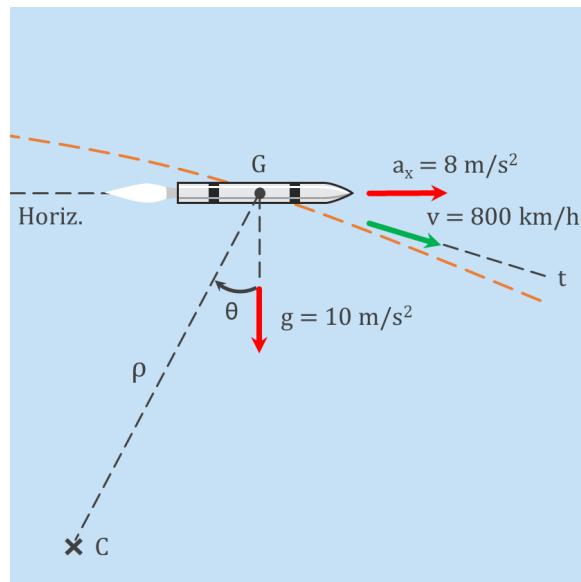


Rocket Accelerates



A rocket maintains at horizontal attitude of its axis during the powered phase of its flight. The acceleration due to horizontal thrust is 8 m/s^2 , and the downward acceleration due to gravity is $g = 10 \text{ m/s}^2$. At the instant represented, the velocity of the mass centre G of the rocket along the (θ) 15° direction of its trajectory is 800 km/h . Determine the normal acceleration a_n with respect to the centre of curvature C .

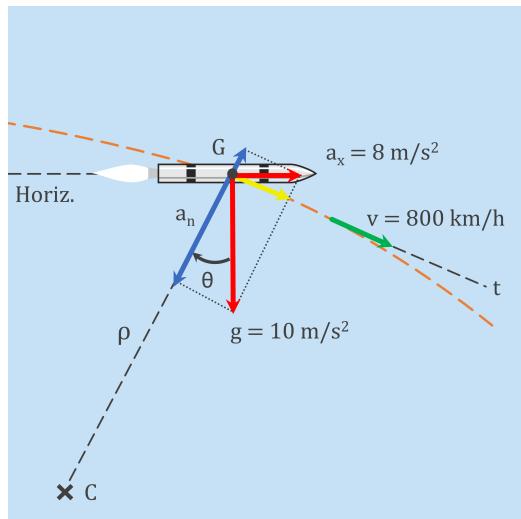


Figure 1: Rocket Accelerates

The normal acceleration a_n points towards the centre of curvature C . Figure 1 shows the acceleration vectors a_x and g deconstructed in the normal direction (blue) and the tangential direction (yellow). It can be easily seen that g and a_x deconstructed in the normal-direction are equal to $g \cdot \cos(\theta)$ and $a_x \cdot \sin(\theta)$ respectively. However, in this case $a_x \cdot \sin(\theta)$ points in the opposite way of a_n (points \nearrow instead of \swarrow). This means that to determine the final value of a_n , the term $a_x \cdot \sin(\theta)$ should be subtracted. Resulting in the final answer:

$$a_n = g \cdot \cos(\theta) - a_x \cdot \sin(\theta) \quad (1)$$