FY04 Director of Operational Test and Evaluation (DOT&E) Report

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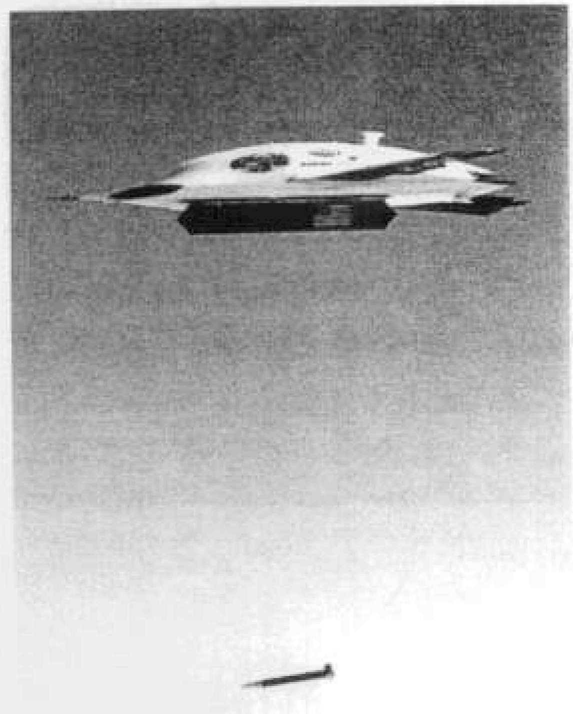
Joint Unmanned Combat Air Systems (J-UCAS)

SUMMARY

- The Joint Unmanned Combat Air Systems (J-UCAS) program is an Advanced Technology Demonstration. The program will demonstrate the potential of unmanned aerial vehicles to perform the following missions:
  - Suppression of Enemy Air Defenses and Strike from a low observable platform
  - Electronic Warfare support/ Electronic Attack
  - Persistent Intelligence, Surveillance, and Reconnaissance
- The J-UCAS program comprises:
  - Boeing X-45C unmanned vehicle
  - Northrop Grumman X-47B unmanned vehicle
  - Common Operating System
- Operational assessments of the J-UCAS will occur in the FY07-12 timeframe. The Services can initiate a decision to enter into a formal acquisition program at any point.



X-45A accomplishments include the release of an inert, GPS-guided 250 pound bomb from its internal weapons bay.

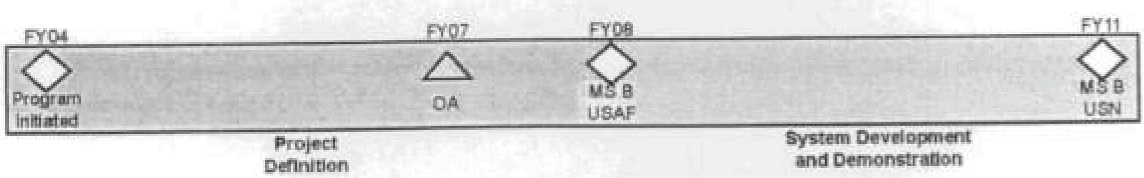
SYSTEM DESCRIPTION AND MISSION

J-UCAS stood up as a Joint Defense Advanced Research Projects Agency/Air Force/Navy Advanced Technology Demonstration program during 2004. The J-UCAS program combined the Unmanned Combat Aerial Vehicle–Air Force and the Unmanned Combat Aerial Vehicle–Navy programs. The Defense Advanced Research Projects Agency is leading the overall effort. They are responsible for the planning and execution of a joint system technology demonstration program, support of the Services' independent operational assessment, and support preparations for potential acquisition transition options that align with emerging Air Force and Navy requirements.

The Boeing X-45C and Northrop Grumman X-47B development efforts will produce multiple air vehicles with significant survivability, range, and persistence. The vehicles will also integrate sensor, weapons, and communications systems. The Boeing X-45C has an increased emphasis on survivability.

