



FLIGHT TESTS FOR GROUND-BASED MIDCOURSE DEFENSE (GMD) SYSTEM

** The matrix below is a summary of the major flight tests in the Missile Defense Agency (MDA)'s Ground-based Midcourse Defense (GMD) system. Over the years, in MDA's hurry to deploy an initial GMD capability, tests have been delayed, had their objectives changed, or skipped entirely. In the process, MDA has gone through at least three different nomenclatures for its flight tests, which leads to confusion when trying to determine what is happening in the program. As such, this matrix will include the most recent information known about the latest flight tests, but it will also keep old flight test names so to show the evolving expectations and schedules that MDA has had for the GMD system. By any measure, the GMD system still has not undergone anything approaching operationally-realistic testing under challenging circumstances that adequately simulate a war-fighting environment. **

Last updated: May 9, 2006

By Victoria Samson, Research Analyst

Center for Defense Information

www.cdi.org

Test No.	Date	Intercept?	Notes	Decoys
IFT-1A	June 24, 1997	n/a	Non-intercept fly-by to assess the performance of the Boeing-built EKV seeker, collect target phenomenological data, and evaluate (post-test) target-modeling and discrimination algorithms. The target cluster consisted of 10 objects: one mock warhead, one bus (the stage of the missile which releases the warhead and decoys), and eight decoys. Boeing was not chosen as the NMD EKV contractor.	Eight decoys: three that were conical in shape, like the warhead, and five spherical balloons. One balloon was large – 2.2 meters in diameter – and had a brighter IR signature than the mock warhead. The two medium-sized balloons were about as bright as the mock warhead; they did not deploy as expected and were not reliable parts of the testing program. The two small balloons were released via a canister and were much dimmer than the mock warhead.
IFT-2	Jan. 16, 1998	n/a	Non-intercept fly-by to assess the performance of the Raytheon-built EKV	The same decoy set used in IFT-1A was also used in IFT-2.

			<p>seeker, collect target phenomenological data, and evaluate (post-test) target-modeling and discrimination algorithms. The target cluster consisted of 10 objects: one mock warhead, the bus (the stage of the missile which releases the warhead and decoys), and eight decoys. Raytheon was chosen as the NMD EKV contractor.</p>	
IFT-3	Oct. 2, 1999	Yes	<p>Element test of the EKV, not an end-to-end system test, which relied on a surrogate booster vehicle and range assets to define the “deployment basket” and deliver the EKV to that location. Once deployed, the EKV operated autonomously to intercept the mock RV. Due to a malfunctioning Inertial Measurement Unit (IMU), which normally is used to position the EKV for the intercept, a backup method of locating the target had to be exercised. The EKV called upon its “step-stare” capabilities (which are used only during off-nominal circumstances) to extend its field of view since the target was not where anticipated. After executing that procedure, the EKV acquired its target. In a background</p>	<p>The only decoy used in IFT-3 was the large balloon from IFT-1A and IFT-2. It had an IR signature six times higher than that of the mock warhead. Because the decoy was so much brighter than the mock warhead, the EKV saw it first. Once the EKV realized that the balloon’s IR signature did not match up with the target data it had received prior to the test, the interceptor shifted to the nearby target.</p>

			<p>test parallel with the EKV flight test, the BMC3 and other elements functioned as planned. The XBR is still in development, so a Ground Based Radar Prototype (GBR-P) is used in its stead. Because the radar is in a position where it cannot completely track the missiles, a Global Positioning System (GPS) receiver on the mock warhead emitted location data; a C-band transponder beacon was used as a backup.</p>	
IFT-4	Jan. 18, 2000	No	<p>First end-to-end system test (intercept attempt) using NMD prototype elements (except the IFICS) and range assets to approximate the objective system. The EKV was again successfully delivered by a surrogate booster and separated into the deployment basket. The failure to intercept is directly traceable to the cryogenic cooling system of the EKV, which failed to cool the IR sensors down to their operating temperatures in time because of an obstructed cooling line. Again, because of the GBR-P's limited tracking abilities, a GPS receiver and a backup C-band radar beacon on the mock warhead emitted location</p>	<p>The only decoy used was the single large balloon from the previous tests. Smaller balloons originally had been planned to be a part of IFT-4, but were dropped in an attempt to simplify the test (partially because of the Welch panel recommendations).</p>

