

Recommendation to perform a demonstration of a rapidly deployable flyby or rendezvous mission to collect critical information on a threatening asteroid or comet

Should IAWN issue an alert of an asteroid or comet with a recognized risk of impacting Earth, the success of any subsequent effort to deflect or otherwise mitigate the threat will depend on accurate and precise information on the object's orbit and its physical properties. Accurate and precise information on the object's orbit will enable reliable predictions on the probability of impact and, the areas of Earth that might be affected. In addition to orbital parameters, basic information on the object's physical and dynamical properties, such as mass, shape, size, composition, and rotation state, could be critical for the design of a mitigation mission. Accurate information on the shape, size and structure would facilitate successful implementation of a deflection mission. A threatening object might also be a multiple body system (having one or several moons). Information to confirm or eliminate this possibility could directly affect the overall success of a mitigation campaign.

Should ground-based information not be sufficient, in the case of a short-warning time, a rapidly deployable flyby mission could provide information on physical properties and the existence of any accompanying object (s). In the case of a longer warning time, a rendezvous mission, if possible, would refine the object's physical characteristics, such as mass and composition, and the existence of any accompanying object(s). All this information would increase the likelihood of a successful mitigation campaign.

It is expected that a near-Earth object (NEO) characterization mission could be adequately performed by relatively small and inexpensive spacecraft with limited payloads. However, the feasibility of development and operation of such a NEO reconnaissance mission and the information that can be obtained must be demonstrated. For these reasons, the Space Mission Planning Advisory Group (SMPAG) recommends that small-scale NEO flyby or rendezvous demonstration missions be performed to test and verify our ability to characterize a potential impactor when needed.