The Northrop Grumman X-47C will provide the capability for limited carrier suitability demonstrations. The Common Operating System provides the functionality and interfaces for command and control, autonomous operations communications management, and system health and status reporting. The Common Operating System is an open architecture system.

TEST AND EVALUATION ACTIVITY



J-UCAS flight-tested the Boeing X-45A air vehicle with Block 2 software. This block of software provides weapons delivery capability and multi-vehicle operations. These flight test events are part of the risk reduction effort for J-UCAS and are a flow down from the Unmanned Combat Aerial Vehicle–Air Force contract.

Boeing X-45A accomplishments include:

- Release of an inert, unguided 250-pound bomb from its internal weapons bay.
- Release of an inert, GPS-guided 250 pound bomb from its internal weapons bay.
- Conduct of a formation flight with two X-45A vehicles.

TEST AND EVALUATION ASSESSMENT

The development of the integrated operational assessment plan is in the initial stages. Early involvement of the Operational Test Activities is important to ensure an independent, operational perspective is available to inform program decision-making. An operational assessment should be an entrance requirement for the Milestone B decision.

Phased Array Tracking Radar Interception on Target (PATRIOT)/Medium Extended Air Defense System (MEADS) Combined Aggregate Program (CAP)

SUMMARY

- PAC-3 demonstrated effectiveness, suitability, survivability, and lethality against a limited set of threats during Initial Operational Test and Evaluation (IOT&E). However, both IOT&E and Operation Iraqi Freedom (OIF) revealed problems with the Phased Array Tracking Radar Interception on Target (PATRIOT) system.
- The Army is addressing these problems through the PAC-3 evolutionary development program.
- The Army conducted two highly successful PAC-3 flight tests during 2004, the second of which involved multiple targets and PAC-3 interceptors in flight simultaneously. These tests completed objectives still outstanding from the IOT&E.
- With OSD approval of Milestone B, the Army successfully merged the PAC-3 program and the Medium Extended Air Defense System (MEADS) program into the PATRIOT/MEADS Combined Aggregate Program (CAP).

MEADS will be a highly mobile air and missile defense system for the protection of maneuver forces and fixed assets.

SYSTEM DESCRIPTION AND MISSION

The PAC-3 air and missile defense system detects, tracks, engages, and destroys short-range ballistic missiles, cruise missiles, fixed-wing aircraft, and other air-breathing threats. A PAC-3 battery includes an Engagement Control Station for battle management, a C-band radar, and up to eight launchers. PAC-3 batteries have a mix of new hit-to-kill PAC-3 missiles and older blast-fragmentation PAC-2 missiles, and PAC-2 Guidance Enhanced Missiles.

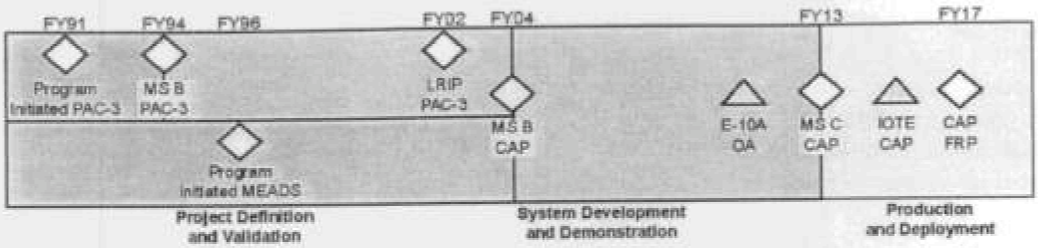
MEADS will be a highly mobile air and missile defense system for the protection of maneuver forces and fixed assets. The system should provide area and point defense capabilities against multiple, simultaneous, 360-degree attacks by ballistic missiles, large caliber rockets, fixed-wing and rotary-wing aircraft, unmanned aerial vehicles, cruise missiles, tactical air-to-surface missiles, and anti-radiation missiles. It should be strategically deployable by C-130 roll-on/roll-off, and tactically mobile to keep up with maneuver forces. MEADS is an international co-development program with Germany and Italy.

