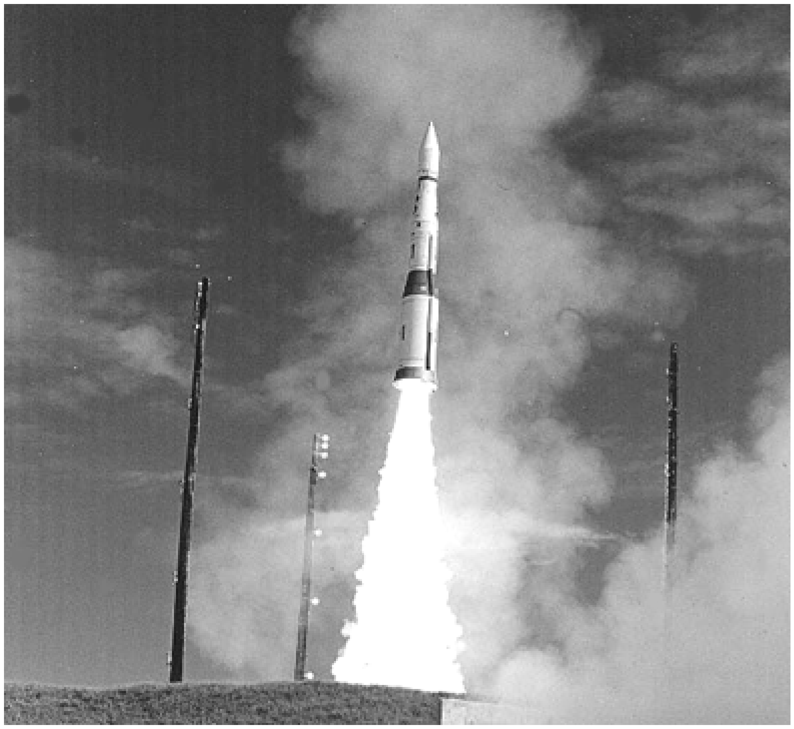
NATIONAL MISSILE DEFENSE (NMD)



DoD ACAT ID Program

Total Number of Interceptors:	20 (Capability 1)
Total Life Cycle Cost (TY$):	$26,600M*
Pro Rata Interceptor Cost (TY$):	$1,150 M
Deployment Readiness Review:	3QFY00
Capability 1 IOC:	FY05

Prime Contractor
LSI: - Boeing North American

**Assumes an FY05 deployment. The figure quoted includes the cost of operating the system for 20 years as well as development, production, and construction costs.*

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The mission of the National Missile Defense (NMD) system is to defend all fifty United States against a limited strike of Intercontinental Ballistic Missiles (ICBMs). The initial deployment (Capability 1) is intended to defend against attacks by adversaries from "rest-of-world," or "rogue nations," with a residual capability against small-scale unauthorized or accidental launches. The system must perform detection, discrimination, battle management, and intercept functions, which require the integration of multiple sensor, communications, command and control, and weapon systems. Capability 2 will be an improved configuration that would exceed the values of the User's threshold operational requirements, but fall short of the objective value. Capability 3 would meet the objective values of the User's operational requirements. The objective capability may take an additional three to five years after the initial deployment of NMD.

The NMD system is an integrated collection of subsystems, referred to as "Elements," that perform dedicated functions during an ICBM engagement. The System will include a Battle Management, Command, Control, and Communications (BMC^3) element, four types of long-range sensors (the Defense Support Program and Space Based Infrared System satellites, Upgraded Early Warning Radar (UEWR), and a Ground Based X Band Radar (XBR)) and arsenal of Ground Based Interceptors (GBI). The BMC^3 at the Cheyenne Mountain Operations Center will perform engagement planning and situation assessment while keeping a "human-in-control," and serve to integrate the GBI and sensor operations through the In-Flight Interceptor Communications System (IFICS). The GBI is a silo-based, three-stage, commercial-off-the-shelf, ICBM-class missile that delivers a separating Exoatmospheric Kill Vehicle (EKV) to an "acquisition point" above the atmosphere en route to engage a threat target. At this point, in a manner similar to upper-tier theater missile defense systems, the EKV uses an infrared seeker to acquire and track the target, firing divert thrusters (for terminal guidance and control) to achieve a direct hit on the targeted reentry vehicle (RV). After the intercept, ground radar continue to collect data so that a kill assessment can be made to evaluate the success or failure of the engagement.