			data.	
IFT-5	July 8, 2000	No	Second end-to-end system test (intercept attempt) using NMD prototype elements and range assets to approximate the objective system. The IFICS served as the communication link between the BMC3 and EKV. The failure to intercept was the direct result of the EKV not separating from the surrogate booster due to an apparent failure in the 1553 data bus in the booster. A C-band transponder on the mock warhead gave off location information; its data was compared against its GPS receiver to determine its accuracy.	The only decoy used was the large balloon from previous tests. It did not inflate properly, causing MDA officials to decide to use a different decoy in the future.
IFT-6	July 14, 2001	Yes	This test was a repeat of IFT-5. The prototype X-Band radar (XBR) used in IFT-6 could not process all the information it was receiving quickly enough, causing it to falsely report that the interceptor had missed its target. If that had happened in a non-test situation, more interceptors would have been needlessly launched at the target to ensure a hit. The kill was confirmed by sensors on a satellite, a 747 jet, and ground stations – backups that will not be	One large decoy balloon was used. This one was 1.7 meters in diameter, so it was slightly smaller than the large balloon used earlier as a decoy. This new decoy still had an IR signature much brighter (approximately three times) than that of the mock warhead.

			<p>available to the fully-developed XBR. A C-band beacon on the mock warhead produced most of the target location data. Starting in IFT-6, a glitch was identified in the GMD's exoatmospheric kill vehicle (EKV)'s target position estimation data, which is used to monitor and track the target during its flight so that the EKV can make an intercept. According to MDA spokesperson Lt. Col. Rick Lehner, the recurring glitch "never interfered with the effectiveness of the EKV," and could have been attributed to "degraded EKV inertial measurement unit output data." MDA believed the anomaly to have been caused by electromagnetic interference into test-unique cabling. This cabling was also used in IFT-7, IFT-8, and IFT-9</p>	
IFT-7	Dec. 3, 2001	Yes	<p>The only variable changed from IFT-6 was the target booster: instead of Lockheed Martin's Multi-Service Launch System, Orbital's Target Launch Vehicle was used. The target set, a modified Minuteman ICBM carrying a mock warhead and a single decoy, did not change. It was not a substantive</p>	<p>There was only one decoy in IFT-7, and it was the same one that was used in IFT-6.</p>

			modification of the test configuration. Again, as in IFT-5 and IFT-6, the mock warhead's C-band beacon produced most of the target location data. IFT-7 was designed to see how well the systems elements would integrate, in addition to attempting to intercept the target missile. Critics noted that interceptor received a wealth of targeting information prior to the test and questioned its operational realism.	
IFT-8	March 15, 2002	Yes	Again, the kill vehicle was given prior information to guide it to the target, which may well have been appropriate for an early level of testing but certainly does not indicate a realistic operational test. The system still depends on a C-band transponder beacon emitting location data in order to find the mock warhead. At the time of IFT-8, the Pentagon had planned on holding at least 20 more tests which were to be completed at a pace of roughly one every four months. This has not happened as promised.	Three decoy balloons (one large, two small) were used to increase the difficulty of determining the target's location; however, critics pointed out that the infrared signals of the balloons differed from that of the mock warhead. The large balloon had a much larger infrared signature than that of the mock warhead, whereas the two small balloons had much smaller signatures.
IFT-9	Oct. 14, 2002	Yes	The Aegis SPY-1 radar was used for the first time in a national missile defense capacity. It tracked the target missile in-flight, and the	IFT-9 is said to have included the same three decoy balloons (one large, two small) in its target cluster as were used in IFT-8, but the