The Army merged the PAC-3 program and the MEADS program into the PATRIOT/MEADS CAP. The CAP includes improvements to the current PATRIOT air and missile defense system and the development of MEADS through three acquisition increments (AIs):

- AI-1 will produce an initial Battle Management, Command, Control, Communications, Computers, and Intelligence (BMC4I) element to replace current PATRIOT BMC4I elements. AI-1 IOT&E is in FY09.
- AI-2 will produce a new lightweight launcher and an improved Missile Segment Enhancement PAC-3 missile. AI-2 IOT&E is in FY11.

- AI-3 will produce the objective MEADS system, which will include the objective BMC4I element, a new UHF-band surveillance radar, and a new X-band multifunction fire control radar. The system will use both PAC-3 and Missile Segment Enhancement missiles. AI-3 IOT&E is in FY16.

TEST AND EVALUATION ACTIVITY



The Army conducted PAC-3 flight test ATM 2-1 at White Sands Missile Range, New Mexico, on March 4, 2004. The PAC-3 system fired two PAC-3 missiles at a PATRIOT as a Target (PAAT) missile, emulating a short-range ballistic missile. The first PAC-3 killed the target, satisfying a flight test objective from the IOT&E (Flight Test OT/DT-4b). The second PAC-3 self-destructed as designed.

The Army conducted PAC-3 flight test DT/OT-11 at White Sands Missile Range on September 2, 2004. DT/OT-11 was the first flight test to use PAC-3 missiles that incorporate cost reduction initiative changes to reduce missile cost while maintaining performance. Using a shoot-shoot tactical firing doctrine, the Army fired two PAC-3 missiles at a Modified PAAT (MPAAT) target missile. The first PAC-3 missile successfully killed the modified MPAAT. The second PAC-3 self-destructed as designed. Near simultaneously, using shoot-look-shoot tactical firing doctrine, the Army fired one PAC-3 missile at a cruise missile flying the same trajectory as the target in the failed OT-3b flight test during IOT&E. The PAC-3 successfully killed the cruise missile.

There are currently 28 flight tests scheduled for FY05-10 to verify upgrades to the PATRIOT system. There are also three flight tests scheduled for FY07-09 to test CAP AI-1, 7 flight tests scheduled for FY08-FY11 to test CAP AI-2, and 13 flight tests scheduled for FY11-17 to test CAP AI-3.

The Program Office conducted the MEADS Risk Reduction Effort exit demonstration near Rome, Italy, on May 6, 2004. DOT&E approved the PATRIOT/MEADS TEMP in August 2004. This fully-funded TEMP is adequate to evaluate the PAC-3 evolutionary development program and is adequate to evaluate the PATRIOT/MEADS CAP.

TEST AND EVALUATION ASSESSMENT

PAC-3 demonstrated effectiveness, suitability, survivability, and lethality against a limited set of threats during IOT&E. However, IOT&E and OIF revealed significant problems with the PATRIOT system. The Program Office is addressing these problems through the PATRIOT evolutionary development program.

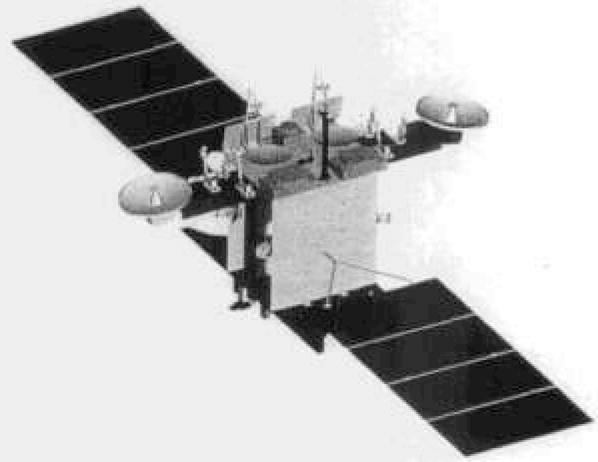
DOT&E has not yet received sufficient data on PATRIOT operations during OIF to perform a comprehensive evaluation of PATRIOT combat performance. However, the data we have received suggest a need for one or two additional flight mission simulator hardware-in-the-loop systems to conduct battalion level testing. Only one flight mission simulator was available during IOT&E, which limited testing to only one PATRIOT battery at a time. Data also suggests that air and missile defense testing should occur during Joint and coalition exercises that include large numbers of different aircraft types, sensors, BMC4I, and weapon systems.