By design, NMD embodies the ***Joint Vision 2010*** operational concept of ***precision engagement***: NMD is an integrated system of subsystem elements, relying on ***information superiority*** to provide responsive command and control to engage attacking ICBMs. It performs kill assessment to evaluate the success of an engagement, and is capable of executing multiple engagements. By providing defense for the nation, NMD also incorporates the operational concept of ***full-dimensional protection***.

BACKGROUND INFORMATION

In early 1996, the DoD completed a comprehensive review of its theater and national ballistic missile defense programs. The review shifted the NMD program from a Technology Readiness Program (1993-1996) to a Deployment Readiness Program (1996-2003), with the potential for a deployment decision in 2000. The previous acquisition strategy for NMD, referred to as the "3+3" program, has been modified based on redirection from the Secretary of Defense. The revised strategy retains a two-phased approach: (1) development; and (2) possible deployment, based on the threat and the demonstrated technological feasibility of the system to defeat that threat. A decision to deploy, based on the recommendation of the Deployment Readiness Review (DRR), planned for June 2000, would allow the program to plan for the fielding of a Capability 1 architecture by 2005 instead of 2003. The specific decisions to be made at the DRR are the commitment to deployment, element site selection, and authorization to proceed to contract award for site construction. Two other key decision points have been added on the path to the 2005 deployment. An FY01 decision will consider the building and/or upgrading of required ground radar systems and the integration of command and control software into the Cheyenne Mountain Operations Center. An FY03 decision will determine if the weapon system is ready for limited production and deployment. If no deployment decision is made, the program will still continue development with an eventual focus on a more capable NMD (Capability 2) system.

The Secretary also directed the Department to take no programmatic steps that would preclude the potential to deploy earlier than FY05. As part of the NMD redirection, more than $6 billion in additional funding was programmed to support development and initial deployment.

In the spring of 1998, the Ballistic Missile Defense Organization awarded the Lead System Integrator (LSI) contract to Boeing North American. The LSI serves as the prime contractor for NMD system development. The LSI contractor will be responsible for integrating the elements of NMD (radar, interceptors, and the BMC[3]). In addition, the LSI will demonstrate the system capability through integrated ground and flight testing. In December 1998, Boeing selected Raytheon as the EKV contractor. A Boeing designed EKVwould be held in abeyance, as a risk reduction activity, until completion of data reduction of Integrated Flight Test-4. Plans for this kill vehicle are undefined at this time.

The LSI will also serve as the key player in developing the necessary plans for fielding the system, should the decision be made to do so.

TEST & EVALUATION ACTIVITY

The system is currently in the Initial Development phase. It is during this phase that an initial NMD capability will be developed and its technological maturity demonstrated. This period will culminate in the DRR, which will determine whether the NMD Capability 1 system is technologically ready, if warranted by the emerging threat, to proceed to deployment. The previous TEMP is being revised. The purpose of the new TEMP is to define the specific progression of the T&E program from the present to an IOC in 2005. The revision will be accomplished in two phases. Phase I addresses the changes to pre-DRR ground and flight testing, brought on by the advent of the LSI and the down-select to a single EKV contractor. The Phase I TEMP was approved by OSD on December 21, 1999. The Phase II edition will provide a detailed T&E roadmap, to include modeling and simulation, for the evolution of the NMD system to the Capability 1 deployment. The Phase II document is expected at OSD in 3QFY00.

Near-term NMD T&E planning focuses on the ability to provide accurate test information and data in support of the DRR, and the ability of the system to achieve the following objectives:

- Demonstrate end-to-end integrated system performance, including the ability to prepare, launch, and fly-out a designated weapon; and kill a threat-representative target through body-on-body impact.
- Demonstrate end-to-end target detection, acquisition, tracking, correlation, and handover performance.
- Demonstrate real-time discrimination performance.
- Demonstrate NMD system kill assessment capability.
- Demonstrate the ability of the NMD battle management software to develop and coordinate battle engagement plans; prepare, launch, and fly out a designated weapon, and kill a threat representative target.
- Demonstrate integration, interface compatibility, and performance of system and sub-system hardware and software.
- Demonstrate human-in-control operations of the NMD system.
- Demonstrate system lethality.

