

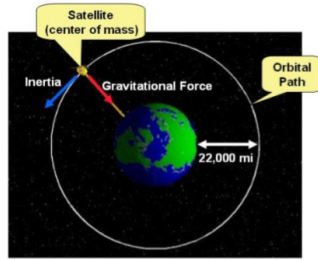
Satellite Motion

Satellite Motion

Objectives

Discuss satellite motion.

Calculate the tangential velocity for a satellite in orbit.



"Falling Moon"

explanation of how satellite motion would work

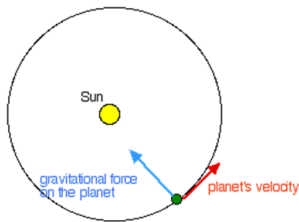
apple falls to surface of Earth b/c gravity.....moon orbits b/c gravity



Satellite Motion

An Earth satellite is simply a falling object

It is simply traveling with enough tangential velocity to fall around the Earth, rather than into it.



Tangential Velocity

too slow - F_g makes satellite fall into earth
too fast - satellite goes into outer space

$$V_t = \sqrt{\frac{Gm}{r}}$$

Unit: m/s

center mass

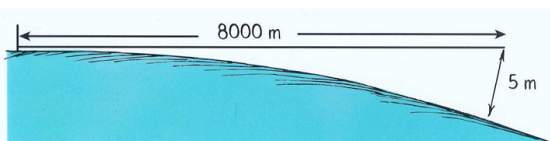


Mountain Cannon

8000 m/s

A satellite close to the Earth has a tangential speed of 8 km/s. (19,000 mi/hr)

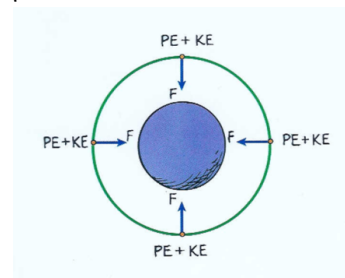
During each second, the satellite falls 5m beneath each successive 8 km tangent.



Circular Orbits

circular orbit - V_t matches available F_g

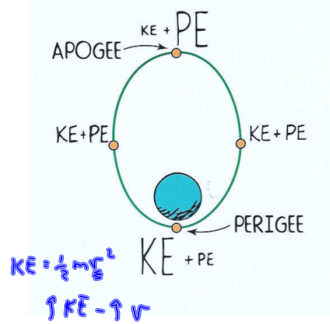
the speed of the satellite is constant



Satellite Motion

Elliptical Orbits

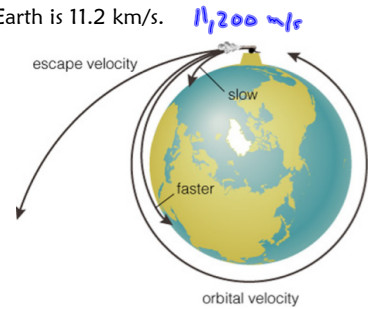
If the tangential speed of the satellite is greater than 8 km/s, the satellite will overshoot a circular path and follow an oval-shaped path or ellipse.



Escape Speed

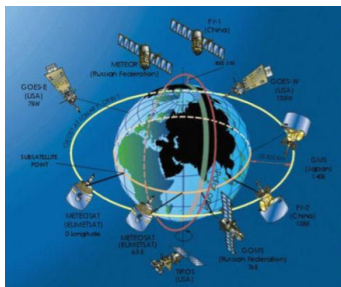
Escape speed is the minimum initial speed an object must have in order to escape the pull of Earth's gravitational field.

Escape speed from Earth is 11.2 km/s. (25,300 mi/hr.)



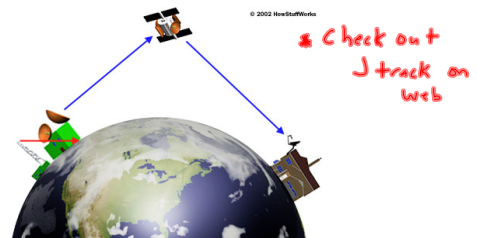
Geosynchronous Orbit

key is that the spin of the Earth and velocity of satellite all have to match up!



TV Satellite

7000 mph at about 22,200 miles above the Earth



Assignments . . .



- Begin Chapter 14 Homework #1 - 5

