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FLIGHT TESTS FOR TERMINAL HIGH-ALTITUDE AREA DEFENSE (THAAD)

** The matrix below is a summary of the major flight tests of the THAAD upper tier terminal-phase missile defense system. The THAAD underwent serious developmental problems that it stopped its testing in 1999 and revamped itself entirely. New flight testing began in December 2005. Since its overhaul, THAAD has made an intercept in six out of eight flight test attempts. The latest flight test, FTT-10, was held on March 18, 2009, and resulted in an intercept. According to fiscal year (FY) 2009 budget justification documents, Missile Defense agency (MDA) plans on delivering the first THAAD fire unit between 2QFY09 and 4QFY10 (instead of 3QFY08 and 3QFY09, as had been planned in the previous year's budget request); it will be made up of 24 interceptors, 3 launchers, 1 THAAD radar, and 2 fire control and communications units. The second fire unit will be delivered between 3QFY10 and 4QFY11 (instead of 3QFY09 and 4QFY10, as had been planned in the previous year's budget request), and will have the same components as the first THAAD fire unit. The FY 2009 budget justification shows significant schedule delays, many of which are due to problems with its test targets.**

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| Flight Test # | Date | Intercept? | Notes |
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| FT-1 | April 21, 1995 | N/A | Propulsion test, no target. The first of 13 planned flight tests in the demonstration/validation phase of development; this and FT-2 were scheduled to be the only non-intercepts. |
| FT-2 | July 31, 1995 | N/A | Kill vehicle control test, no target. It was aborted because the missile was going too fast at burnout. To adjust to its high speed, the missile arced up, bringing it to a point where debris from its planned destruction at the end of the test would have landed outside the test range. This test was supposed to be a dry-run for FT-3, which was supposed to be an intercept attempt. At this point in time, it was expected that development, testing and production of THAAD would cost about \$10 billion and that it would be produced at the end of 1996. |
| FT-3 | Oct. 13, 1995 | N/A | Target fly-by. A Storm target was used to gather seeker data. EMD was expected to last four years and cost about \$1.2 billion to \$2 billion; it was thought then that only seven more tests were needed before an EMD decision could be made. |

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| FT-4 | Dec. 13, 1995 | No | Software error in avionics led to premature kill vehicle fuel consumption. A Storm target was used. |
| FT-5 | March 22, 1996 | No | Kill vehicle connector to booster failed at separation. It was the first test involving all components, including the palletized load system. |
| FT-6 | July 15, 1996 | No | Seeker electronics failure or dewar contamination led to saturation of one half of focal plane array. A Hera target was used. At that point, each THAAD test cost \$2 million. |
| FT-7 | March 6, 1997 | No | Kill vehicle battery interface connection was contaminated, preventing operation of DACS thrusters. This was the first test that the THAAD radar took part in. At that point, the User Operational Evaluation Systems (UOES) of THAAD was scheduled to be available by FY 99, while deployment of THAAD was to begin in 2004. |
| FT-8 | May 12, 1998 | No | Electrical short circuit due to foreign object debris in thrust vector control caused booster failure. Prior to the test, Pentagon officials tried to lower expectations by saying they would consider the test successful if the missile reached the endgame. Angry with the repeated failures, the Senate voted to cut the FY 99 funding authorization by \$253.9 million, reallocating the resources to black projects. This eliminated the rest of the money authorized in FY 99 to begin an EMD contract with Lockheed Martin. SASC had already cut \$70 million from the THAAD EMD authorization for that year. The House voted to make Lockheed Martin liable for future tests. |
| FT-9 | March 29, 1999 | No | Attitude control system nozzle was torn from its bracket. There were four failures: a maneuvering thruster malfunctioned, the thruster's combustion chamber overheated, the telemetry failed and the missile missed the target. The test was also to demonstrate the infrared indium antimonide (InSb) seeker, closed-loop system, and (for the first time) the user operational evaluation system radar performance against the unitary target. Lockheed Martin was penalized \$15 million for the miss. |
| FT-10 | June 10, 1999 | Yes | Intercept of Hera class unitary target within the aimpoint region (an area on the mock warhead). The interception occurred at an altitude of just under 60 miles with both target and interceptor traveling at just under 1 mile/sec. At this point, the goal was to field units by 2007. |
| FT-11 | Aug. 2, 1999 | Yes | Exoatmospheric intercept of Hera class separating target within the aimpoint region (again, an area on the mock warhead). After, the Pentagon decided to skip attempting a third interception before going into EMD (the contract was awarded June 30, 2000, for \$4 billion). If Lockheed Martin had not achieved an interception, it would have been fined \$20 million. |
| Block 2004 | 2004 or 2005 | N/A | THAAD had been scheduled to hold a total of four non-intercept exoatmospheric flight tests from 2004 to 2005. However, the explosions at the Pratt-Whitney propellant-mixing plant in the summer and fall of 2003 had a ripple effect on the program's |