Capability 1 system elements are derived from previous technology programs and will be integrated and tested in a series of Integrated Flight Tests (IFTs). Initially using surrogates to approximate NMD elements (as needed), then progressing to prototypes, IFTs are designed to collect data that address system issues and key technical parameters, verify the performance of NMD elements, and demonstrate overall system effectiveness. IFT-5, the final test to demonstrate overall system performance before the DRR, is scheduled for 3QFY00, and will play a key role in demonstrating that overall system objectives are met. The following table shows the major milestones in the flight testing program.

CURRENT SCHEDULE OF MAJOR FLIGHT TEST MILESTONES

Capability Level	Event	Planned Date	Purpose
Capability 1	IFT-3	October 1999	First intercept of a target in the exoatmosphere using range instrumentation and EKV guidance-**achieved an intercept.**
Capability 1	IFT-4	January 2000	First intercept attempt using NMD system prototype elements or surrogates, ***except*** the In Flight Interceptor Communications System and objective booster-**failed to achieve an intercept**.
Capability 1	IFT-5	3QFY00	First intercept attempt with all NMD prototype or surrogate elements integrated together ***except*** the objective booster.
Capability 1	IFT-7	2QFY01	First intercept attempt with objective, off-the-shelf booster.
Capability 1	IFT-14	2QFY03	First flight test against dedicated LFT&E target (Uses production representative EKV).
Capability 1	IFT-19	1QFY05	First IOT&E flight test.
Capability 2	TBD	TBD after FY05	First intercept at enhanced deployed capability on path to User's objective operational requirements.
Capability 3	TBD	TBD after 2007	Demonstrate intercept at objective Capability 3 performance level.

The initial flight test, IFT-1, was attempted in January 1997, but the Payload Launch Vehicle, the surrogate for the missile booster, failed to launch and the test was aborted. Since then, the NMD T&E program has performed two integrated flight tests: IFT-1A and IFT-2. IFT-1A, executed in June 1997, and IFT-2, executed in January 1998, were deemed highly successful. Both IFT-1A and IFT-2 were non-intercept, fly-by tests, designed to assess EKV seeker discrimination and homing algorithm design. Boeing and Raytheon built the EKVs for IFT-1A and IFT-2, respectively. IFT-3 and IFT-4 were previously planned to be intercept attempts by Boeing and Raytheon in support of an EKV contractor down-select prior to IFT-5. At the recommendation of the LSI, the NMD Joint Program Office (JPO) opted to down-select to a single EKV design prior to IFT-3. This approach has the advantage of three possible intercept flights with the selected EKV prior to the DRR, but added the risk of no attempts prior to down-select.

IFT-3 was conducted on October 2, 1999. It was the first attempt at intercepting a threat-like ICBM test target. The target complex, which consisted of an RV and a large balloon decoy, was launched by a Minuteman based Multi-Service Launch System from Vandenberg AFB, CA. The GBI surrogate, the Payload Launch Vehicle (PLV), was launched about twenty minutes later from Meck Island in the Kwajalein Atoll, about 4,200 miles west of Vandenberg. While the test examined all aspects of the NMD system design to some degree, its principal focus was the EKV. The EKV was boosted to its deployment location by the PLV and guided to its initial acquisition position by range instrumentation and Global Positioning System data downloaded from the target RV. After separation from the PLV, the EKV oriented itself to look at known star configurationsto correct for any attitude bias. Errors induced in the inertial navigation system during this orientation process , coupled with incorrect star data that was loaded into the system pre-flight, subsequently induced additional aiming errors into the EKV. Given these errors, when the EKV aimed itself toward the expected target location, nothing appeared in the field of view. After executing its search routine, it acquired the large balloon and subsequently the rest of the target complex. From that point, the EKV discriminated the RV from the other objects and diverted to an intercept. The large balloon aided in acquisition of the target. It is uncertain whether the EKV could have achieved an intercept in the absence of the balloon, although analysis of the data indicates that achievement of the intercept cannot be discounted.

