

*FLIGHT TESTS FOR GROUND-BASED MIDCOURSE MISSILE DEFENSE'S  
BOOST VEHICLE*

\*\* The matrix below is a summary of the major flight tests of the booster rocket being developed for the Missile Defense Agency's ground-based midcourse missile defense system.\*\*

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Flight Test Number	Date	Intercept?	Notes
Boost Verification (BV)-1	April 28, 2001	N/A	This was a "pathfinder" ground test to check all the procedures that lead up to an actual flight test and included booster ground handling, safety and flight termination system checks, and all launch and safety steps. The missile was not intended to be launched.
BV-2	Aug. 31, 2001	N/A	The flight test was 18 months behind schedule. The three-stage Boeing rocket tested with a mass-simulated kill vehicle payload, did not attempt a missile intercept. It appears there was an anomaly in vehicle roll control in first-stage operation beginning at about 33 sec. into the mission and that could affect kill vehicle performance in an operational scenario. The second- and third-stage motors performed normally.
BV-3	Dec. 13, 2001	N/A	Failure. The BV veered off course 30 seconds after launching and was ordered to self-destruct. It landed in the Pacific Ocean off of Vandenberg AFB, CA.
BV-4	Unknown	N/A	This test has apparently been cancelled.
BV-6	Aug. 16, 2003	N/A	This was a test of OBV, Orbital's alternate boost vehicle. Because the boost vehicle program had undergone so many problems, Orbital was awarded a contract in March 2002 to develop a new alternate boost vehicle. The MDA claims it will continue to follow a dual-booster program, but for now, it plans to use Orbital's rocket for the 10 interceptors of the October 2004 initial deployment and for four flight tests. Orbital's rocket is based on its

			commercial boost vehicles, the Pegasus and the Taurus. BV-6 was not a designated intercept test and did not demonstrate functionality between the payload and the booster. The three-stage rocket was launched out of Vandenberg Air Force Base at 11:01 AM, flew for about 25 minutes, reached an altitude of about 1,165 miles, and ranged about 3,300 miles. BV-6 was first supposed to be held on Aug. 15 but had to be delayed 24 hours when a software anomaly arose during preflight preparation, necessitating the system's reboot.
BV-5	Jan. 9, 2004	N/A	This test of Lockheed Martin's booster was a failure. BV-5 was originally to be held August 2003, and then in December 2003. But on Dec. 15, 2003, pre-testing found what MDA officials termed an "extremely minor" electronic glitch in one of the third-stage rocket motor's circuit boards. The board had to be replaced before BV-5 could be held, but the problem apparently was larger than officials had thought. When it was finally held, BV-5 was not a designated intercept test and did not demonstrate functionality between the payload and the booster. An apparent power drop prevented the mock EKV from separating from the booster. None of the interceptors that are to be deployed by October 2004 are expected to use the Lockheed Martin booster. This decision came out of an investigation of two manufacturing accidents at the Pratt and Whitney facility which mixes propellant for the Lockheed Martin booster. On Aug. 7, 2003, an ignition which occurred during propellant mixing set off a fire that overtook 36 or 37 acres, but no one was seriously injured. But on Sept. 12, 2003, James Franklin Spotts was killed from an explosion that occurred while he was adjusting a propellant mixer.
IFT-13A	N/A	N/A	Lockheed Martin's test, IFT-13A, has been indefinitely delayed due to explosions at its rocket fuel mixing plant in the summer and fall of 2003: it may not occur until FY 05. Right now, MDA is planning on using only

			the Orbital version in its initial deployment but may use the Lockheed Martin rocket for later deployments. It may be used in FTG 04-1 (BV+RRF/13a/16b/IFT- 1/b), which is scheduled for 4QFY05.
IFT-13B	Jan. 26, 2004	N/A	This system-level test of the Orbital Sciences' boost vehicle launched the rocket carrying a simulated EKV from Kwajalein Atoll against a simulated target coming from Vandenberg AFB, Calif. IFT-13B was not an intercept attempt. Included in this test was the latest version of the GMD program's fire control software, which is being built by Northrop Grumman and which performed as expected in this test. IFT-13B was the second test of Orbital Sciences' booster; the first was Booster-Verification (BV)-6, successfully held in August 2003.
IFT-13C	Dec. 15, 2004	N/A – the interceptor failed to leave the silo	In this test, the new Orbital Sciences booster was supposed to fly from Kwajalein and hit a target coming out of Kodiak, Alaska. While the target flew as planned, the booster failed to leave the ground. The system shut itself down 23 seconds before launch. According to Lt. Gen. Trey Obering, the head of the MDA, this was due to a "very minor glitch" in the software. He stated that the failure arose when a routine pre-flight test showed that there were too many electronic messages being missed in the interceptor's communications bus, but that this was the designers' fault for having set the bar too high for an acceptable level of missed messages. However, there are many other problems with the 1553 communications bus being used for the GMD system, which is regarded by some as being incapable of processing messages at a rate that is fast enough for the GMD system to work effectively. IFT-13C officially was slated to be a target "fly-by," but program officials had hoped that an intercept would occur since both a live target and live EKV were used. IFT-13C was originally supposed to have been held in December 2003, but a pre-flight ground-inspection determined that there were serious flaws in the EKV's