			<p>information it gathered was passed to the GMD's battle management system but was not used to achieve the intercept. Also, a C-band transponder on the mock warhead provided early flight trajectory and location data. IFT-9 was originally planned to take place in August 2002, but was twice delayed. First it was postponed for about a week while program officials scrambled to fix a leak in the kill vehicle's helium tank. Then it was delayed because of problems with the seals of an engine nozzle on the booster rocket.</p>	<p>specifics are unknown as MDA classified decoy details in May 2002.</p>
IFT-10	Dec. 11, 2002	No	<p>IFT-10 failed when the Raytheon-built exoatmospheric kill vehicle (EKV) did not separate from its booster rocket, a modified Minuteman ICBM that was being used as a surrogate until a more advanced booster rocket could be developed. The problem was created when a pin broke that should have activated a laser to release the boost vehicle's restraining units, causing the boost vehicle to remain with the EKV. The failure to separate precluded the EKV from attempting an intercept of the target missile. The pin came</p>	<p>The increase in target complexity over the entire GMD flight test program has been much slighter than originally planned; for example, IFT-7 initially was to include a tumbling RV, but problems with the GMD technology have prevented that target type from being a part of any test target clusters so far. This lag in target complexity, especially when combined with the test delays after IFT-10, has hindered MDA's ability to demonstrate the GMD technology's targeting discrimination capabilities in more realistic test scenarios.</p>

			<p>apart from excessive vibrations related to the removal of a piece of insulating foam by the subcontractor to make monitoring the system easier. IFT-10's failure caused Boeing and Raytheon to forfeit much of the award fees. This was the first night test of the GMD flight test program, but because the intercept failed, the objective of IFT-10 to demonstrate the ability to intercept a target at night was not achieved. Also incorporated into the test process for the first time were the radars of the Theater High Altitude Area Defense system and the Airborne Laser, both of which were used to track the target missile after its launch. IFT-10 was the last flight test with the surrogate booster rocket. A nearly year-long pause was given to the testing program so that a new booster could be brought into the program and new hardware could be installed in the Ft. Greely site.</p>	
IFT-11 and IFT-12	Cancelled	N/A	<p>The MDA announced in January 2003 that it would cancel these tests so that it could instead focus on developing the GMD system's booster rocket. At the time of that announcement,</p>	

			MDA had cancelled nine out of 20 flight tests that had been scheduled from that time through the next five years so it could meet the Bush administration's deadline of starting an initial missile defense deployment in 2004. These cancellations prompted a report from the non-partisan General Accounting Office warning that the MDA is "in danger of getting off track early and impairing the effort over the long-term."	
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. 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	<p>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.</p>	
IFT-13C	Dec. 15, 2004	No. The interceptor failed to leave the silo.	<p>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</p>	

			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-14	Feb. 13, 2005	No. The interceptor failed to leave the silo.	This test was a planned intercept attempt. As in IFT-13C, Orbital Sciences' booster, carrying Raytheon's production kill vehicle,	

			<p>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. Since then, MDA has realized it must remove the arms entirely and put in new components that can work in the silo environment. The faulty performance of the silo arms has been found by outside investigation teams to be due to faulty quality control. The other GMD interceptors that have already been fielded will need to be fixed as well.</p>	
IFT-15	<p>May be cancelled? Unknown (had been planned for fall or winter 2004)</p>	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</p>	

