NEXT-TIME QUESTION

CONCEPTUAL Physics

A rocket coasts in an elliptical orbit around the Earth.

To attain escape velocity using the least amount of fuel in a brief firing time, should it fire off at the apogee, or at the perigee?

Hint: Let the formula

$$Fd = \Delta KE$$

guide your thinking.

thanx to Chelcie Liu

Hewitt Drew-it!

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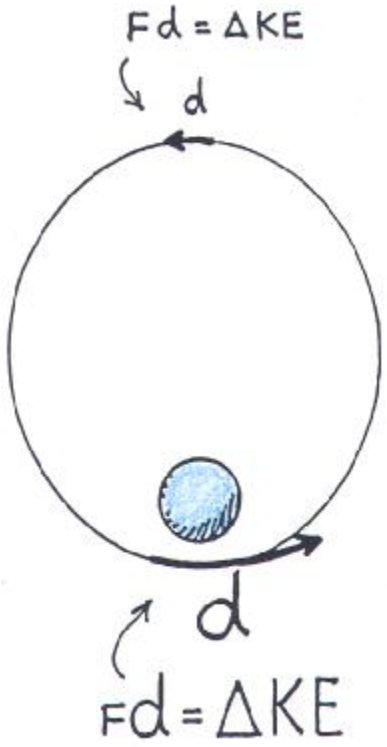
Answer: at the perigee

In accord with the work-energy formula, $Fd = \Delta KE$, for a constant thrust F, the maximum change in KE will occur when d is maximum. The rocket will travel the greatest distance d during the brief firing time where it is traveling fastest—at the *perigee*.

This can be seen also by considering the relative KEs given to the exhaust gases at the perigee and apogee. At the apogee, where the rocket coasts slower, much more KE of the system goes to gases, whereas at the perigee most of the KE is associated with the rocket. (If the orbital speed = rocket exhaust speed, the gases are motionless with respect to the Earth and the rocket gets 100% of the KE.)



CONCEPTUAL Physics

ARBOR SCIENTIFIC
TOOLS THAT TEACH.