The current MEADS test plan contains no U.S.-only operational testing prior to the battalion-level IOT&E in FY16. However, the International MEADS Evaluation Board plans to conduct a Fire Unit-level international operational test that includes two DT/OT flight tests and a multiple phase ground test program using production-representative equipment prior to the first unit equipped in FY15. Such a test would verify operational system performance prior to initial deployment. It would also provide an opportunity to discover and fix system problems prior to U.S. IOT&E.

Advanced Extremely High Frequency (AEHF) Satellite Communications System

SUMMARY

- The Air Force is making progress on the four major technology risk areas – nuclear hardening and shielding, nuller spot beam, phased array antenna, and electric propulsion.
- Special attention will be required in testing capabilities not adequately tested or deferred under Milstar program. These areas include mission planning and the nulling antenna.
- The synchronization of Service terminal programs remains critical for both launch and operational testing.



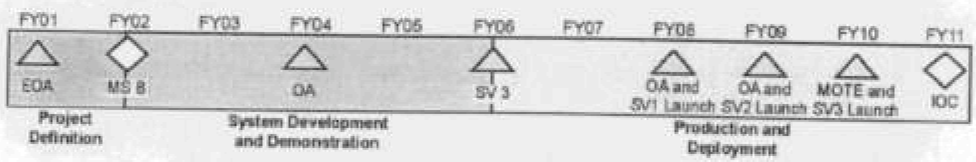
AEHF satellite communications system is designed to provide secure, survivable communications to U.S. warfighters during all levels of conflict.

SYSTEM DESCRIPTION AND MISSION

The Advanced Extremely High Frequency (AEHF) satellite communications system is designed to provide secure, survivable communications to U.S. warfighters during all levels of conflict. It will follow Milstar as the protected backbone of DoD's military satellite communications architecture, will increase system capacity by a factor of ten, and will increase the maximum data rate for an individual terminal from 1.544 Mbps to 8.192 Mbps. The first flight of the AEHF satellite program, named "Pathfinder", will be programmed to operate initially as a Milstar II satellite in order to complete the Milstar II constellation. The second flight will then be launched as a fully capable AEHF satellite. After it is operational, Pathfinder will be reprogrammed on-orbit as an AEHF satellite.

The first three program phases: AEHF Technology, Engineering Models, and System Definition are complete. At Milestone B, the Defense Acquisition Board authorized fabrication and assembly of the first two satellites (SV1, SV2), development and deployment of the ground command and control segment, and advanced procurement for one additional satellite (SV3) within the Future Years Defense Program. Following completion of the system-level Critical Design Review, a separate, tailored Milestone C was anticipated to provide the final authorization for production of SV3, SV4, and SV5. However, a February 2003-approved Acquisition Program Baseline incorporated a revised strategy that deleted SV4 and SV5. The strategy also discussed a decision point in 1QFY05 to evaluate Transformational Communications development and the need, if any, for additional AEHF satellites. The first AEHF launch is scheduled for 3QFY08 with the subsequent launches in 3QFY09 and 3QFY10.

TEST AND EVALUATION ACTIVITY



The Air Force Operational Test and Evaluation Center performed an early operational assessment and operational impact assessment in support of the Milestone B decision in 4QFY01. An operational assessment was conducted in FY04 in conjunction with the Critical Design Review. The Air Force Operational Test and Evaluation Center has not yet released the results of this operational assessment.