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| | | | testing. The whole program has been moved to the right and is striving toward fielding two fire units to the Army later than anticipated. Hence, the tests have been renamed accordingly. |
| THAAD Flight Test (FTT)-01 | Nov. 22, 2005 | N/A | There was no target involved in this test: it was a component-level missile characterization flight. According to the Director of Operational Test & Evaluation's report for FY 2005, "This test successfully demonstrated missile egress, booster/KV separation, KV shroud separation, Divert and Attitude Control System operation, and KV control." Also, before this test was held, "MDA took a deliberate approach to pre-test qualification of the missile;" this "discovered and fixed several problems." The test slipped one quarter because, in the words of Army Col. Charles Driessnack, MDA's THAAD manager, "[T]echnical discoveries have delayed completion of interceptor qualification, integration and assembly." |
| FTT-02 (FT-2) | May 10, 2006 | N/A | MDA called this test "successful" in achieving all its objectives. A simulated target was "injected" into THAAD's radar, after which the rest of the system's components operated as they would normally. With a simulated target, when THAAD's missile seeker deployed, it didn't have a target to find. This also marked the first test that used electronic controls for the launcher: during the previous test, the launcher only was able to give mechanical support. |
| FTT-03 (FT-3) | July 12, 2006 | Yes | A unitary Hera target missile was used in this test, whose primary goal was seeker characterization in the high endo-atmosphere, just inside the Earth's atmosphere. While an intercept was not cited as the main objective of the test, one was achieved. This test, the first fully integrated flight test of the revamped THAAD system, had originally been scheduled for March 2006. |
| FTT-04 (FT-4) | Sept. 13, 2006 | No | FTT-04's primary objective was an intercept, but the test was stopped due to a faulty target., The unitary Hera target missile had to be destroyed by safety officers at the White Sands Missile Range (WSMR), N.M., two minutes after it was launched. The Hera missile may have had a panel give way before the first stage could complete burn out, causing the missile to veer off-track. The THAAD interceptor, scheduled to be launched five and a half minutes after the Hera missile, was thus not launched. According to Col. Charles Driessnack, THAAD project manager, data collection during the test makes them believe that the THAAD interceptor "wouldn't have had any difficulty engaging that target." As such, he says that "we're very confident in the system's performance." Originally this test was planned with a separating target, but later changed to use the unitary Hera target instead, which failed. |
| FTT-05 (FTT-04-01) | Planned June 2007 but cancelled | N/A | This non-intercept test originally had been scheduled to be held shortly after FTT-04. It was a missile characterization test – no intercept was to be attempted - and was designed to see how THAAD did in the lower atmosphere. After the failure of FTT-04, |

