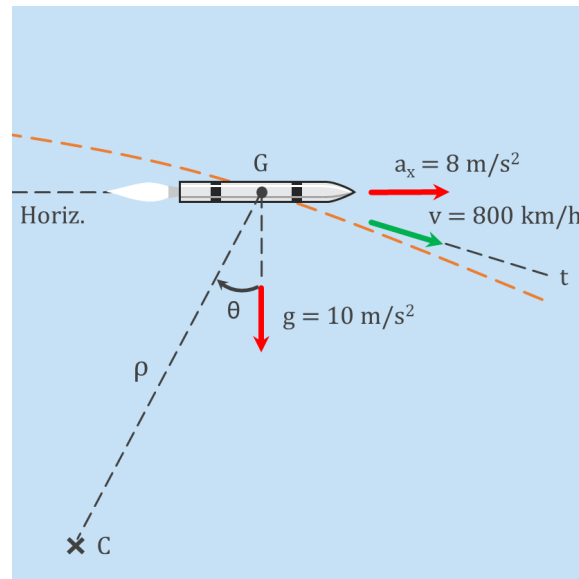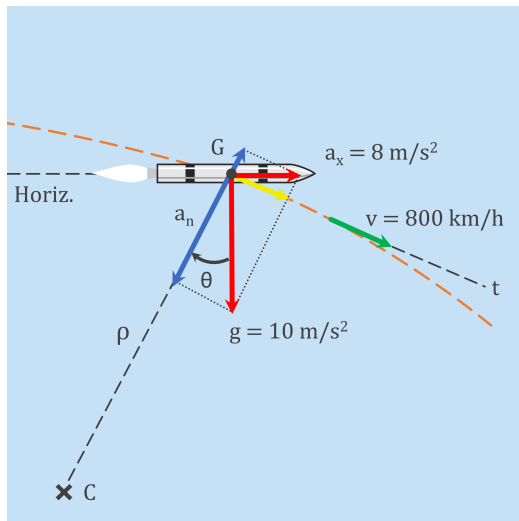# Rocket Accelerates

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 $g = 10$ 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 tangential acceleration a_t with respect to the centre of curvature C.

Figure 1: Rocket Accelerates

The tangential acceleration a_t points is parallel to v. 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 tangential-direction are equal to $g \cdot \sin(\theta)$ and $a_x \cdot \cos(\theta)$ respectively. Resulting in the final answer:

$$a_t = g \cdot \sin(\theta) + a_x \cdot \cos(\theta) \qquad (1)$$