Centre for Air Power Studies (CAPS)

Forum for National Security Studies (FNSS)

CAPS FELLOW SEMINAR RAPPORTEUR'S REPORT

NEAR EARTH ASTEROID DEFENCE: NEED, ORGANISATION AND LEGAL OPTIONS

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Wg Cdr KK Nair, made an interesting presentation on "Near Earth Asteroid Defence: Need, Organisation and Legal options". Most of the asteroids that might pose threat to Earth would be from the asteroid belt which lies between Mars and Jupiter. Comets on the other hand come from even longer distances, from Oort cloud some 50,000 Astronomical Units (AU) or Kuiper belt 30-100 AU away. These asteroids are primarily composed of metals like iron, nickel and even rare minerals like iridium, silica and platinum, etc. Comets which come from longer distances are composed of ice and dust which is why they develop a tail as they approach the sun as the ice sublimates which is ejected along with dust particles.

The four prime major asteroid impact events are - KT Event, Tunguska Event, Dhajala, India and Chelyabinsk. The KT which happened several million years ago was the reason for the extinction of dinosaurs. The 20 km long asteroid created a crater in Mexico and left traces of Iridium, which is a

non-earth metal. Such events happen once in several million years. Hence the immediate danger is from asteroids that crosses earth's orbit at closer intervals such as the one that impacted Tunguska in the year 1908. The estimated energy of the impact was equivalent to a nuclear airburst with a yield of around 10,000 to 15000 KT. Out of the impact energy of $3x10^{23}$ ergs $5x10^{18}$ ergs was converted into seismic energy which measured 5.0 on the Richter scale.

The next major event in India was on 28 January 1976 known as the Dhajala Shower. Some 500 stone fragments rained down in a 250 km span from Ahmedabad to Bhavnagar. It was estimated that out of the one tonne mass that approached Earth, around 900 kg evaporated during atmospheric entry and some 60 kg fragmented. The important aspect to notice here is the velocity of the meteors which was estimated to be from 20 to 25 km/sec. The fourth incident happened as recently as 15 February 2013 where the asteroid travelling at a velocity of 20 km/sec impacted Chelyabinsk, a place in Russia which caused damages worth millions of dollars. The approaching asteroid was not detected in advance and all data and analysis came only after the surprise impact. Russia started some kind of asteroid defence system after the Chelyabinsk event.

The rare occurrence of an asteroid impact on Earth is the primary reason behind the lack of sufficient attention to the defence and proper preparation to deal with such an event. Compared to large asteroid impacts which are very rare events, smaller asteroids which are less than 30 meters are the immediate threat as the frequency of such an event is high. Further, due to the rapid trend of increasing mega cities and large scale migration of population from rural to urban areas, the potential damage that could be caused by an asteroid strike on these high population density areas would be very high.

The primary challenge in asteroid defence would be the detection of small asteroids approaching Earth as most of these asteroids have not been identified. Despite a tenfold increase in financial allocation to detect asteroids measuring smaller than 140 meters, NASA is still nowhere close to

identifying 90% of the near Earth asteroids. One recent example of an undetected asteroid impacting Earth is the Chelyabinsk incident.

Asteroid detection and mitigation should be a global effort given the common threat it poses. There should be an international law identifying it as a common threat and calling for collective security in dealing with the threat. Further, certain institutes of United Nations like International Asteroid Warning Network (IAWN) and Space Mission Planning Advisory Group (SMPAG) need to be nurtured. Further, asteroid mining is one key area that is likely to be given sufficient attention in future as asteroids have of valuable metals like Iridium, platinum, diamond, etc. It is important that an advanced space faring nation like India be a member SMPAG.

In the discussion that followed, the key points that emerged were:-

- The key is to create the necessity in the psyche of the countries to have some defensive mechanisms to defend against asteroids.

- There are other organisations as well like Emergency Asteroid Defence Project (EADP, B612), which is assisting NASA, and the UN organisations.

- Regarding the legal aspects, provisions do exist within the UN charter to ensure that the efforts towards asteroid defence are not seen as weaponisation of space.

Some of the important points that came out during the Q&A sessions are,

1. Jupiter offers incidental protection to Earth by attracting the asteroids moving towards the Earth towards itself.

2. Asteroid is a common threat and hence the issue should not be brought into the question of weaponisation of space.

(Disclaimer: The views and opinions expressed in this report are those of the speakersr and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

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