Ground-based Midcourse Defense Segment (GMDS) Exoatmospheric Kill Vehicle (EKV)

The Ballistic Missile Defense Organization completed a successful integrated system test of the Ground-based Midcourse Defense Segment program on July 14, 2001. This test, designated IFT-6, resulted in the second successful intercept of a ballistic missile target by the Raytheon EKV. The first successful test took place on October 2, 1999. Both tests were consummated over the central Pacific Ocean at altitudes above 140 miles. On both occasions, the EKV hit and destroyed its target at closing speeds in excess of 16,000 miles per hour.

Benefits

- Target selection made in presence of multiple decoys
- "Hit-to-kill" technology allows complete destruction of WMD
- Counters the threat in the exoatmosphere
- Payload consists of EKV and adaptor for booster mounting

The Raytheon kill vehicle represents a critical piece of the Ground-based Midcourse Defense Segment (GMDS) program. It is the intercept component of the Ground Based Interceptor (GBI) of a potential regional defense system. Its mission is to protect against a small-scale missile attack. Specifically, its niche in strategic defense is to engage high-speed ballistic missile warheads, otherwise known as reentry vehicles, in the midcourse or exoatmospheric phase of their trajectories and destroy them using only force of impact.

The Exoatmospheric Kill Vehicle (EKV) consists of an infrared seeker in a flight package used to detect and discriminate the reentry vehicle from other objects. The "hit-to-kill" concept involves colliding with the incoming warhead, completely pulverizing it. This collision ensures complete destruction of a warhead carrying weapons of mass destruction – nuclear, biological or chemical and the means of delivery, such as mid-range and long-range ballistic missiles. Accidental or unauthorized attacks by nuclear-capable nations, or attacks by rogue nations represent a significant concern.

In addition to having an infrared seeker, the EKV has its own propulsion, communications, discrimination algorithms, guidance and control system, and computers to support target selection and intercept decisions in the final seconds, or end game, of its flight.

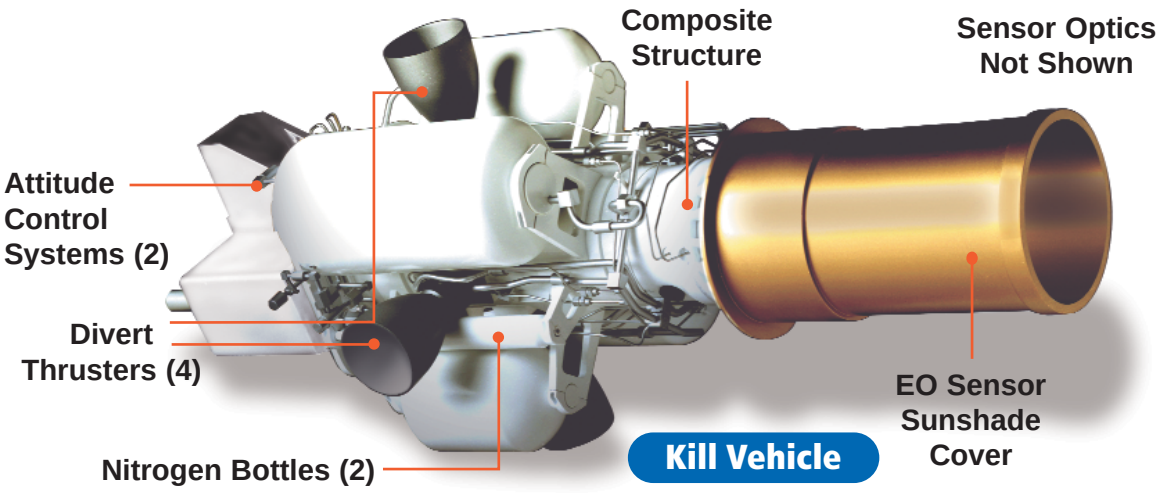
The EKV weighs approximately 128 pounds, is 55 inches in length and approximately 24 inches in diameter.

Successful EKV sensor tests conducted in 1997 and 1998 demonstrated the on-board sensor's performance in discriminating between the surrogate reentry vehicle from among penetration aids and decoys. The tests consisted of EKV sensor fly-bys of simulated missile warheads and decoys. Data was collected, transmitted to the ground, and used to exercise and refine target discrimination algorithms for future intercept tests. No intercepts were planned for these sensor flights.

The sensor tests represent key milestones as elements of risk mitigation prior to flying the total packaged EKV with both its Divert and Attitude Control System (DACS), which steers the EKV, and its on-board discriminating sensor, which includes a multiple-waveband infrared seeker which it uses to acquire and track targets. This seeker is comprised of focal plane arrays and a cryogenic cooling assembly attached to an optical telescope, supported by hardware and software processing.

The EKV is designed to withstand the rigors of the in-flight environment en route to performing its mission of locating and destroying its target using kinetic energy, or "hit-to-kill" technology.

In April 1998, BMDO awarded Boeing a long term contract to coordinate the entire missile defense effort. Boeing is the



GMDS (formerly known as National Missile Defense) program's prime contractor. As the prime contractor, Boeing is responsible for design, development, testing, and integration of the six GMDS elements into a viable system capable of defending a nation, state or region from a limited ballistic missile attack.

An EKV designed by the Raytheon Company has been selected for the intercept and discrimination tests. Selection was made by the Boeing Company and announced jointly by the BMDO and the NMD Joint Program Office on December 4, 1998.

The continued development and testing of a potential regional system will result in an extensive review to determine the practicality of deploying the system. The review will consider the technical maturity of the system elements, cost, and the current as well as the future ballistic missile threat. As a result of this review, the President will make a decision to deploy or to continue development and testing.

The regional system currently under development, will consist of Ground Based Radar along with a small number of Ground Based Interceptors, comprised of kill vehicles integrated with booster rocket motors. Space-based early warning satellites and ground-based upgraded early warning radars will detect hostile missile launches and provide guidance to ground stations. A battle management, command, control, and communication system will provide operational control.

Following the aforementioned successful integrated flight test conducted on July 14, 2001, test results have led to further improvements and refinements to the EKV. In-depth analyses have led to process improvements that have increased reliability for future launches. The EKV team continues its work with Boeing to provide kill vehicles for future tests.

Boeing oversees the work of the multi-contractor force developing the components of the GMDS. As a subcontractor, the Raytheon Company works for the prime contractor directly. Raytheon, which also develops Upgrades to Early Warning Radars (UEWRs) and the production X-Band Radar, receives oversight authority from the BMDO, and its GMDS Joint Program Office.

The GBI Project Management Office and Radar Project Management Office, both in Huntsville, Ala., are the cognizant oversight authorities for the major Raytheon pieces of the total system. Of note, the U.S. Air Force UEWR Project Management Office is located in Bedford, Mass., near the Air Force Electronic Systems Center at Hanscom Air Force Base.

Currently, missile defense technologies for intercepting incoming reentry vehicles in the mid-course of their trajectories promise to be able to offer protection against limited nuclear attacks on the United States.

It appears that current defense policy is focused responsibly and designed to protect an expanded regional area against already known threats. The Bush administration is responding to the Missile Defense Act of 1999 which states that America will deploy an effective missile defense system to protect all 50 states as soon as tecnologically possible.

EKV hardware together with the adapter assembly is pictured on the missile access stand at Meck Island in the Marshall Islands.