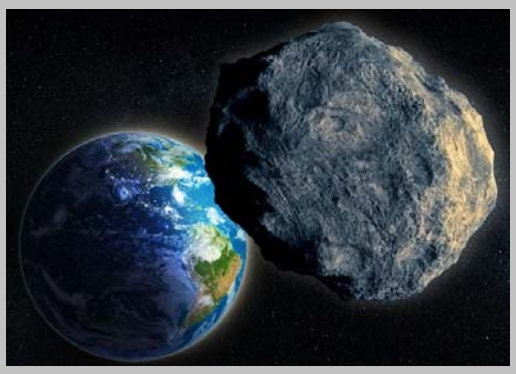
Will planet earth escape asteroid hit?



It looks like the earth would get away this time, says S.Ananthanarayanan.

2011 AG5 is the name of an asteroid, a 140 metre piece of rock that is in orbit around the sun and which astronomers think could collide with the earth in the year 2040. AG5 is one of 8,744 (as of Feb 2012) solar system objects that come reasonably close to the sun, which is within 1.3 times the earth-sun distance, and present the possibility of a collision with the earth. And the first estimates of the path of AG5 suggested that this one was headed dangerously earth-wards. There has hence been great interest in working out its trajectory with certainty. But a team at Hawaii's Institute of Astronomy has just announced that AG5 would miss the earth by a safe margin.

Near Earth Objects

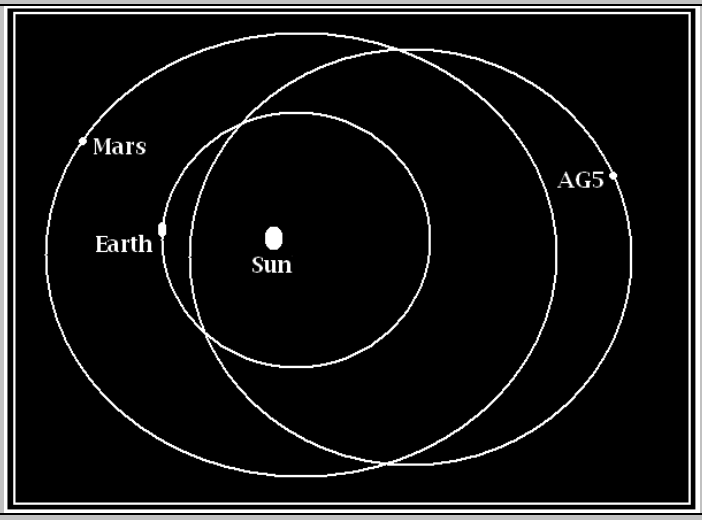
Near Earth Objects (NEOs) include asteroids, comet and meteoroids. Asteroids are rocky and irregular objects, which do not have the spherical shape of a planet and are usually quite small. There are millions of asteroids, mostly orbiting the sun in a belt, ***in the inner solar system***, between the orbits of Mars and Jupiter. But occasional ones have been pulled out of this orbit and approach the sun, in an elongated orbit. Comets are similar rocky objects, but they are distinguished by ***ice in their composition***. Their origin is in the ***outer solar system*** and they have periods of orbit that can range from a few years to thousands of years. And their characteristic is that when they are near the sun, the ice that they contain melts and forms a thin atmosphere, the ***coma***, and the pressure of the light from the sun sometimes '*blows back*' some of the coma which shows itself as a *tail*. And as for meteoroids, these are small pieces of rock that enter the earth's atmosphere and usually burn out before they reach the ground.

As orbiting NEOs have different periods, the relative position of the earth and the object changes at every visit and it is possible that over a large number of visits, there may be a collision. But given the very small size of the objects and the earth, compared to the distances that they travel, or even the earth's orbit, the likelihood of this happening is very small. But there is evidence that large objects have crashed into the earth, obviously with cataclysmic results. The earth is pock-marked with craters that have arisen from

impact of large asteroids and the extinction of the dinosaurs is believed to be because of the long chill that followed one such event, which raised a cloud that enveloped the earth for millennia.