IFT-4 was conducted on January 18, 2000. It was the first flight test for which the LSI assumed complete responsibility. Previous flight tests were run by the Government. IFT-4 attempted to demonstrate the functionality of all of the NMD elements, although the PLV was again used to launch the EKV and the In Flight Interceptor Communications System was not fully exercised. Additionally, mid-range target tracking was accomplished using beacon tracking or GPS data from the target RV. The interceptor Weapon Task Plan initial targeting coordinates and In Flight Target Updates were created using the GPS data, which is significantly more accurate than similar data from the Early Warning X-Band Radar. IFT-4 failed to achieve an intercept. Forensic analysis of the test data is ongoing to understand the cause(s) of the missed intercept.

Integrated Ground Tests (IGTs) will be conducted utilizing the Integrated System Test Capability (ISTC), a computer-based hardware/software-in-the-loop test tool that uses actual NMD element data processors and software in an integrated configuration. Unlike the range-constrained IFTs, IGTs will look at the total engagement space in a tactical environment. They will also: (1) validate the functional interfaces between the elements; (2) subject those interfaces to stressing environments and tactical scenarios; and (3) evaluate target-intercept boundary conditions. In short, IGTs will enable identification of “unknown unknowns” in an interactive system context, and verify the interoperability of NMD elements.

Prior to the formalization of the NMD program, IGTs-1 and 2 were informally conducted to verify the development of the ISTC and assess preliminary functional interactions and interfaces among NMD element representations. IGT-1A was the first formal ground test designed to demonstrate successful exchange of messages between the BMC^3 and the prototype XBR, (the Ground Based Radar Prototype (GBR-P)). IGT-1A was conducted from April to May 1998, using ISTC Configuration Build 4.0.2, which incorporated BMC^3 Capability Increment-2 and GBR-P Increment-1 processors. The IGT-1A threat scenarios were representative of IFT scenarios, derived from measurements by range sensor data recorded during IFT-1A. All IGT-1A objectives were successfully accomplished. IGT-3 added a UEWR processor to the GBR-P and BMC^3 network and exchanged information using the Capability Increment-3 message set. There were 75 good run-for-record test runs conducted from February 1-18, 1999. All objectives were achieved, although the UEWR was sometimes overwhelmed by the number of cues it received from the BMC^3. Also, the UEWR did not always track all of the objects that it should have. In addition, during six control tests, significant unexpected variability was exhibited in system performance.

There were 50 acceptable runs-for-record for IGT-4, conducted during August 9-18, 1999. IGT-4 was not intended to assess the performance of the C1 architecture. The test successfully demonstrated integration of the BMC^3, GBR-P/XBR, and UEWR. There was no direct communication between the BMC^3 and the EKV. The UEWR was more successful in maintaining connections to the BMC^3 than it had been in IGT-3. The run-to-run variability was significantly smaller in IGT-4 than it had been in IGT-3.

There were 55 acceptable runs-for-record for IGT-5, conducted during October 12-19, 1999. The test continued to successfully demonstrate integration of the BMC^3, GBR-P/XBR, and UEWR. In addition, IGT-5 provided a preliminary assessment of the NMD performance against a subset of C-1 requirements. Of the six different types of scenario examined in IGT-5, only one scenario type had nominal performance. Most of the problems in the other scenarios were due to the lack of maturity of the NMD system representations used in IGT-5.

Computer models and simulations will provide representations of elements that are not mature enough for the test program. The principal simulation tool providing DRR support is the LSI Integration Distributed Simulation (LIDS). Modeling and simulation will be employed to effectively repeat hypothetical experiments in order to improve the statistical sample or determine the values of key technical parameters possibly overlooked or unmeasured.

All NMD flight testing will be in compliance with the Anti-Ballistic Missile (ABM) Treaty and other applicable treaties at the time of testing. Kwajalein Missile Range (KMR) and White Sands Missile Range are authorized to launch interceptors under the ABM treaty, but only KMR is configured to accept incoming strategically representative target flights. Accordingly, flight tests will use target suites launched from Vandenberg and directed towards KMR.

The LFT&E Working Group, a subgroup of the NMD Lethality IPT, has developed the LFT&E strategy for NMD. LFT&E activities include flight testing, sub-scale light-gas-gun testing, and simulation analyses. Sled tests are also being considered for low-end intercept velocities. Three dedicated LFT&E flight tests are planned to be conducted.