			circuitry that could affect the divert and attitude control system. This pushed back the test several times so that the electronic unit in question could be replaced.
IFT-13	Cancelled	N/A	The MDA cancelled IFT-13 – a flight intercept test – so that it could focus on developing a new booster rocket for the GMD system. Instead, the test has been split into three booster development tests, IFT-13A, -13B, and -13C.
IFT-13A	N/A	N/A	Lockheed Martin’s test, IFT-13A, has been indefinitely delayed due to explosions at its rocket fuel mixing plant in the summer and fall of 2003. Right now, MDA is planning on using only the Orbital version in its initial deployment but may use the Lockheed Martin rocket for later deployments.
IFT-13B	Jan. 26, 2004	N/A	This system-level test of the Orbital Sciences’ boost vehicle launched the rocket carrying a simulated EKV from Kwajalein Atoll against a simulated target coming from Vandenberg AFB, Calif. IFT-13B was not an intercept attempt. Included in this test was the latest version of the GMD program’s fire control software, which is being built by Northrop Grumman and which performed as expected in this test. IFT-13B was the second test of Orbital Sciences’ booster; the first was Booster-Verification (BV)-6, successfully held in August 2003.
IFT-13C	Dec. 15, 2004	No. The interceptor failed to leave the silo.	In this test, the new Orbital Sciences booster was supposed to fly from Kwajalein and hit a target coming out of Kodiak, Alaska. While the target flew as planned, the booster failed to leave the ground. The system shut itself down 23 seconds before launch. According to Lt. Gen. Trey Obering, the head of the MDA, this was due to a “very minor glitch” in the software. He stated that the failure arose when a routine pre-flight test showed that there were too many electronic messages being missed in the interceptor’s communications bus, but that this was the designers’ fault for having set the bar too high for an acceptable level of missed messages. However, there are many other problems with

			<p>the 1553 communications bus being used for the GMD system, which is regarded by some as being incapable of processing messages at a rate that is fast enough for the GMD system to work effectively. IFT-13C officially was slated to be a target “fly-by,” but program officials had hoped that an intercept would occur since both a live target and live EKV were used. IFT-13C was originally supposed to have been held in December 2003, but a pre-flight ground-inspection determined that there were serious flaws in the EKV’s circuitry that could affect the divert and attitude control system. This pushed back the test several times so that the electronic unit in question could be replaced.</p>
IFT-14	Feb. 13, 2005	No. The interceptor failed to leave the silo.	<p>This test was a planned intercept attempt. As in IFT-13C, Orbital Sciences’ booster, carrying Raytheon’s production kill vehicle, was supposed to fly from Kwajalein and hit a target coming out of Kodiak, Alaska. And, also as in IFT-13C, while the target flew as planned, the booster failed to leave the ground. This time, however, the system shut itself down just a few seconds before launch. This failure has been traced to the arms that hold the interceptor up in the silo: apparently, they did not contract all the way, so the software that monitors the launch’s progress aborted the mission. It is unclear whether this problem affects the other GMD interceptors that have already been fielded.</p>
IFT-15	May be cancelled? Unknown (had been planned for fall or winter 2004)	N/A	<p>This test may have been cancelled. If it is held, it should not be confused with IFT-15A, which is simply a radar characterization flight. In IFT-15A, the target missile would be launched from Kodiak, Alaska. IFT-15, as planned by MDA officials, was supposed to have been a fully integrated flight intercept test with the target coming from Kodiak and the interceptor from Kwajalein.</p>
FT 04-2a/b (CMCM-1a/b)	2QFY05	N/A	<p>This series of radar certification flights, part of the Block 2004 effort, goes by FT 04. CMCM means that it’s a critical measurements and countermeasures test. These “are dedicated flight tests which</p>

