



SECRETARY OF THE AIR FORCE
WASHINGTON

**USAF
Advisory**
2016 Quick Look
January 2016

**Scientific
Board**
Study, Beginning

Directed Energy Maturity for Airborne Applications
Terms of Reference

Background

Recent DOD demonstrations indicate that directed energy (DE) technologies, especially solid-state laser, millimeter-wave, and microwave systems, are approaching a level of maturity that airborne applications could be viable for development and fielding. For example, the Active Denial System is a non-lethal millimeter-wave technology that has been demonstrated for ground use and could potentially be suited for certain airborne applications such as nuclear convoy protection or special operations missions. A second example is solid-state laser technology, for which recent demonstrations have shown advances in both fiber-optic and slab laser performance. To date lasers have been fielded as countermeasures on air platforms to defeat missile sensors (mission kill), but key technologies may have advanced sufficiently to enable demonstration of a hard kill self-defense capability on airborne platforms ranging in size from transport aircraft to fighters. Applications of airborne directed energy require consideration of size, weight, power, thermal management, concepts of employment, potential countermeasures, and other factors to assess their practical utility. To inform appropriate investments and demonstrations, an assessment is needed of current capabilities and limitations of airborne directed energy for such platforms and missions.

Charter

The study will:

- Identify Air Force missions and platforms that could be suited for laser, millimeter-wave or microwave-based DE capabilities. Characterize concepts of employment for each, including targets and desired effects, potential countermeasures, and criteria for effectiveness.
- Assess the current understanding of directed energy weapon effects against these classes of targets, including countermeasure effectiveness, and recommend testing needed to establish the knowledge base of airborne DE weapon effects.
- Determine the maturity of millimeter-wave, microwave, and solid-state laser-based directed energy for airborne self-defense or active attack, including power and thermal management, pointing and beam control, aperture integration, and other system-level considerations.
- Evaluate SWaP available for system integration on various classes of airborne platforms, and quantify any shortfalls relative to corresponding DE system SWaP requirements.
- Identify key research efforts needed to mature relevant technologies and their integration to enable airborne DE systems, and develop a roadmap and timeline for maturing these.
- Recommend critical milestones, integrated demonstrations, and potential opportunities for near, mid and far-term transitions.

Study Products

Briefing to SAF/OS & AF/CC in July 2016. Publish report in December 2016.