

## **Kinetic Precision Effects Abstract**

The *Kinetic Precision Effects* study was chartered to explore technological barriers to, and potential solutions for, the development of precision kinetic munitions, and to provide an assessment of the current technology and technology trends in advanced guidance, energetic materials, sensing, fuzing, effects assessment, and systems approaches for the development of such weapons. The evolution of Air Force weapons toward smaller precision warheads holds the promise of providing the warfighter with improved accuracy, precision effects delivery, and reduction of collateral damage and fratricide. The development and fielding of advanced highly precise kinetic weapons present numerous technological challenges. This SAB Study sought to identify key technology solutions that will allow the Air Force to best meet the challenges it faces in employing small precision weapons, which are anticipated to provide its near-, mid- and far-term capabilities.

In the course of this Study, the panel's work was enabled by the high quality briefings from a broad range of entities involved with the development of advanced precision munitions. The panel received briefings from groups associated with eight companies doing R&D relevant to small precision munitions. The Study heard from the Air Force Research Laboratory (RD, RW, RX, RY, and AFOSR), several Army and Navy components, and DARPA—all of which have organized important munition technology development activities. The Study benefited from hearing from DTRA and AAC that have expertise in the development of munitions systems. FFRDCs provided key briefings in GPS, sensing technologies, advanced energetic materials, and emerging kinetic weapons concepts. The panel made fact finding visits to AFSOC at Eglin AFB, ACC at Langley AFB, STRATCOM at Offutt AFB, and the 53rd Test and Evaluation Group at Nellis AFB, NV during which the panel talked with operators and maintainers involved with several key weapons systems. The perspective from warfighter and other government organizations was critical to the Study's overall understanding of the challenges and opportunities of small kinetic weapons.

The Study finds that no energetic material is on the horizon that will increase the energy potential of small weapons to be equivalent to that of large inventory munitions. However, there are novel concepts to enhance energy coupling to targets to enhance lethality. The Study determined that the Air Force should carefully examine alternatives to the use of GPS, when degraded, for munition guidance to a target. The Study spent considerable time exploring means to achieve precision effects given the range of TLE and CEP for various systems. The Study examined the modular integration of the guidance, navigation, sensor, ordnance, and fuzing systems, and the ability to assess effects from smaller weapons that will generally have subtler effects than larger weapons. For small weapons to be effectively deployed, a host of challenging requirements need to be addressed to enable the munition to get closer to the target, have increased efficiency in coupling energy to the target, and operate against countermeasures. The Air Force must improve Mission and Planning tools, including the JWS, to include additional information to predict and assess the effectiveness of small munitions, and must develop an ability to detect potentially elusive signatures for weapon targeting and assessment.