2011 AG5

2011 AG5 was discovered in Jan 2011 and the danger of a collision was described provisionally as '1' in the '1 to 10' ***Torino Impact Hazard Scale***. This represents a very low level of ***Impact Hazard*** but is alarming nevertheless, given the consequences. At the time of its discovery and even till the present, the position of the asteroid is in the direction of the sun and one can observe the asteroid, distant and tiny as it is, only during a few minutes of twilight. It is in 2013 that it would move sufficiently away from the sun,



for clear, night-time view, when its co-ordinates could be fixed more exactly. The data available so far indicates that AG5 would pass 1.6 million km from the earth in 2023 and 16.7 million km from the earth in 2028. But during the pass in 2040, it was felt that there is a possibility of the paths intersecting, although the chance that this would happen is only 1 in 625.

In the US, NASA has the task of cataloguing and monitoring NEOs that present any significant danger, and the programme of observation, using both ground-based and space-based telescopes, is called ***spaceguard***. While NASA has been waiting for better data to be sure about AG5, other scientists view the current data with great concern. Russian scientists, in fact, have called for an '***earth defense network'*** of space capable nations to be set up immediately. Asteroid threat dominated the Vienna conference of the 49th session of the Scientific and Technical Subcommittee of the United Nations Committee on the Peaceful Uses of Outer Space, in June 2012.

But NASA has just announce, based on data collected at the ***Gemini North telescope*** on Mauna Kea, Hawaii, that AG5 would no, in fact, actually cross the earth's path and this conclusion is 60 times more reliable than previous estimates. The Impact Hazard has been brought down to '0' on the Torino scale, which represents 'no significant risk'. The observations used Gemini's ***Multi-Object Image Spectrograph*** and "were extremely difficult observations of a very faint object," said team-member Richard Wainscoat. "We were surprised by how easily the Gemini telescope was able to recover such a faint asteroid so low in the sky." The increased reliability of the results has come from the mass of data, based on increased sampling points, that has been possible, thanks to the scheduling flexibility and facilities in the Gemini observatory.

According to a press release issued by Jet Propulsion Laboratory, Pasadena, the experience gained in the current study and the contingency deflection analysis conducted has demonstrated that astronomers, using NSF and NASA facilities, are well poised to detect and predict the trajectories of Earth-threatening asteroids in the future.

Deflecting asteroids

The course of action, if an asteroid is found to be heading for a collision, would be to send spacecraft out to the asteroid, months ahead of the expec6ted collision, to place nuclear charges on its surface. The explosions would then deflect the path of the asteroid. Alternatively, a smaller asteroid could be smashed so that the debris consists of smaller segments that would be burned in the atmosphere before they reach the ground.

Small targets are difficult to hit

The great security of the vastness of space is that collisions are exceedingly rare and unlikely events. There is a story of how a marksman's coach converted a player's legendary inability to be on target into a circus act.

The marksman was any sporting coach's despair. In football, his strike would be a goal-length off target. In basketball, he would miss the basket by half the court. In archery, it was anybody's guess where the arrow would fly. The target is the safest place to be, someone quipped.

It was this wisecrack that gave the coach the idea. He strapped a lady model to a rotating disk and put her on the stage. Our hero, the marksman, was given a sheaf of a hundred sharp daggers and he was asked to fling them at the rotating lady. True to form, every single dagger missed the young woman, carving out the outline of her figure on the board - to the gasping wonder-ment of spectators and the great relief of the model

Asteroid hits are statistically expected about once in 10,000 years. The consequence of a strike could be extinction of life forms or at least of dominant species. A successful species should hence devise methods of surviving asteroid hits. The dinosaurs ranged the earth for 160 million years and could be considered to be the most successful species so far. But they had no ways to escape the great asteroid or meteor event of 66 million years ago that wiped them out. In contrast, humans have been around for less than a million years. But we have developed strategies that could save us from similar fate. This ability

has developed, in fact, only in the last 50 years, and if we are already thinking of putting it to use, we are acting in time!

Collision course

At interview for the post of station master

Q: What would you do if two express trains were rushing to each other on the same track"

Ans: I would set the signals to danger.

Q: And if the signals did not work?

A: I would switch off the overhead power

Q: And if the circuit breaker failed?

A: I would rush to the village and fetch my uncle, Shri Ramaswami.

Q(flabberegasted): And what would Shri Ramaswami do?

A: Nothing sir, but he has never seen a train crash.