			officials, was supposed to have been a fully integrated flight intercept test with the target coming from Kodiak and the interceptor from Kwajalein.	
Medium-range air-launch target	April 8, 2005	N/A	In this test, a medium-range target was dropped from the rear of a C-17 about 800 northwest of the Pacific Missile Test Facility in Hawaii. According to MDA, “The missile's rocket motor then ignited, sending it on a planned trajectory over the Pacific Ocean.” The Cobra Dane radar was not used as planned.	
FT 04-5	September 2005	N/A	In this test, the Cobra Dane radar was used to track a long-range air-launched target. According to a GAO report, “Cobra Dane performed as expected in these test events, but officials in the office of the Director, Operational Test and Evaluation (DOT&E) are concerned that the radar's software, as currently written, could cause the GMD element to waste inventory.”	
FT-1 (formerly FTG 04-1/BV+RR F/13a/16b/IFT- 1/b). As of spring	Dec. 14, 2005	N/A	The interceptor was launched against a simulated test target flown on a trajectory from Kodiak, AK. Unlike the previous two flight tests, the operationally configured	

2006, this is the newest nomenclature for the flight tests.			warhead and its booster did leave the ground. Originally, when it was still called IFT-13a, the test was to include the Lockheed Martin boost rocket. However, since then, that booster has had a multitude of problems during development and the Orbital Sciences booster is now the program's primary boost vehicle.	
FTG 04-5 (IFT-19/2d)	Held in 1QFY06	N/A	IFT-19 had been cancelled in earlier MDA test schedules, but some variant of it apparently was revived.	
FTX-01 (formerly FT 04-1/IFT-16a)	2QFY06	N/A	Originally intercept attempt IFT-16, then changed to radar characterization flight test IFT-16A, then FT 04-1, now FTX-01.	
FT 04-2	2QFY06	TBD		
FTG 04-2 (IFT 1/c)	2QFY06	TBD		
FTC-02B (formerly CMCM-1/FT 04-2)	April 13, 2006 (originally scheduled for 4QFY05)	N/A	In FTC-02B, a missile system powered by a two-stage SR19 rocket was flown from the Kauai Test Facility in the Pacific Missile Range Facility. According to an MDA press release, the payload included the "deployment of complex countermeasures, a mock reentry vehicle, an on-board sensor package." This series of radar certification flight was initially part of the Block 2004 effort. CMCM means that it's a critical	

			measurements and countermeasures test. According to MDA, "Test data from these missions, including lessons learned about complex countermeasures, will be used in the design of missile defense interceptor and sensor elements across the Ballistic Missile Defense System." CMCM-5, -6, -7, and -9 have been cancelled.	
CMCM-2 (formerly FT 04-4)	April 28, 2006 (originally to be held 4QFY05)	N/A	This countermeasures test was a repeat of the one held on April 13, 2006. MDA tested its radars in the Pacific Missile Test Facility in Hawaii against a target missile that carried countermeasures, a mock warhead, and an on-board sensor package. No interceptor missiles were used.	
FTC-03 (formerly FT 06-3/CMCM-3)	3QFY06	N/A	Cancelled.	
FTG-2	3QFY06	TBD		
FTX-02 (formerly FT 06-1)	3QFY06	TBD		
FTG-02 (formerly FT-2)	3QFY06	TBD	In this flight, an operationally configured warhead will be launched from Vandenberg AFB against a target coming out of Kodiak, AK. In this test, officially, an intercept is not planned;	

			however, since a live target will be used, program officials hope that an intercept will occur.	
FTG-03 (formerly FT-3)	4QFY06	TBD	This will be a repeat of FT-2, but this will have an intercept as its primary goal.	
FTG-05 (formerly FTG 06-1/IFT-20/21)	4QFY06	TBD	IFT-20 had been cancelled in earlier MDA test schedules. FTG 06 had originally been planned as the first intercept flight test attempt for MDA's Block 2006 capability. It was supposed to be a salvo mission, but now that it's FTG-05, that appears to be scrapped.	
FTX-02 (formerly FT 06-1 GMD RCF3)	4QFY06	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).	
FTG 06-1a/b (Salvo mission)	4QFY06	TBD		
FT 04-3 (MRT)	1QFY07 (formerly March-May 2006)	TBD	This radar certification test will use an MRT, or Medium Range Target. It also will be the first time an operational radar (Beale AFB, Calif.) will provide the "engagement quality cues," according to Lt. Gen. Trey Obering, head of MDA. The interceptor will be launched from Vandenberg AFB against a target launched from	

