

FLIGHT TESTS FOR AEGIS BALLISTIC MISSILE DEFENSE

** The matrix below is a summary of the major flight tests in the Navy's Aegis Ballistic Missile Defense system.**

*Last updated: Feb. 6, 2006
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Flight Test Number	Date	Intercept?	Notes
Control Test Vehicle-1A (CTV-1A)	Sept. 24, 1999	n/a	This test was the first launch of the SM-3 missile, which showed a successful second and third stage separation and flight endurance – once it launched (it actually was supposed to be launched on Sept. 23, but did not fire due to a computer error; the test had to be repeated the following day).
FTR-1 (the first risk reduction flight and the second flight overall in the Aegis LEAP intercept (ALI) test series)	July 14, 2000	n/a	The third stage of the SM-3 failed to separate. An errant interrupt signal was transmitted to the missile that caused it to fail immediately after launch. The software, which had been used in an earlier test without problems, had to be re-coded.
Flight Test Round-1A; a repeat of FTR-1 (third flight test of nine scheduled)	Jan. 25, 2001	n/a	This test was conducted to evaluate the SM-3's airframe stability and control through a nominal kinetic warhead separation. The test launch achieved third-stage separation, third-stage motor burn, and attitude control through nominal KW separation.
Flight Mission (FM)-2	Jan. 25, 2002	Yes	This fly-by test was not intended to be an intercept: its objective was to evaluate the SM-3's fourth-stage kinetic warhead guidance, navigation and control. The SM-3 was launched by the USS Erie Aegis cruiser against an Aries target missile, which has been reported as having been five times longer and a third wider than any medium-range ballistic missile that the SMD is being designed to shoot down. It was the first fully operational SM-3 with a live solid divert and attitude control system to steer the kinetic warhead into the target.
FM-3	June 13, 2002	Yes	In this designated intercept test, an SM-3 launched from the USS Erie Aegis cruiser successfully intercepted an Aries ballistic

			missile target. This was the fifth of nine planned developmental tests. FM-3 only intended to show that a Navy interceptor can hit a ballistic missile target; FM-3 did not attempt to demonstrate lethality. To be "killed", certain types of enemy missiles must be hit at the right spot for a hit to also be a kill. This will be attempted on FM-4.
FM-4	Nov. 20, 2002	Yes	FM-4 marked the first time a Navy theater test target was intercepted during its ascent phase. An SM-3 missile was launched from the Aegis cruiser USS Lake Erie to counter an Orbital Sciences Test Target Vehicle that was launched from the Pacific Missile Range Facility in Kauai, Hawaii. The SM-3 missile had an altitude of 93 miles at the time of impact; because of this, its flight time was shorter by about a minute and a half. FM-4 demonstrated the SM-3's ability to switch its aimpoint while in flight to increase its accuracy, according to Raytheon program officials. FM-4 was the first of six planned flight tests to develop an emergency sea-based short- and medium-range ballistic missile defense capability.
FM-5	June 18, 2003	No	FM-5 was supposed to demonstrate the Block 2004 system's solid divert and attitude control system (SDACS) and its ability to achieve a lethal aim point shift in an ascent phase scenario; it failed at both. The attitude control system had been reengineered, so this was its first flight test. Another new addition for the testing program was a package on the Aries target missile that MDA officials hoped would allow for a more thorough post-test assessment of the attempted interception. In FM-5, an Aries target missile was launched from the Pacific Missile Range Facility in Kauai, Hawaii; two minutes later, an SM-3 interceptor was launched from the USS Lake Erie Aegis cruiser. The mock warhead was deployed and the guidance system was activated, but an interception did not occur and both missiles fell into the Pacific ocean. The malfunction may have resulted from a crack in the diverter ball that regulates gas flow in the SDACS. The SDACS has three solid propellant sections. The

