Deflecting an Asteroid

Team 452

Problem A

**Abstract**

There are innumerable asteroids in this galaxy and in our solar system there are countless asteroids that are usually detached from the asteroid belt and float in space. A planet's gravity leaves a chance for asteroids to hit that planet. In this paper we have tried to find a mathematical solution for deflecting an asteroid that could hit the Earth by a spacecraft at the right time. For this we have used different types of mathematical equations and theory including Kepler theorem, different mathematical equations of deflection, orbital equation etc. Finally, we used these to calculate the impact time of the asteroid from the lower earth orbit and the impact time from an estimated distance to the earth, and from this we determined the time that the asteroid would deflect before the spacecraft hit the earth.

**1 Notations Used**

|  |  |  |
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| **Symbol** | **Meaning** | **Numerical Value** |
| μ | Standard Gravitational Parameter | 3.986004418×1014 m3s-2 |
| rperigee | Perigee Radius of Earth |  |
| h | Angular Momentum |  |
| R | Earth Radius | 6378 km |
| Mn | Mean Anomaly |  |
| v | Speed of Asteroid |  |

**2 Problem Analysis**

In this problem we are given a situation where an asteroid can hit the Earth's surface with a velocity of 25 km/s. But we have placed a spacecraft in our lower earth orbit that can deflect the asteroid so that the asteroid doesn't hit the earth but passes by. In this case, it is said that the diameter of the asteroid is 100 meters and the mass of the spacecraft we are using to deflect it is 2000 kg.

**3 Introduction**

Asteroids of various sizes have hit our Earth at various times over thousands of years. Because of this, the world has had a catastrophic impact every time. It cannot be ruled out that this is unlikely to happen in the future. About 65 million years ago, a large asteroid hit the Earth and the dinosaurs disappeared from the Earth. The impact of this injury was many more years.

Whether an asteroid will hit Earth depends on several factors. One such is the size of the asteroid. Small asteroids often enter our Earth's atmosphere, most of which burn up in the atmosphere before reaching the surface. Again, some small pieces reach the surface of the earth which are collected and used in various research. However, the probability of a large impact is less than the probability of a small asteroid impact. According to scientists, such a possibility occurs once every 300,000 years. Scientists have found out that the last time around 65 million years ago, the Earth was hit by a large asteroid, which caused the temperature of the whole Earth to rise, and the Earth faced an apocalyptic situation.