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| | | | this test was scrapped so that the overall THAAD test schedule wouldn't slip too much. |
| FTT-06 (FTT-06-1/FT-06) | Jan. 27, 2007 | Yes | The test resulted in the intercept of a "high endo-atmospheric" (just inside earth's atmosphere) unitary (non-separating) target representing a 'SCUD'-type ballistic missile." The target was launched from a naval platform positioned off the Hawaiian island of Kauai. Besides successfully launching the interceptor from the Pacific Missile Range Facility, other primary objectives included: "interceptor seeker characterization (target identification), discrimination and intercept of a non-separating liquid-fueled target; and collection of data including missile aimpoint, ground equipment and radar tracking/target discrimination and hit assessment algorithms, and evaluation of the missile launching procedures and equipment." |
| FTT-07 (FTT-06-2/FT-07) | April 6, 2007 | Yes | The test "involved the successful intercept of a 'mid endo-atmospheric' (inside earth's atmosphere) unitary (non-separating) target representing a 'SCUD'-type ballistic missile." The target launch procedure was very similar to that of FTT-06. The THAAD unit's command and control system also linked with a "simulated" AEGIS ship via a satellite link with the Navy's Space and Naval Warfare Systems Command in San Diego. Other completed objectives included "demonstrating the integration of the radar, launcher, fire control, communications and interceptor operations; interceptor seeker characterization (target identification); discrimination and intercept of a non-separating liquid-fueled target; and examining launch procedures and equipment." |
| FTT-08 (FTT-06-3/FT-08) | Oct. 27, 2007 | Yes | According to the FY 08 budget justification documents, FTT-08 was supposed to demonstrate "Exo Aim point selection & intercept" against a high aspect liquid-fueled target outside the atmosphere. During this test, a "threat-representative" short-range unitary target was intercepted outside the Earth's atmosphere. A ship off the coast of Hawaii fired the target missile, and minutes later, soldiers with the U.S. Army's 6th Air Defense Artillery Brigade in Kauai launched an interceptor missile that destroyed its target. According to DOT&E, "the missile was 'heat-conditioned' before the test to simulate operations in a hot environment." |
| FTT-09 (FTT-06-4/FT-09) | June 25, 2008 | Yes | According to an MDA press release, "This test involved the intercept of a separating target (mock warhead separated from the booster rockets) in the "midendoatmosphere" (inside the earth's atmosphere). The target, representing a threat ballistic missile, was launched from a U.S. Air Force C-17 aircraft flying over the Pacific Ocean at 4:16 p.m. Hawaiian Standard Time (10:16 p.m. EDT). Approximately six minutes later the interceptor missile was launched from a mobile THAAD launcher on the range facility." |
| FTT-10 (FTT-06-5/FT-10) | Sept. 17, 2008 (originally, 2QFY08) | No | This was supposed to be an endoatmospheric intercept of a separating target. The test was to involve a target missile being engaged by two THAAD interceptors. According to the Missile |

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| | | | Defense Agency (MDA), the target missile malfunctioned and never achieved the necessary velocity to reach the safe area approved for the intercept. As a result of the malfunction, the two THAAD missiles were never launched in order to save them for later tests. |
| FTT-11 | March 18, 2009 (originally, 1QFY09) | Yes | According to the FY 09 budget justification documents, this test was to have been a “[s]alvo exo intercept of separating target unconstrained (DT/OT mission).” According to the press release MDA sent out after the test, “Preliminary indications are that planned flight test objectives were achieved.” Said MDA Director Lt. Gen. Patrick O’Reilly, “[T]his test demonstrated THAAD’s ability “to launch on a cue from an Aegis BMD ship (via Link 16) to intercept a separating target high in the earth’s atmosphere.” |
| FTT-12 (FTT-08-1) | 4QFY09 – 1QFY10 (originally 2QFY09- 3QFY09) | TBD | This is supposed to be a dual endoatmospheric intercept of “two complex separating targets.” It was pushed back due to a lack of appropriate targets. |
| FTT-13 (FTT-08-2) | 2QFY10-3QFY10 (originally 3QFY09- 4QFY09) | TBD | This test will be an exoatmospheric intercept of a “long range separating high velocity MRBM target.” It was pushed back to due to a lack of appropriate targets. |
| FTT-14 (FTT-08-3) (DUAL) | 3QFY10-4QFY10 (originally 1QFY10- 2QFY10) | TBD | This test also will be an exoatmospheric intercept of a “long range separating high velocity MRBM target.” And it too was pushed back due to a lack of appropriate targets. |
| FTT-15 (FTT-08-4) | Probably cancelled | N/A | FTT-15 did not appear in the FY 09 or FY 08 budget justification documents, but had been in the FY 07 budget justification documents. It appears to have been cancelled. |
| FTT-16 (FTT-08-5) | Probably cancelled | N/A | FTT-16 did not appear in the FY 09 or FY 08 budget justification documents, but had been in the FY 07 budget justification documents. It appears to have been cancelled. |
| FTT-17 (FTT-08-6) | Probably cancelled | N/A | FTT-17 did not appear in the FY 09 or FY 08 budget justification documents, but had been in the FY 07 budget justification documents. It appears to have been cancelled. |

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