			Kodiak, AK.	
FTG-04 (formerly FT-4)	1QFY07	TBD	This will be the same scenario as FT-2 and FT-3, and, like FT-3, will be officially an intercept attempt.	
FTX-03 (formerly FT 06-2)	1QFY07	N/A	This will include Japanese Cooperative JFM-1 in its test configuration.	
FT 06-6 (GMD RCF-4)	1QFY07	TBD		
FTG-4	1QFY07	TBD		
FTG 06-2	1QFY07	TBD		
FTG 06-3a/b (formerly IFT-23/24)	2QFY07	TBD	In this test, the GMD interceptor is supposed to be cued via the FBX-T.	
FT-5	2QFY07	TBD		
FT-6	3QFY07	TBD		
FTG 06-4	3QFY07	TBD		
FT 06-4 (CMCM-4)	3QFY07	N/A	This will be a risk reduction flight for the MKV program.	
FTG 06-4 (formerly IFT-25)	3QFY07	TBD	IFT-25 had been cancelled in earlier MDA flight test schedules.	
FTG-5	1QFY08	TBD	Booster-engine launch from VAFB.	
FTG 06-2 (formerly IFT-22)	1QFY08 (slipped one calendar year from the FY 06 budget documents)	TBD	The SBX will be tested in this.	
FT-7a/b (Salvo)	1QFY08	TBD		
FTS-01 (formerly FT 06-7/TMDD-1)	1QFY08	TBD	This will include a test of the STSS.	
FTS-02 (formerly	1QFY08	TBD	This will include a test of the STSS.	

FT 06-8 (SMDD-1)				
FT 08-1 (RDC)	1QFY08	TBD		
FTG 06-5	1QFY08	TBD		
FTG 06-5 (BV+RRF /16b)	1QFY08	TBD	This will be a risk reduction flight of the BV+ booster.	
FTG 06-2	2QFY08	TBD		
FTG 06-3	2QFY08	TBD		
FT 06-4 (CMCM-4)	2QFY08	TBD		
FT 08-2 (CMCM-6) (TMDD-2)	2QFY08	TBD	According to the 2006 budget documents, this series of radar certification flight tests, as planned at that time, was supposed to support the Block 2008 BMDS system's development.	
FT-8	3QFY08	TBD		
FT 08-3 (SMDD-2)	3QFY08	TBD		
FTG 08-1 (formerly IFT-26)	3QFY08	TBD		
FTG 08-2	3QFY08-2QFY09	TBD	May have been cut.	
FT 08-4 (RDC)	4QFY08	TBD		
FTG 08-3	1QFY09	TBD	Was a salvo launch in the 2006 budget documents.	
FTG 08-4	1QFY09	TBD		
FT 08-6 (RDC)	2QFY09	TBD		
FTG 08-5	4QFY09	TBD	Was a salvo launch in the 2006 budget documents.	
FT 08-7 (RDC)	4QFY09	TBD		
FTG 08-5	4QFY09	TBD		
FTG 08-6	4QFY09	TBD		
FT 08-8 (STSS)	1QFY10	TBD		

