HYPERBOLIC ORBITS

(November 2021)

I invite you to have a closer look at the current NASA "*planetary defense mission*" to the Didymos asteroid, which has been reported to great fanfare.

NASA has just launched a probe designed to crash onto the asteroid, in the hope that its speed will be altered enough to deviate its trajectory.

Despite all the media hype, the NASA engineers themselves, all rather junior, are at a loss to explain exactly what will happen.

The reality is that the probe they just launched has a mass of 500 kg only, which is of the order of one billionth part of that of the asteroid, and its speed, relative to that of the asteroid, will be about one sixth. Since kinetic energy goes like the mass and the square of the speed, the probe's kinetic energy with respect to that of the asteroid will be 1 for 40 billion (with a b).

The media reports that after impact the asteroid's speed will be altered by 0.4 mm per second, which needs to be compared with the asteroid's initial speed at the point of impact of the order of 35,000,000,000 mm per second (35 billion mm per second). The ratio is therefore of the order of 100 billion.

Not only do they all claim quite excitedly that the speed alteration would be enough to deflect the asteroid from a collision course if it were aimed at Earth, but in addition it appears that the speed alteration could in fact not exceed 0.01 mm per second rather than 0.4.

A 0.4 mm per second speed alteration would probably require a 40 ton probe instead of the current 0.5. That was the payload of Saturn V, the largest rocket ever built, which was used to launch men to the moon and back 50 years ago.

Simple trigonometry would show you that since the distance to Earth at the time of impact will be 11 million kilometers, which is less than 1,750 times Earth's radius, the 100 billion speed ratio is unlikely to have any effect. Furthermore, it seems the real ratio would rather be 4 trillion.

They would tell you that the purpose of the impact is to alter the asteroid's orbit, and in fact the more than 2 year period of revolution would only be altered by 0.15 second (the media reports 70 seconds, still a very minute value), while the asteroid's closest distance to Sun would be altered by 0.75 km from the current value of 152 million.

What seems to happen is that NASA, which despite its remarkable history has had not much serious fish to fry in decades, is spending relatively small amounts of money on projects which she entrusts to the care of relatively junior teams, but feels an obligation to brag about unimportant, even useless, projects. On top of that, the general purpose media, which seems

not to be conversant with any scientific issue, amplifies the news after understandably distorting information.

It is not so much that the media is fake, and I don't think it generally would be on purpose, it is rather that the general purpose media is ignorant of the issues it reports, with little incentive to publish uninteresting information as uninteresting, since it is only the sensational that sells copies. After all, news that the Emperor cheated on his wife last night would sell considerably more copies than news that he spent one more night in his wife's bed.

I am not referring here to the specialized professional press, which is tentatively held to a much higher technical standard.

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