Re: Ballistic entry into circular orbit?

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- *From*: "Androcles" <Headmaster@xxxxxxxxxxxxxxx>
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<nospam@xxxxxxxxxx> wrote in message
news:50hfr3pltum23ne824g02qdbq93thmbjf8@xxxxxxxxxx
| Hello all.
|
| Would someone please help me figure out the correct way to analyze a
| problem? Namely, is it possible to literally shoot something into
| circular orbit?
|
| Assuming a vacuum, basic orbital mechanics says the orbit intersects
| the gun's location.
|
| Posit an objectl in a highly elliptical orbit about a point−like Earth
| mass, perigee at the gun 4,000 miles out. To circularize the orbit at
| 4,300 miles, we have to a) reduce the apogee from God knows what to
| 4,300 miles and b) increase the perigee from 4,000 miles to 4,300
| miles. Can we do that?
|
| One way to increase an orbit's perigee is to add energy, but you have
| to do so when the satellite is at apogee. Obviously, you can't do
| that by introducing atmospheric drag into the model because you'd be
| subtracting energy, not adding it. Worse, the atmosphere is at the
| wrong end of the orbit. On the other hand, I don't know if that's the
| only way to increase an orbit's perigee.
|
| By the same token, you can remove energy when the satellite is at
| perigee to reduce its apogee. That you can certainly do with
| atmospheric drag. Unfortunately, while that'll pull the apogee down,
| you're still stuck with a perigee at the gun. Again, I don't know if
| that's the only way to futz with the apogee.
|
| For example, what happens if you add or subtract energy at a point in
| the orbit somewhere between apogee and perigee? Can you thereby take
| some apogee altitude and trade it for some perigee altitude?
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| One thing I know for sure: any object 300 miles up will be in circular
| orbit as long as is has 25,000 fps tangential velocity, zero radial
| velocity, and is under no accelerations other than gravity.
|

| The sixty−four million dollar question is: given a real launch angle
| and velocity, can you employ real atmospheric drag to make a ballistic
| projectile launched from the surface achieve that state?
|
| My first thought was to divide the muzzle velocity into radial and
| tangential components − or vertical and horizontal, near enough.
|
| Use drag and sqrt(2gh) to figure the vertical component of the muzzle
| velocity needed to get the thing to 300 miles.
|
| Use drag and surface velocity at your latitude to figure the
| horizontal component needed to produce a 25,000 fps surplus after
| passing though the atmosphere.
|
| Muzzle velocity is then the root of the sum of the squares of the
| component velocities.
|
| Aim point altitude is the arctangent of the ratio of the component
| velocities, vertical to horizontal.
|
| Given strong enough materials, couldn't you thus put a projectile into
| just about any dynamic state you wanted to?
|
| BUT
|
| Orbital mechanics says the perigee will intersect the gun.
|
| I can't see how to reconcile those two ideas. One of 'em is obviously
| wrong, or at least incomplete.
|
| Any help with this would be appreciated; thank you.
| −−
| Dave Typinski

It cannot hit the gun if the gun recoils, which it will by Newton's third law.
Perhaps this is a better way, it gets over the atmosphere problem:
http://video.google.co.uk/videoplay?docid=2995709441588134017

However, there is another consideration (or more).
1) The planet or moon will turn beneath the orbit, so that will move the gun away but 3 orbits later a mountain replaces the gun. Better start from the top of the highest peak.
2) Another body:
http://faculty.ifmo.ru/butikov/Projects/Collection.html

There is no solution to the three body problem.

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