			provide a venue for risk reduction for BMDS Block Testing, addressing phenomenology, countermeasures, and counter-countermeasures requirements, and providing critical measurements to support developmental and validation of algorithms, modeling and simulation, discrimination, and new technology demonstrations.” CMCM-5, -7, and -9 have been cancelled.
FT 04-3 (MRT)	2QFY05	N/A	This radar certification test will use an MRT, or Medium Range Target.
FT 04-1 (formerly IFT-16a)	3QFY05-2QFY06	N/A	Originally intercept attempt IFT-16, then changed to radar characterization flight test IFT-16A, now this is called FT 04-1. It will be a radar certification flight and will test the upgraded early warning radar at Beale AFB, Calif.
FT 04-4 (CMCM-2)	4QFY05	N/A	
FT 04-5	4QFY05-3QFY06	N/A	This will be a radar certification test including Cobra Dane and a Long Range Air Launch Target (LRALT).
FTG 04-1 (BV+RRF/13a/16b/IFT-1/b)	4QFY05	TBD	The tests for the GMD program have been renamed to better emphasize the block development in which MDA has organized its programs. This series of intercept flight attempts are part of the Block 2004 program. Originally, IFT-13a was to use the Lockheed Martin boost rocket; it is unclear whether that is still the case.
FTG 04-2 (IFT 1/c)	1QFY06	TBD	
FTG 04-3 (IFT 2/a)	Unknown	TBD	Date not given, but the test is mentioned in the 2006/2007 budget documents.
FTG 04-4a/b (formerly IFT-17/18)	Unknown	TBD	Date not given, but the test is mentioned in the 2006/2007 budget documents.
FT 06-1 (GMD RCF3)	1QFY06	N/A	This series of radar certification tests supports the Block 2006 BMDS system’s development. FT 06-1 is GMD RCF3 (radar certification flight).
FT 06-2	2QFY06	N/A	This will include Japanese Cooperative JFM-1 in its test configuration.
FT 06-3 (CMCM-3)	3QFY06	N/A	
FTG 04-5 (IFT-19/2d)	1QFY06	TBD	IFT-19 had been cancelled in earlier MDA test schedules, but some variant of it seems to have been revived.
FTG 06-1a/b (formerly IFT-20/21)	4QFY06	TBD	IFT-20 had been cancelled in earlier MDA test schedules. Now FTG 06-1a/b is the first

			intercept flight test attempt for MDA's Block 2006 capability and will be a salvo mission.
FTG 06-2 (formerly IFT-22)	1QFY07	TBD	.
FTG 06-3a/b (formerly IFT-23/24)	2QFY07	TBD	IFT-23/24 were supposed to be multiple simultaneous engagements, so these may be as well.
FT 06-4 (CMCM-4)	3QFY07	N/A	This will be a risk reduction flight for the MKV program.
FT 06-5	Unknown		Not mentioned in the 2006/2007 budget documents.
FT 06-6 (GMD RCF-4)	1QFY07	N/A	
FTG 06-4 (formerly IFT-25)	4QFY07	TBD	IFT-25 had been cancelled in earlier MDA flight test schedules.
IFT-27	Cancelled		This cancellation dates back to earlier MDA flight test schedules.
IFT-28	Cancelled		This cancellation dates back to earlier MDA flight test schedules.
IFT-29	Fall 2007	TBD	Unclear which flight test this is under the new naming system.
IFT-30	Fall 2008	TBD	Unclear which flight test this is under the new naming system.
FTG 06-5 (BV+RRF/16b)	1QFY08	TBD	This will be a risk reduction flight of the BV+ booster.
FT 08-2 (CMCM-6)	2QFY08	N/A	This series of radar certification flight tests supports the Block 2008 BMDS system's development.
FT 08-3	Unknown		This test was not mentioned in the 2006/2007 budget documents.
FTG 08-1(formerly IFT-26)	2QFY08-1QFY09	TBD	This series of intercept flight intercept tests supports the Block 2008 BMDS system's development.
FTG 08-2	3QFY08-2QFY09	TBD	
FTG 08-3a/b	4QFY08-3QFY09	TBD	This intercept attempt will be a salvo mission.
FT 08-1	1QFY09	N/A	
FTG 08-4	1QFY09-4QFY09	TBD	
FT 08-4 (CMCM-8)	2QFY09	N/A	
FTG 08-5	3QFY09-2QFY10	TBD	
FTG 08-6	4QFY09-3QFY10	TBD	
FTG 10-1	1Q-4QFY10	TBD	This series of intercept flight intercept tests supports the Block 2010 BMDS system's

			development.
FTG 10-2	3QFY10- 2QFY11	TBD	
FTG 10-3a/b	4QFY10- 3QFY11	TBD	This flight intercept attempt will be a salvo mission.
FTG 10-4	1Q-4QFY11	TBD	
FTG 10-5	1Q-4QFY11	TBD	
FTG 10-6a/b	1Q-4QFY11	TBD	This flight intercept attempt will be a salvo mission.

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