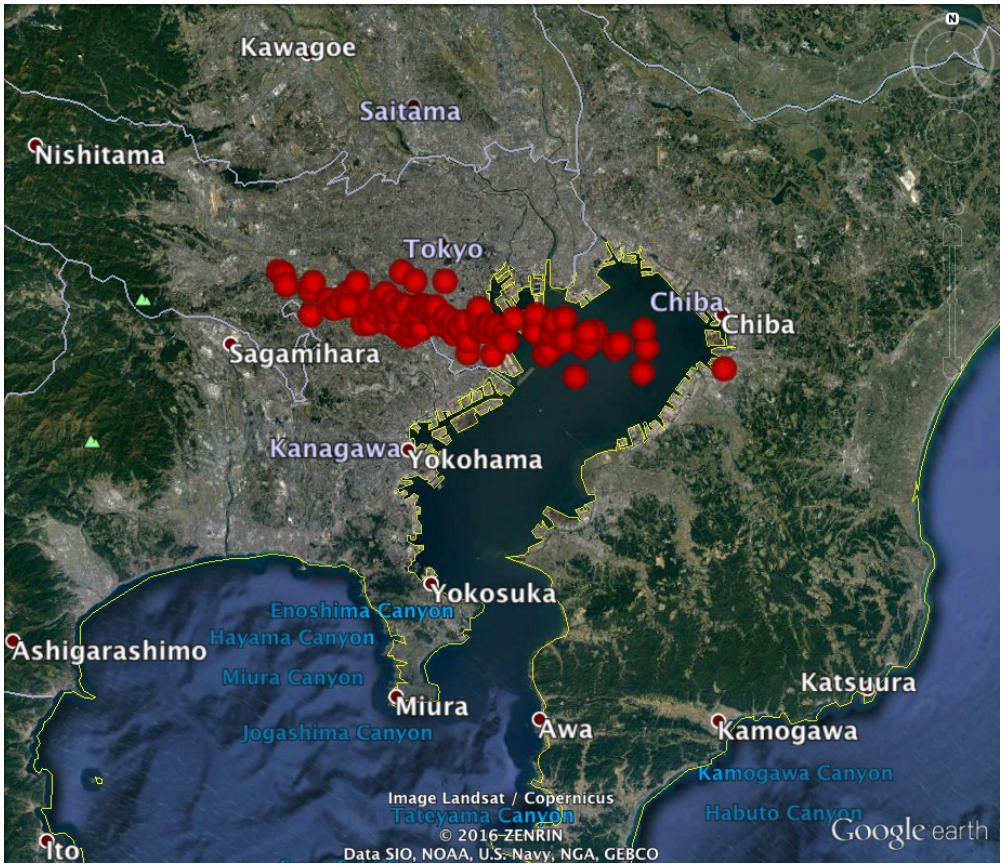
# DAY 3

## PRESS RELEASE: MAY 15, 2020

## ASTEROID 2017 PDC DISCOVERED TO BE BINARY AND CONFIRMED TO BE HEADED FOR IMPACT NEAR TOKYO, SIX SPACECRAFT ON THE WAY TO DEFLECT IT

The first of a series of space missions flew by the threatening asteroid 2017 PDC today, and took up-close images that revealed the asteroid to be a binary: a primary body about 270 meters (900 feet) in size with a roughly 100-meter (330-foot) moon orbiting around it. The images also provided key data on the asteroid's trajectory, and the International Asteroid Warning Network (IAWN) has concluded that 2017 PDC is headed for impact near Tokyo, Japan, on July 21, 2027. Unless it is deflected, IAWN predicts that the asteroid will impact somewhere within the region outlined by the red dots below.




Over the last two years, the Space Missions Planning Advisory Group (SMPAG) has been very active in coordinating an international response to the impact threat posed by 2017 PDC. The fast flyby spacecraft that just arrived at the asteroid was only the first of an armada of spacecraft launched towards this object. Attempts were made to construct eight Kinetic Impactor (KI) spacecraft, but only six of them are ready for launch. The six

KI spacecraft were launched over a 3-week period beginning two months ago on trajectories to intercept the asteroid in February 2024, around the time that it will be closest to the Sun. One of the launches failed, leaving a total of five spacecraft headed towards the asteroid. The KI spacecraft will crash into the asteroid at high velocity, one at a time, and separated by several days. Each KI impact will impart a small velocity change to the asteroid. The cumulative effect of multiple KI impacts is designed to deflect the asteroid off of its collision course by boosting the asteroid's speed around the Sun, thereby moving the asteroid's trajectory eastwards in 2027. An additional set of Kinetic Impactors was under development for moving the asteroid trajectory westwards, but the change to the asteroid's orbit necessary to prevent impact altogether was much larger in that direction and could have inadvertently moved the impact point to one of several other countries; the westwards deflection plan was therefore abandoned.

The fact that 2017 PDC is binary has added an unanticipated complication to the deflection campaign. The orbital radius of 2017 PDC's moon (the "secondary") is 1 to 2 kilometers, considerably larger than expected for asteroid binaries in this size range. The implication is that the secondary is only loosely bound gravitationally to the primary. While any deflection applied to the primary component will certainly affect the orbit of the secondary through their mutual gravitational attraction, there is a chance that the secondary could escape the system and continue on its own trajectory.

The sequence of approach images from the flyby spacecraft has provided enough data for IAWN to estimate an approximate orbital period for the secondary, which is on the order of a few days. This result allows scientists to obtain an approximate estimate of the mass of the primary body, an unexpected benefit from the flyby mission. The mass of the primary is a key determinant of the amount of deflection each of the KI spacecraft will produce. Together with an approximate shape model produced from the flyby images, and a resulting volume estimate, scientists have concluded that the density of 2017 PDC is about 20% higher than assumed previously. The important result from this analysis is that, in the worst case, a successful deflection is required from all five kinetic impactors in order to divert 2017 PDC from colliding with tour planet.

Two spacecraft have been prepared for launch next month on a mission to rendezvous with 2017 PDC in May, 2023, three years from now. Decision-makers discussed whether to install nuclear devices on the rendezvous spacecraft and decided not to do so. However, the rendezvous spacecraft were still designed and built to be capable of carrying nuclear devices. Those spacecraft will arrive in time to observe the series of kinetic impactor deflections scheduled for February 2024, and the data sent back will be invaluable in assessing the results of the deflection and establishing new trajectories for both components of the binary asteroid.

---

For more information, visit: **https://cneos.jpl.nasa.gov/pd/cs/pdc17/day3.html**.