USAF Scientific Advisory Board Study
Technology Readiness for Hypersonic Vehicles

Study Abstract

Recent successful hypersonic technology demonstration efforts and an increasing focus on access to denied airspace have renewed interest in pursuing hypersonic weapon systems. This study examined the potential military utility of hypersonic technology to help the Air Force characterize the maturity (current and projected) of the applicable enabling technologies, identify overall system concepts, develop confidence in the requisite aerodynamics, propulsion, structures, materials, and flight control technologies for the vehicle, address the sensors, communications, and other auxiliary sub-systems needed for the overall concept, and effectively integrate all those technologies. The Study Team gathered data from across the US Air Force operational, research, and test communities and elsewhere in the Department of Defense as well as from the Intelligence Community and Industry.

Based on the present state of hypersonic technology readiness and DoD plans for further advancement of these capabilities, the Study found that an air-launched tactical range hypersonic strike weapon has substantial operational utility in projected anti-access/area denial (A2/AD) environments and can be fielded for use in the 2025 timeframe. Specifically:

1. Tactical-range hypersonic weapons provide key A2/AD strike capabilities that place defensive challenges on any potential adversary.
2. Hypersonic technology research/demonstration efforts over the past 10 years have advanced many core vehicle technologies to Technology Readiness Level (TRL) 5+ and current technology maturation efforts and flight demonstrations are structured to bring remaining critical weapons subsystems to TRL 6+ by 2020.
3. Terminal seeker and seeker integration are the highest priority technology maturation aspects of hypersonic weapon advancement.
4. Sustainment and planned enhancements of current hypersonic propulsion ground test facilities (i.e., the NASA 8-foot High Temperature Tunnel (HTT) and Arnold Engineering Development Center (AEDC) Aerodynamic and Propulsion Test Unit (APTU)) are required to support advancing hypersonic weapon systems to TRL 6 by 2020.
5. High terminal speed provides pathways to enhanced weapon lethality and can also enable new target lethality mechanisms beyond those of conventional blast-fragmentation warheads.
6. Current technology readiness does not support development and fielding of a hypersonic intelligence, surveillance, and reconnaissance aircraft before 2035 at the earliest.

The SAB THV Study Panel recommended that the Air Force should:

1. Make the investments needed to close the remaining technical gaps for hypersonic tactical strike weapons to ensure all critical sub-systems reach TRL 6 no later than 2020 with a focus on seeker/seeker integration, terminal guidance and maneuverability, and aero-shell materials for hypersonic boost glide concepts.
2. Operate both existing weapons-scale ground-test propulsion facilities (i.e., continue NASA 8-ft HTT availability, execute AEDC APTU clean air heater and extended run

upgrades) to ensure availability through 2020 for two competitive hypersonic cruise missile efforts.

3. Explore enhanced target lethality munitions concepts that leverage the high-terminal velocity of hypersonic strike weapons.
4. Develop the technology-related acquisition support infrastructure (e.g., establish a hypersonic weapon Capability Collaboration Team, mature cost models/cost basis for hypersonic strike weapon concepts, and assess military utility and concepts of employment) to enable potential requirements definition and to create a common understanding of intended operational uses of hypersonic tactical strike weapons.
5. Relative to hypersonic aircraft for intelligence, surveillance, and reconnaissance the AF should sustain current level of technology investments to prepare for potential future military utility.