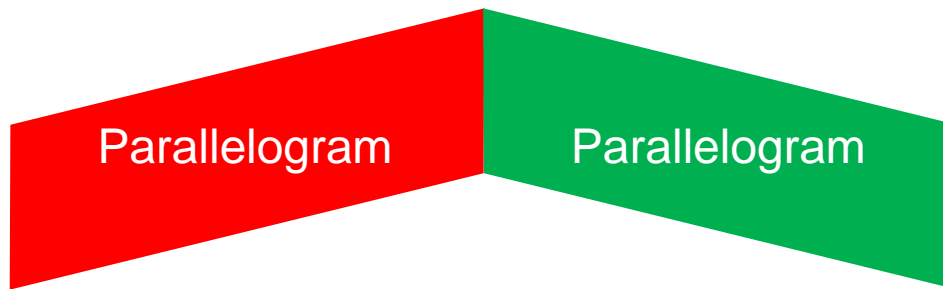
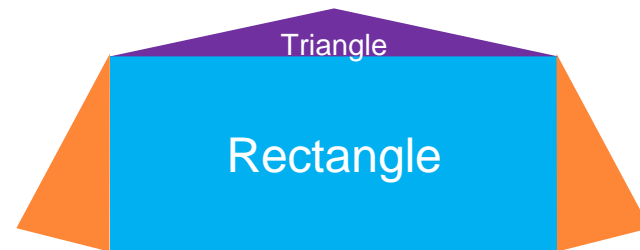
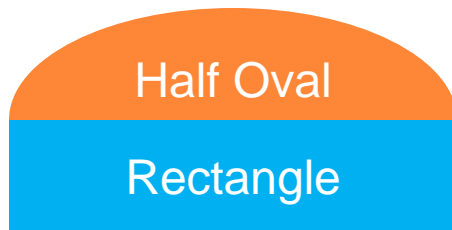
- Use the formulas for area divide your shape up into rectangles, circles/semicircles, ovals, and triangles
- Find the area of each shape
- Add up the area of each shape to find the total area

Estimation

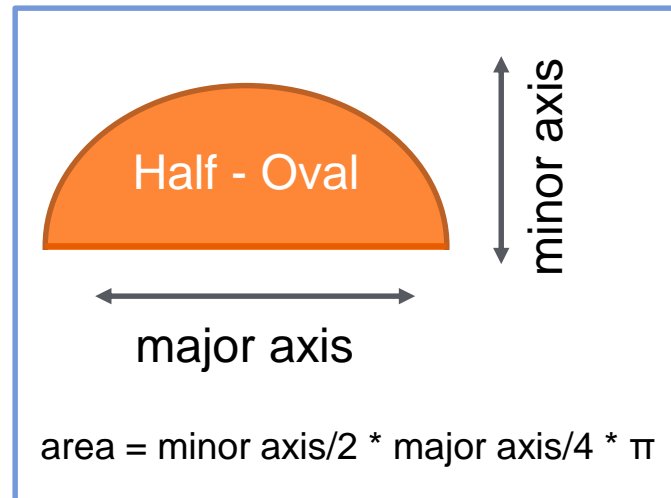
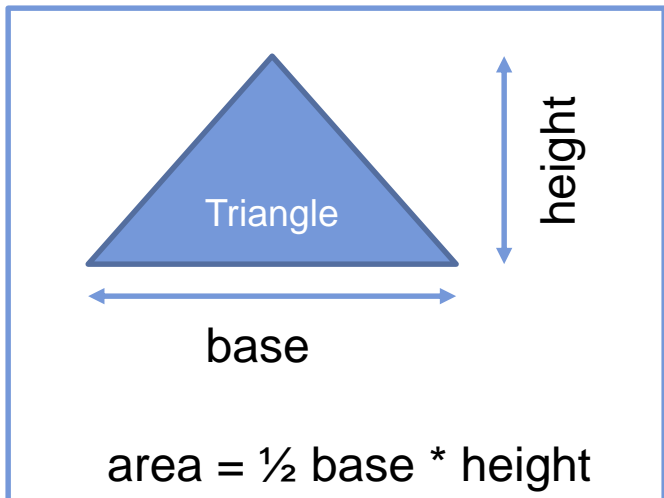
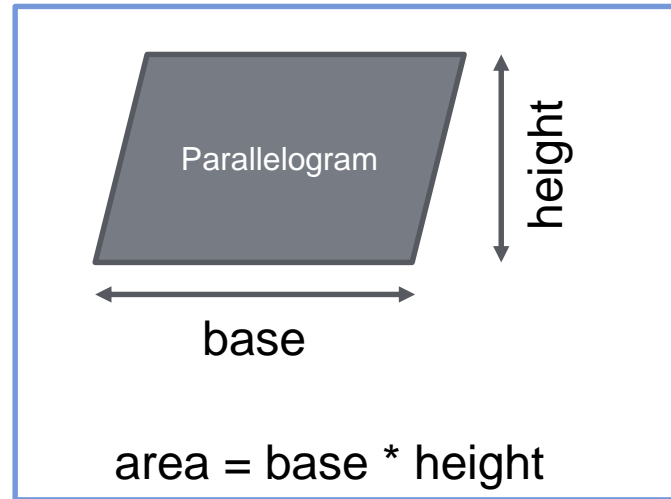
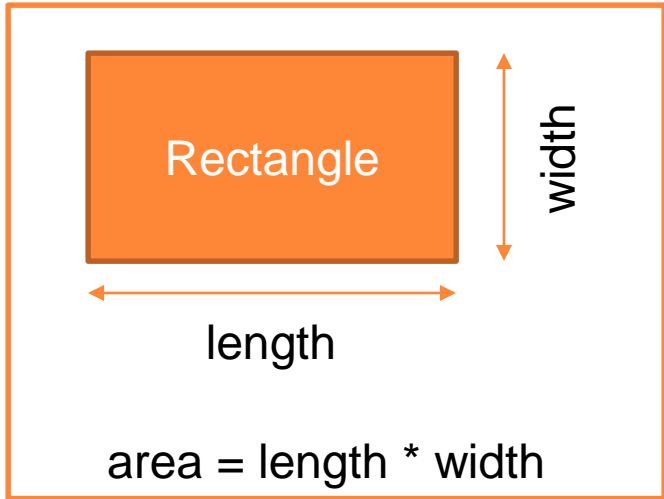
- Lay the clear graph paper over your airplane.
- Count the number of boxes

Mathematical Method – In Detail

- Step 1 Divide the plane up into basic shapes
 - Rectangles, Triangle, Parallelograms, and Half-Ovals are the most common



Mathematical Method in Detail – Shapes



Mathematical Method – In Detail

- Step 2 - Measure the area of the different shapes in cm
- Use the formulas to calculate the area for each shape
- Add up all the areas to get the total area in cm^2

Estimation Method in Detail

- Lay the clear graph paper over the plane (without the stabilizer)
- If it's a partial square, count it as .25, .50, or .75 and add it to the total
- If you have 1.0 cm graph paper then your answer is already in cm^2
- If you have 0.5 cm graph paper, then you need to double your answer to get cm^2

- Picture will go here

Try It Out

- Calculate the surface area of your plane using both methods
- Draw the CG line & symbol
- Add Weight to balance the plan on the center of gravity