FTG 10-1	2QFY10	TBD	According to the 2006 budget documents, this series of intercept flight intercept tests, as planned at that time, was supposed to support the Block 2010 BMDS system's development.	
FT 08-5 (CMCM-8)	2QFY10	TBD		
FTG 10-1	2QFY10	TBD		
FTG 10-2a/b (Salvo)	2QFY10	TBD		
FT 10-1 (RDC)	3QFY10	TBD		
FT 10-2 (STSS)	3QFY10	TBD		
FTG 10-3	1QFY11	TBD		
FT 10-4 (STSS)	2QFY11	TBD		
FTG 10-4	3QFY11	TBD		
FTG 10-5a/b (Salvo)	3QFY11	TBD		
FT 10-5 (RDC)	4QFY11	TBD		
FTG 10-6	4QFY11	TBD		
*****From here on, the names use the older nomenclature and the dates are based on what MDA was expecting at the time the tests were set.*****				
FTG 04-3 (IFT 2/a)	Unknown	TBD	This test was mentioned in the 2006/2007 budget documents, but not the 2007 budget documents.	
FTG 04-4a/b (formerly IFT-17/18)	4QFY06	TBD	This test was mentioned in the 2006/2007 budget documents, but not the 2007 budget documents.	
FT 06-5	Unknown		Not mentioned in the 2006/2007 or 2007 budget documents.	
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.	

Sources:

IFT-1A – IFT-5: *DOT&E FY 00* report; “Decoys and discrimination in intercept test IFT-8,” *DOT&E Report in Support of National Missile Defense Readiness Review*, aka “The Coyle Report,” Aug. 10, 2000; Union of Concerned Scientists Technical Working Paper, March 14, 2002

IFT-6: “Crucial radar failed missile defense test. Military: Although initially called a success, the system's trial run on Saturday had a troubling glitch, some analysts say,” *Los Angeles Times*, July 18, 2001; “Decoys and discrimination in intercept test IFT-8,” Union of Concerned Scientists Technical Working Paper, March 14, 2002

IFT-7: “Missile defense hits three out of five,” *Space & Missile*, Dec. 6, 2001; “BMDO using new target booster for missile defense test,” *Defense Daily*, Nov. 27, 2001; “Decoys and discrimination in intercept test IFT-8,” Union of Concerned Scientists Technical Working Paper, March 14, 2002

IFT-8: “Missile defense hit clears way for more complexity in countermeasures,” *Defense Daily International*, March 22, 2002; “Kill vehicle scores a hit with proponents of missile defense. Weapons: The Pentagon says the successful tests may restore credibility to the program,” *Los Angeles Times*, March 26, 2002; “Decoys and discrimination in intercept test IFT-8,” Union of Concerned Scientists Technical Working Paper, March 14, 2002

IFT-9: “US carries out successful missile defense test over Pacific,” *Agence France Presse*, Oct. 15, 2002; “The target set for missile defense intercept test IFT-9,” Union of Concerned Scientists Technical Working Paper, Oct. 11, 2002; “Helium leak in missile defense interceptor pushes back test,” *Aerospace Daily*, Aug. 14, 2002; “MDA delays GMD flight test to replace damaged interceptor nozzle,” *Defense Daily*, Aug. 21, 2002

IFT-10: “MDA reports EKV failed to separate from booster in GMD flight test,” *Defense Daily*, Dec. 12, 2002; “Overhauls Ground-Based Midcourse Test Plan To Prove More Than Hit-To-Kill,” *Defense Daily*, May 15, 2003; “Boeing Loses Bonus After Raytheon Warhead Fails in Missile Test,” *Bloomberg.com*, June 9, 2003

IFT-11/12: “Pentagon cancels two missile intercept tests, saving \$200 million,” *Associated Press*, Jan. 8, 2003; “Rush to field missile defense may ‘impair’ program, GAO says,” *Bloomberg.com*, June 3, 2003; “Missile Defense: Knowledge-Based Practices Are Being Adopted, but Risks Remain,” GAO-03-441, April 2003

IFT-13 and -13A: “MDA Reports Tight Schedule For New Booster Development and Test,” *Defense Daily*, May 19, 2003; “GMD booster verification test planned for mid-December,” *Aerospace Daily*, Dec. 2, 2003; “Year Of The Missile Shield: If all goes as planned, the US on Oct. 1 will throw the switch on its first true ballistic missile defense,” *Air Force Magazine*, January 2004; “Rapid Fire,” *Aviation Week & Space Technology*, Jan. 5, 2004

