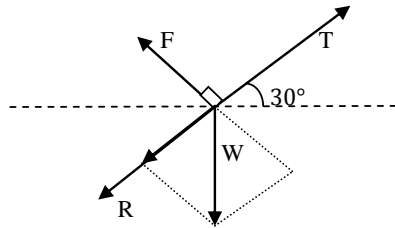


A plane is flying with a constant speed along a straight line at an angle of  $30^\circ$  with the horizontal. The weight of the plane is 80,000 N and its engine provides a thrust of 100,000 N in the direction of flight. Two additional forces are exerted on the plane: the lift force perpendicular to the plane's wings, and the force due to air resistance opposite to the direction of motion. Draw

the free-body diagram showing all forces on the plane. Determine the lift force and the force due to air resistance.

### Solution



***F*** - lift force, ***R*** - the force due to air resistance , ***T*** – force provided by engine.

The lift force **F** provided by the wings

$$F = W \cos 30 = 80,000 * \cos 30 = 69,282N .$$

As the plane has a constant speed the net force acting along the line of flight must be zero.

Which means

$T = \text{weight component 'down the slope'} + R$

$$100,000 = (80,000 \cdot \sin 30) + R \rightarrow R = 100,000 - 40,000 = 60,000N$$

**Answer: 69,282N; 60,000N.**