The Air Force will conduct a second operational assessment in FY07 to assess readiness of the AEHF Mission Control Segment to support the first AEHF launch. An operational assessment in FY07 will evaluate the results of the developmental test/operational test performed on the Pathfinder satellite to verify its full capability to function as a Milstar II low-data-rate/medium-data-rate satellite. Multi-Service operational test and evaluation, to be conducted in FY09, will evaluate whether the entire system, including equipment, personnel, procedures, training, and logistics support, is effective and suitable based on the operational requirements. The test will exercise satellite-to-satellite cross-links to evaluate theater-to-theater communications, network control, satellite control, and interoperability.

TEST AND EVALUATION ASSESSMENT

The system Program Office is making satisfactory progress on the four major technology risk areas: nuclear hardening and shielding, performance of the nuller spot beam, performance of the phased array antenna, and electric propulsion. Terminal synchronization remains essential for mission control and for a successful multi-Service operational test and evaluation. Monitoring the fidelity of the AEHF Universal System Test-Terminal simulator and the payload simulators is also imperative. If their configurations do not remain standardized and consistent with the true payload, the new terminals will not be compatible with the payload or with each other.

Also, modeling and simulation will assess nuller spot beam performance in a variety of single and multiple jammer scenarios. However, contractor model validation testing will be limited to only single jammer cases. DOT&E is concerned that the contractor needs more robust validation testing to reduce risks associated with using this model to evaluate nuller operational performance.

There is still a high program risk associated with the development of the cryptographic capability needed to integrate the AEHF extended data rate. This includes the manufacture of a highly complex Application Specific Integrated Circuit. Schedule slips in cryptographic development have consumed the entire available margin and are now pacing the program.

C-130J Family of Aircraft

SUMMARY

- Lockheed Martin initially developed specific versions of the C-130J for the British Royal Air Force and the Royal Australian Air Force.
- Approximately 70 percent of the U.S. variants represent new development and system integration relative to the legacy C-130s flying today.
- The C-130J was neither operationally effective nor operationally suitable in its Initial Operational Test and Evaluation (IOT&E) Phase I.
- The Air Force intends to deploy the C-130J to Central Command early in FY05, before the completion of IOT&E Phase II. Capabilities are limited.
- The C-130J Test and Evaluation Master Plan is being updated for approval in early FY05.
- C-130J operational testing will likely continue past 2008 as the program shifts to spiral development.
- There are no milestone decision reviews planned for any variant of the C-130J.

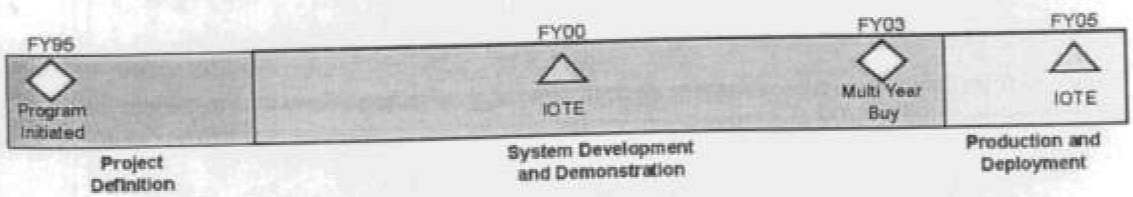
The basic C-130J is a medium-range, tactical airlift aircraft designed primarily for the transport of cargo and personnel within a theater of operations.

SYSTEM DESCRIPTION AND MISSION

The basic C-130J is a medium-range, tactical airlift aircraft designed primarily for the transport of cargo and personnel within a theater of operations. The cargo area can adapt to accommodate a combination of passengers, cargo, and/or aeromedical airlift missions. Variants of the C-130J are intended to perform missions such as fire fighting, weather reconnaissance (WC-130J), electronic combat (EC-130J), and aerial refueling (KC-130J). The combat delivery C-130J has more than 70 percent new equipment, relative to previous C-130 models. Significant differences include an advanced integrated digital avionics system, a redesigned flight station intended to facilitate a two-person cockpit, a new propulsion system intended to provide improved take-off, climb and cruise performance, and cargo handling system enhancements. The Air Force intends to deploy the C-130J to Central Command early in FY05, before the completion of IOT&E Phase II. Capabilities are limited.