The NMD T&E program also includes a number of pre-DRR lethality test and analysis activities to support the development and accreditation of first-principles physics codes, commonly known as hydrocodes, for application to NMD. This testing will also support the development and accreditation of the lethality simulation known as Parametric Endoatmospheric/Exoatmospheric Lethality System. These simulation tools will be used for analyses in both pre- and post-DRR timeframes. The activities include: (1) target aerothermal shield damage analyses; (2) hydrocode analyses that define kill criteria for the respective EKV designs proposed by Boeing and Raytheon; (3) light-gas-gun impact testing for hydrocode validation; (4) kill-enhancement device testing; and (5) light-gas-gun testing to develop and validate material equations of state at high velocities. The analysis activities are currently ongoing. Twenty light-gas-gun tests planned for hydrocode validation were successfully completed in FY99. Testing to develop equations-of-state (the characterization of the physical phenomena that occurs during impact) is in its initial stages.

NMD Y2K vulnerability assessment addressed all aspects of the program, including the system elements (especially the BMC^3 system), the flight and ground testing supporting systems, and the models and simulations used to predict performance. All NMD mission critical deployable systems, as well as science and technology support systems, were declared Y2K Compliant by the Ballistic Missile Defense Organization Y2K Compliance Review Board in July, 1999. The process of Y2K compliance includes assessment, renovation, validation, and implementation phases. The NMD program office will continue to work with the LSI to ensure Y2K compliance of the deployable systems through a configuration management process as hardware/software development continues. The program also conducted a Y2K Operational Evaluation Test of system prototypes to preclude a Y2K anomaly during any flight testing after January 1, 2000. Associated elements for conduct of IFTs and IGTs also underwent extensive Y2K testing. Two Y2K Operational Evaluation tests were conducted within the flight and ground test schedules. The first occurred at the ISTC prior to pre-mission testing for IFT-4. The second was conducted at KMR in early January 2000 during the pre-mission checkout for IFT-4. During the pre-mission dry runs and readiness tests, participating elements and the mission control support tested Y2K dates. This testing verified: (1) interface hardware and software; (2) sub-system functions; and (3) that the adequacy of operator training and procedures are not affected by Y2K dates. Testing through IFT-4 has not identified any Y2K problems.

TEST & EVALUATION ASSESSMENT

Despite the revised program, the aggressive schedule established for the NMD Program presents a major challenge. The NMD program will have to compress the work of 10 to 12 years into 8 or less years. As a result, many of the design and T&E activities will be performed concurrently. Program delays also caused the conduct of IFT-3 to slip to October 1999. This represents almost a 20-month slip over the last two years and demonstrates an extremely high-risk schedule. Additionally, the failure of IFT-4 to achieve an intercept may result in a further setback to the NMD schedule. The revised program has alleviated some of the long-term risk by deferring and staging the decision process as described earlier. However, since the DRR date has not been deferred, undue pressure has been placed on the program to meet an artificial decision point in the development process. The DRR will be a “come as you are” type of review which will examine the maturity and potential of the program at that point. This is driving the program to be “schedule” rather than “event” driven. This pattern has historically resulted in a negative effect on virtually every troubled DoD development program. In spite of this intense pressure, the program manager is doing an excellent job in trying to efficiently and effectively manage the preparation for the DRR and ultimately the deployment.

The complex operating characteristics and environments of the NMD T&E Program make it necessary to plan and conduct IFTs that are restricted in scope. DRR information based on a few flight tests with immature elements will be limited. Although IFT-3 was an important test in ballistic missile defense and demonstrated a newtechnology, it had significant limitations to operational realism, as noted throughout this report.

Due to the restrictions on realistic operational flight testing, the T&E program will rely heavily on ground testing and the execution of simulations for assessing the maturity and performance of the NMD system concept. The LIDS model development is proceeding much slower than planned. It is extremely doubtful that the model will be completed in time to allow for a rigorous system analysis for the DRR, resulting in limited analysis. A “beta” version of the software is promised to be ready by the end of February 2000. Service Operational Test Agencies may have to rely on alternative low fidelity models to assess the potential system effectiveness.