IFT-13B: “ATK backs test of Ground-Based Midcourse Defense System,” *Advanced Materials & Composites News*, Feb. 16, 2004; “GMD successfully conducts flight test with new booster,” *Aerospace Daily*, Jan. 28, 2004; “MDA carries out successful booster Integrated Flight Test,” *Defense Daily*, Jan. 28, 2004

IFT-13C: “‘Minor’ software glitch is cited in missile failure: program official calls problem easily correctable,” *Washington Post*, Jan. 13, 2005; “Ready or Not: Missile defense fielding nears, but critics remain skeptical of its effectiveness,” *Aviation Week & Space Technology*, June 28, 2004; “Interceptor repairs completed; missile defense test delayed,” *Defense Daily*, April 22, 2004

IFT-14: "Interceptor missile test fails," *Los Angeles Times*, Feb. 15, 2005, "Ground equipment likely at fault in incomplete GMD test," *Defense Daily*, Feb. 15, 2005; "U.S. missile defense again fails key test," *Washington Post*, Feb. 15, 2005; "Rocket fails to launch in test run," *New York Times*, Feb. 15, 2005; "Tester: GMD making progress, but not operationally ready," *Aerospace Daily & Defense Report*, March 16, 2005

IFT-15: "GMD test cancellation delays test of upgraded radar," *Aerospace Daily*, May 14, 2003

Medium range air-launched target: "US air-launches ballistic missile as target in missile defense test," *Agence France Presse*, April 8, 2005

FT 04-5: "Acquisitions: Missile Defense Agency Fields Initial Capability but Falls Short of Original Goals, GAO-06-327," Government Accountability Office, March 15, 2006

FT-1: "Northrop Grumman Plays Critical Role In Missile Defense Test," *Space Daily*, Dec. 15, 2005; "MDA deems first flight test of revamped GMD program a success," *Inside the Pentagon*, Dec. 15, 2005

FTG 04-5 – FTX-02: *FY 2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2006

FTX-01: "U.S. plans Pentagon cancels three more intercept tests," *Global Security Newswire*, April 21, 2003; "GMD test cancellation delays test of upgraded radar," *Aerospace Daily*, May 14, 2003

FT 04-2 – FTG-04: *FY 2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2006

FTC-02B (formerly CMCM-1/FT 04-2): *U.S. Fed News*, April 13, 2006; "MDA officials tout two successful countermeasures flight," *Inside the Pentagon*, May 4, 2006

CMCM-2 (formerly FT 04-4): "Vacuuming Up The Data," *Defense Daily*, May 1, 2006; "Missile defense test conducted off Hawaii," *Agence France-Presse*, April 28, 2006; "Orbital Successfully Launches Second Target Rocket for U.S. Missile Defense Agency's CMCM-2 Program; Two Launches in April Conducted from Hawaii's Pacific Missile Site," *Business Wire*, May 1, 2006

FTC 03 – FTX-02: *FY 2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2006

FT-2 – FT-3: "Duma: Next Three GMD Flight Tests Critical to Confidence-Building," *Inside the Army*, April 10, 2006; "MDA deems first flight test of revamped GMD program a success," *Inside the Pentagon*, Dec. 15, 2005

FTG-05 – FT 04-3: *FY 2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2006

FTG-04: "Duma: Next Three GMD Flight Tests Critical to Confidence-Building," *Inside the Army*, April 10, 2006; "MDA deems first flight test of revamped GMD program a success," *Inside the Pentagon*, Dec. 15, 2005

FTX-03 - FTG 10-6: *FY 2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2006

FTG 04-3 - FTG 04-4a/b: *FY 2006/2007, Missile Defense Agency (MDA) Exhibit R-2A RDT&E Project Justification*, February 2005

IFT-27 – IFT-30: *MDA RDT&E, Defense-Wide Budget Documentation, FY 2005 Budget Request*, February 2004