So now we can calculate pressure at a particular depth in a fluid

1. where does is act on the body?
2. Why is it important where it acts?

Concept of “PRESSURE PRISM” or “PRESSURE DISTRIBUTION DIAGRAM”
Let's calculate magnitude of $F$:

Our plane in question could be at an incline:

\[
dF = p \, dA
\]

but $p = \gamma h$ and $h = l \sin \alpha$

\[
dF = \gamma l \sin \alpha \, dA
\]

Integrate over all incremental $dFs$

\[
F = \gamma \sin \alpha \int l \, dA
\]

From principle of first moments:

\[
\int l \, dA = l_C A
\]

\[
F = \gamma l_C A \sin \alpha \quad \text{or} \quad F = \gamma h_C A
\]
\[ F = \gamma h_C A, \quad \text{But where does this force act?} \]

\((at \ P) \) So what is \( h_P \cdot l_P \)

- Note: \( h_C \) is fixed depending on where the plane is.

- We need to find where is \( P \) located with respect to surface of liquid. Find \( l_P - l_C \)
  
  - Moment of resultant force about any point = sum of moments of components

\[
l_P F = \int l \, dF = \int l (\gamma l \sin \alpha \, dA)
\]

\[
l_P F = \gamma \sin \alpha \int l^2 \, dA
\]

- Transfer theorem for second moments

\[
\int l^2 \, dA = I_0 = I_C + l_C^2 A
\]

\[
l_P = l_C + \frac{I_C}{l_C A}
\]
\[ l_P = l_C + \frac{I_C}{l_C A} \]

- \( l_C \): if we know the shape we know position of \( C \)

- \( I_C \): if we know the shape we know position of \( C \)

- \( A \): area of surface

**Location of Center of pressure on the immersed surface**

- We know the depth of that point from surface of fluid (\( h_P \) or \( l_P \))

- What is the position of that point on surface of plane

\[ x_P = \gamma \sin \alpha \int x_C l dA \]

\[ \frac{F}{x_P} \]