The FY98 DOT&E Annual Report identified a number of risks that could have significant impact on the NMD T&E program’s ability to test, analyze, and evaluate system performance. The degree to which those risk areas have changed from the last reporting cycle are addressed below:

- Limited Pre-DRR system-level testing: Only three intercept flight tests are planned before the DRR. Furthermore, the IFT-5 configuration will differ from the Capability-1 system; it uses prototype and surrogate sensors and a surrogate GBI booster stack. Nothing in the program alleviates this system maturity or schedule issues. Since IFT-3 was not conducted until October 2, 1999 and IFT-4 failed to achieve intercept, the schedule risk is increasing. On a positive note, while stretching out the program does not increase or decrease the number of pre- or post-DRR flight tests, it does allow more opportunity for operational testing a more mature system prior to fielding.

- Limited engagement conditions: Flight test launches from California and interceptors from Kwajalein Missile Range, along with safety constraints, place significant limitations on achieving realistic geometry and closing velocities. This area is unchanged. The geometry of an intercept of a missile launched *from* Vandenberg AFB, CA, presents an easily detectable, large, then decreasing radar return signal to the surrogate early warning radar used to support the flight tests. The mid-range tracking coordinates of the target RV are provided by a beacon transmitter on the RV or through a GPS receiver on the RV relayed to the ground. Pre-launch Weapon Task Plans for the interceptor are created using these data sources. This approach is acceptable for early developmental testing, but it does not suitably stress the NMD system in a realistic enough manner to support acquisition decisions. Additionally, the intercept velocities that are safely permitted during testing are on the low end of what might occur in a real ICBM attack. This limits the operational realism and engagement conditions.

- GBI booster testing: The NMD T&E program makes use of a surrogate launch vehicle, the Payload Launch Vehicle, for all flight tests until IFT-7. The program restructure has not affected this limitation. The objective booster contract was awarded in July 1998, and first delivery will not occur until after the FY00 DRR. Lack of IFT data without the objective GBI capability (e.g., larger burnout velocity than the Payload Launch Vehicle) before the DRR will limit the GBI evaluation. Since the date of the DRR is not being changed, the evaluation will not have the benefit of data from intercept flight tests using the new booster. However, the risk of limited GBI booster testing has been mitigated somewhat by the scheduling of two Boost Vehicle Tests before the DRR. These tests will evaluate the performance of the booster with an emulated EKV package added to the front end of the missile. However, IFT-7 is the first integrated system test *against a target* that makes use of the objective booster. The mitigating factor in this risk area is that the weapon decision will not be made until 2003.

- Limitations of ground testing: The ISTC will be the major source of data generated from ground testing. This area has been improved somewhat through the incorporation of common scenarios from one IGT to the next. This will allow the tracking of progress in the ISTC development. However, test articles used to represent NMD elements in the testbed will still have minimal verification or validation in time for the DRR. Additionally, the validation process is not linked directly to flight test scenarios, since the IGTs use actual Element processors versus the surrogate Elements that currently support flight testing. The risk in this area should be reduced in the post-DRR timeframe, as the program embarks on an aggressive, comprehensive end-to-end hardware-in-the-loop effort. However, it is imperative that the hardware-in-the-loop program focus its initial efforts on the EKV.

- Target suite: The NMD T&E program is building a target suite that, while an adequate representation of one or two RVs, may not be representative of threat penetration aids, booster, or post-boost vehicles. Use of the large balloon in the target complex has some value, but continued use should be reevaluated for future flight tests. Test targets of the current program do not represent the complete "design-to" threat space and are not representative of the full sensor requirements spectrum (e.g., discrimination requirements). Much of this limitation, however, is attributable to the lack of information surrounding the real threat. As the knowledge of the threat evolves, the risk in this area should decrease slightly. However, specific details on threat characteristics are rarely readily accessible.

- Multiple target testing: NMD system performance against multiple targets is still not currently planned for demonstration in the flight test program. There are, however, plans to begin construction on two silos at KMR, which can be employed to do flight testing against multiple targets. The focus in this area is to use validated simulations to evaluate multiple simultaneous target engagement.