			<p>first pulse (the sustain pulse) may have overheated the warhead enough so that one of the other pulses (pulse one and two) cracked the diverter ball. Because of this problem, the first five SM-3 interceptors deployed by Oct. 1, 2004, will have their SDACS pulse one and pulse two disabled.</p>
FM-6	Dec. 11, 2003	N/A	<p>FM-6 was designed to demonstrate the Block 2004 system's solid divert and attitude control system (SDACS) and its ability to achieve a lethal aim point shift in an ascent phase scenario. While an interception did occur, the SDACS was tested in a different mode than the one in which it will be deployed. This flight test has been portrayed by the Missile Defense Agency as part of the SM-3's "more complex, stressing, and operationally realistic ballistic missile engagement scenarios." However, FM-6 was a modified, less difficult version of FM-5, which was held in June 2003 and a failure. FM-5's problem has been traced to the SDACS that was used for the first time in that test. Specifically, the SDACS was being used in pulse mode, which probably created the cracked piece which resulted in the malfunction that caused the intercept failure. FM-6 used the new SDACS but in a sustain mode, with no additional pulses being used (which is not how it is designed to work out in the field). FM-6 saw a Standard Missile (SM)-3 interceptor (off of the Lake Erie near Kauai) intercept an Aries target at the speed of 3.7 kilometers per second and at an altitude of 137 kilometers.</p>
Flight Test Maritime 04-1 (formerly FM-7)	Feb. 24, 2005	Yes	<p>During Flight Test Mission (FTM) 04-1, a target was launched from the Pacific Missile Test Range in Kauai, followed one minute later by a Standard Missile (SM)-3 Block 1 interceptor from the <i>USS Erie</i>, an Aegis cruiser which was situated about 100 miles from Kauai. Two minutes after that, an intercept was reported. The interceptor again used only the sustain pulse mode of its guidance control system, the SDACS. FTM 04-1 was the first for the initial operational variant of the Aegis BMD system and used a "no-notice" launch for the target missile. During this scenario, the</p>

			Aegis crews are put on alert, like they would be during a time of heightened hostilities, but they do not know exactly when the test target will be launched. FTM 04-1 had been originally scheduled to be tested in summer 2004; likewise, it did not include a target with a separating warhead, as first planned by program officials.
FTM-04-2 (formerly FM-8)	Nov. 17, 2006	Yes	A medium-range target missile with a separating warhead was launched from the Pacific Missile Range Facility. The target had a range of 620 to 1,860 miles. It was intercepted by an SM-3 at an altitude over 100 miles. This was the first time a separating target was used. According to the DOT&E report, "Recent ground tests of the SM-3 third-stage rocket motor surfaced problems with thrust performance for certain fly-out scenarios. Also during ground tests of the redesigned kinetic warhead maneuvering system, the highest pulsed thrust mode failed to consistently perform to specification. This maneuvering system was redesigned in FY05 an attempt to address past problems with thrust response. These thrust anomalies could lead to additional design changes."
FTM-04-3 (formerly FM-9)	4QFY06	TBD	FTM-04-3 is going to be cancelled, as a missile defense official is claiming that "After FTM 04-2, we learned enough that FTM 04-3 objectives had essentially been met." Instead, MDA may focus on a flight test scheduled for 3QFY06 with the Japanese and FTM-06-1.
FTM-06-1 (formerly FM-10)	3QFY06	TBD	This test is to verify BMD 3.1 engagement capability with the intercept of multiple targets using SM-3 Block I and IA missiles in separate engagements.
FTM-06-2 (formerly FM-11)	1QFY07	TBD	This test is to verify BMD 3.1 engagement capability with the intercept of multiple ARAV targets in separate engagements.
FTM-06-3 (formerly FM-12)	3QFY07	TBD	
FTM-06-4 (formerly FM-13)	1QFY08	TBD	
FTM-08-1 (formerly FM-14)	3QFY08	TBD	FTM-08-1 (formerly FM-14)
FTM-08-2 (formerly FM-15)	4QFY08	TBD	

FM-15)			
FTM-08-3 (formerly FM-16)	2QFY09	TBD	
FTM-08-4 (formerly FM-17?)	4QFY09	TBD	
FTM 10-1	1QFY10	TBD	
FTM 10-2	3QFY10	TBD	
FTM 10-3	1QFY11	TBD	
FTM 10-4	3QFY11	TBD	

SOURCES:

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FTM-04-3 (formerly FM-9): "MDA Mulls Skipping Next Aegis BMD Test," *Defense Daily*, Dec. 19, 2005

FTM-06-1 (formerly FM-10) - FTM 10-4: MDA FY 2006/2007 Budget Estimates, February 2005