Preventing Asteroid Hit with HAMMER

Why in news?

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US scientists have conceptualised the HAMMER to deal with asteroids heading for earth.

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What is the need?

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- Few years back, Stephen Hawking warned of one of the major threats to intelligent life in the universe.
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- It is the high probability of an asteroid colliding with inhabited planets.
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- If these bodies impact Earth, they can cause regional damage across a whole country or even a continent.
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- In response, scientists are looking at possible ways to ward off the threat, if and when it comes.
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- The chance of an impact appears slim now, but the consequences would be dire.
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- The studies thus aim to help shorten the response timeline when the threat is evident, so as to have more options to deflect it.
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What are the possible ways of dealing with it?

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- Scientists are looking at two possible ways to ward off the threat.
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- One is to "nudge" the asteroid off its Earthbound course.
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- The idea is to give a small push that is needed to change the asteroid's course and save the planet.
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- The second one is the nuclear option.
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- The idea is to blow the asteroid into pieces, most of which will miss the Earth or burn up in the atmosphere.
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- Two new studies have sought to assess the practicability of the two approaches and choosing the better between the two.
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What is the HAMMER?

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- **Mission** - HAMMER is the short for Hypervelocity Asteroid Mitigation Mission for Emergency Response vehicle.
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- HAMMER is a spacecraft designed to serve as either a kinetic impactor or as a transport vehicle for a nuclear device.
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- It can deflect an asteroid by nudging i.e. a device (a battering ram) is used to apply force to cause deflection.
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- The US team evaluated how effective HAMMER would be in nudging away the asteroid Bennu.
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- **Bennu** - Bennu is a 500 m wide and 79 billion kg asteroid.
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- It has a 1-in-2,700 chance of striking the Earth on September 25, 2135.

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- If it does, the energy released would be equivalent to 1,200 megatonnes or 80,000 times the energy of the Hiroshima bomb.
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- **Launches** - Delta IV Heavy rocket is the world's second highest-capacity launch vehicle.
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- If launched from the Delta IV Heavy rocket 10 years before the impact, HAMMER would take between 34 and 53 launches of the rocket.
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- Each of the launches would carry a single HAMMER impactor, to make a Bennu-class asteroid miss Earth.
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- If launched 25 years in advance, it would still need 7 to 11 launches.
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- The spacecraft, on the other hand, can carry a nuclear device to the object, to cause detonation to deflect the object.
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Why is the nuclear option more viable?

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- Nudging an asteroid is the preferred option, because blasting it entails the risk of fragments crashing into Earth.
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- If the object were smaller (say 100 m) or the time to impact were greater (say 100 years), a kinetic impactor may provide a better result.
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- But using a single HAMMER spacecraft as a battering ram would prove inadequate for deflecting an object like Bennu.
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- The spacecraft capabilities make the nuclear option more viable against a large asteroid within a limited response time.
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- The nuclear option is also the only viable option for launches 10-25 years before impact.
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What is the Russian research on this?

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- Russian scientists, have made toy asteroids, and blasted them with a laser pulse.
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- They then estimated the size of the nuclear explosion that would be required to blow up an actual asteroid.
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- Notably, to eliminate a rocky asteroid 200 m wide, the bomb needs to deliver the energy equivalent of 3 megatonnes of TNT (trinitrotoluene, an explosive chemical compound).
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- This is 200 times the TNT equivalent of Little Boy (15 kilotonnes), the atomic bomb that exploded in Hiroshima in 1945.
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Source: Indian Express, The Hindu

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