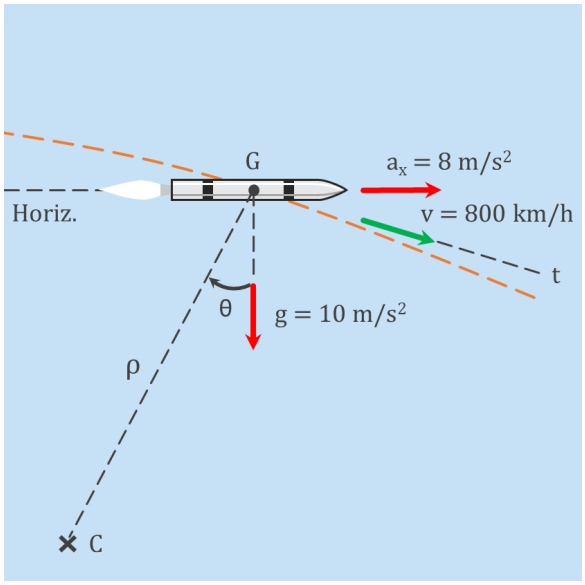
Rocket Accelerates



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.

The tangential acceleration a_t is parallel to v. To find this acceleration, a parallelogram can be drawn using the other acceleration terms g and a_x (see Figure 1). It can be seen that g in the direction of a_t results in $g \cdot \sin(\theta)$ and a_x in the direction of a_t results in $a_x \cdot \cos(\theta)$. Adding both together results in the final answer:

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

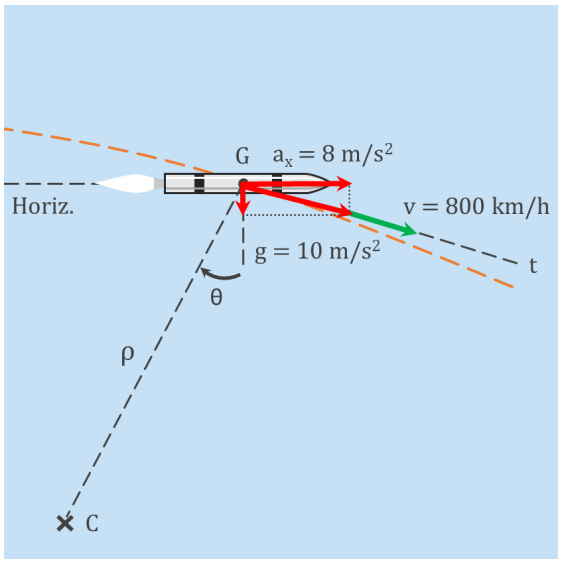


Figure 1: Rocket Accelerates, with parallelogram drawn that results in a_t.