

Foreword

Back in 1967, when the world was first learning that asteroids can pose a hazard to the Earth, MIT students were challenged with a fictitious “what if” scenario of an asteroid named Icarus on a collision course with Earth. The outcome of their study, called **Project Icarus**, became a book and a movie titled “Meteor” starring Sean Connery and Natalie wood. The movie didn’t do so well.

On April 13th, 2029, a Friday, an actual asteroid close encounter is going to happen. The object is 350 meters across, the size of an aircraft carrier, with a mass of 20 million metric tons. This 2029 asteroid close encounter is science fact, not science fiction.

We can say for certain the asteroid **will miss the Earth** as it passes by less than 6 Earth radii away. That’s less than 1/10th the distance to the Moon, and passing inside the belt of our geosynchronous satellites. An object this size passes this close about once per 1000 years. As the asteroid passes by, it will be visible to the naked eye in the nighttime sky.

So we do know the asteroid is going to miss. What we don’t know is what the outcome will be of Earth’s gravitational forces and tidal stresses on the asteroid. This will depend on the composition and internal construction of the asteroid, something that has never yet been measured for such a potentially hazardous object. Thus this close encounter provides a once-per-thousand year natural experiment to reveal the internal structure of a hazardous asteroid. Scientifically this is fascinating, but this is also something that might be essential to understand in the unlikely but not impossible event that an actual asteroid impact someday appears in the forecast.

The point we emphasize is that this 2029 asteroid encounter is real. Nature is doing this once-per-thousand year experiment for us. All we have to do is figure out how to watch. Thus, the real challenge and the Charge given to MIT students in *12.43 / 16.83 Space Systems Engineering* is to figure out how to do it, and show the spacefaring world the path forward that it can be done.

The asteroid’s name is Apophis. This is MIT Project Apophis.

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