- BMC^3 interoperability testing: The BMC^3 to Commander-In-Chief interface inside Cheyenne Mountain will not be tested prior to the DRR. Little has changed in the pre-DRR timeframe under the current program. Build Increment-1, the first significant BMC^3 release, will not be available until 2QFY00, providing very little time to be fully evaluated by the June 2000 DRR. The revised deployment schedule does reduce risk in this area, however, by providing more time for post-DRR BMC^3/Cheyenne Mountain Operations Center integration and testing. Additionally, the decision on whether to initiate the integration has been deferred to the 2QFY01 Defense Acquisition Board.

- Spare test articles: The previous TEMP identified a lack of spare test articles due to a resource allocation trade-off. Current program planning uses a rolling spare concept in which the test target for the immediate future test flight serves as the backup for the current flight test. This approach will mitigate the spare target problem; however, the spare test article issue also applies to the interceptor and EKV, where test failures have major schedule impacts.

- Limitations of ground lethality testing: Currently, there is no ground test facility capable of propelling EKVs or their full-scale replicas against targets at the closing velocities expected for NMD intercepts. These closing velocities will exceed 7 kilometers per second (KPS) and in some cases will even exceed 10 KPS. Existing full-scale sled track facilities have only approached 3 KPS. Additionally, propelling a non-aerodynamic structure, such as the EKV, down a sled track through an atmosphere at the operational velocities involves special considerations. Holloman High Speed Sled Track is working on measures to achieve much higher velocities approaching Mach 10 (approx. 3.5 KPS), still much lower than tactical intercepts. If this work is successful, the lethality test data to support DRR will still have to be collected from light-gas-gun tests of reduced-scale replicas of EKV surrogates and targets at the lower-end (six kilometers per second or less) of the intercept velocity spectrum, with hydrocode simulations for the higher velocities.

- Programmatic Issues: The LSI contractor has taken time to overcome the inertia of bringing the program up to full speed. The Government's System Evaluation Plan was supposed to be replaced by a LSI generated System Verification Plan (SVP). The LSI has now determined that the SVP is not sufficient to evaluate the program for the DRR, and is developing a

System Analysis Plan that will provide the roadmap for DRR assessment. The High Fidelity System Simulation, which was to be the fast running, system performance, digital simulation for assessing many scenarios throughout the threat space, has been abandoned in favor of Boeing's LIDS model. It now appears that LIDS is at high risk of being delivered in time to allow for a robust system evaluation for the DRR or will have a reduced functionality and only allow for minimal evaluation.

- Logistics Support (***New concern***): Mathematical predictions for the Element reliability and availability goals that are needed to satisfy operational requirements are extraordinarily high. These requirements may be either unachievable or necessitate extensive spare parts supplies or intense maintenance efforts.

VALUE ADDED

DOT&E has been a significant contributor through the IPT process to formulate the NMD T&E program on practically a daily basis. We have been one of the principal stimuli to the JPO's plan to develop a comprehensive integrated HWIL effort. This will enable an effective and efficient ground testing capability, which will significantly reduce the risk of successful flight testing.

At DOT&E's recommendation, the JPO is proposing to alter the 2003 weapon decision to seek low rate rather than full-rate production authorization. It will permit dedicated LFT&E flight tests to be performed with production representative EKVs and allow the IOT&E to be conducted prior to full-rate production. This will reduce the risk of prematurely committing to the production in large quantities of interceptors that may not have sufficient lethality to defeat threat RVs.

Many of DOT&E's concerns and recommendations have likewise been independently captured in the second Welsh panel report.

RECOMMENDATIONS

The DRR is currently firmly scheduled in June 2000 rather than after completion of the analysis of IFT-5. This is a strongly "schedule driven" (vice "event driven") approach, thereby placing unrealistic pressure on the JPO. IFT-5 will be the first intercept attempt with all NMD elements integrated except the booster. DOT&E is recommending that preparations for the DRR allow time for a thorough analysis of the IFT-5 test data in order to inform the DRR decision, especially in light of the failure of IFT-4 to intercept the target. This would provide a clear technical understanding of the results and avoid forcing the DRR before the analysis is complete.

Several factors drive the need for an improved hardware-in-the-loop approach. They include the failed IFT-4 intercept, the role of the large balloon in supporting an intercept and speculation on the EKV's ability to discriminate countermeasures. DOT&E strongly recommends an intensive effort to develop a flexible, comprehensive hardware-in-the-loop facility that presents a high fidelity representation of the threat target for designing and testing of the EKV.