DOT&E designated the C-130J aircraft for Live Fire Test and Evaluation (LFT&E) oversight in May 1995 and approved the Test and Evaluation Master Plan in July 1999. Threats include man-portable air defense systems, surface-to-air missiles, anti-aircraft artillery, air-to-air missiles, rockets, and small arms. The C-130J LFT&E vulnerability reduction program addresses wing dry bay fire, composite propeller blade ballistic vulnerability, engine and engine bay fire, vulnerability to man-portable air defense systems threats, and mission-abort vulnerability.

TEST AND EVALUATION ACTIVITY



Due to system immaturity, operational testing was initially segmented into three phases: Phase 1A, Phase 1B, and Phase 2. Phase 1A evaluated the ability of the aircraft to train pilots. Phase 1B evaluated the aircraft's ability to perform the airland mission. Phase 2, planned for FY06, will evaluate all combat delivery capabilities, including airdrop using the Enhanced Cargo Handling System.

Block 5.4 modifications are now designated as the production representative version, with operational testing scheduled for early FY06. Block 6.0 will include Communications, Navigation, and Surveillance for Air Traffic Management (CNS/ATM) capabilities, while Block 7.0 is undefined at this time. Many documented deficiencies will not be corrected until Block 6.0 or 7.0.

There were no Vulnerability Reduction Program activities in FY04. The Air Force delivered the Vulnerability Reduction Program Phase II (Composite Propeller Vulnerability) Test Report to DOT&E in June 2004. Phase IV (Engine Nacelle Fire Extinguishing Evaluation) testing is scheduled for FY05.

TEST AND EVALUATION ASSESSMENT

C-130J

Major issues confronting the C-130J program include funding of logistics support and training systems; hardware, software, and technical order deficiencies; manufacturing quality; sub-system reliability; failure to meet required measures of system effectiveness and suitability; and resolution of documented deficiencies. A program for the correction of deficiencies is being worked.

Based on the evaluation of test results from Phase 1A and Phase 1B, the aircraft is not operationally effective. However, the Air Mobility Command has released a limited cargo carrying capability based on results from a command-initiated Force Development Evaluation. The airdrop mission cannot be evaluated until deficiency corrections are implemented and the developmental and operational tests are completed as planned in FY06.

Aircrew workload issues, software discrepancies, and cargo loading and constraint requirements are still major issues. Air Force users are unable to verify manpower requirements to field this system until the crew workload evaluation is complete. Army developmental and operational test and evaluation for airdrop of cargo and personnel are now scheduled using Block 5.4 hardware and software. Air Force operational test and evaluation requires the completion of Army testing prior to start.

DOT&E determined that the aircraft is not operationally suitable. Phase 1B reliability, maintainability, availability, and logistics supportability results failed to meet operational requirements and legacy standards. Deficiencies were noted with on-aircraft integrated diagnostics and fault isolation systems, portable maintenance aids, maintenance technical orders, and the availability of spare parts. Additional contractor field service representatives are required to assist in the maintenance of the aircraft for the foreseeable future.

DOT&E determined that testing of defensive systems has not demonstrated their effectiveness and suitability. An integrated system-level test is required to characterize system capability. However, the Air Force intends to deploy the C-130J to Central Command early in FY05, before the completion of IOT&E Phase II and the integrated defensive system test. Capabilities are limited to airland operations.

Phase II of the Live Fire Vulnerability Reduction Program showed that the C-130J composite propeller blades are not vulnerable to catastrophic threat-induced failure. Completion of Phase IV testing will conclude Vulnerability Reduction Program testing.

WC-130J

Three major issues confront the weather reconnaissance aircraft. They are the radar performance in the hurricane reconnaissance mission, propeller anti-ice protective cover peeling, and excessive vibration in the Drop Sonde Operator's station.

The low power color radar was designed as a weather-avoidance radar, but it was installed in the WC-130J to perform the weather penetration mission. The radar does not fully support operational requirements for the weather mission. The

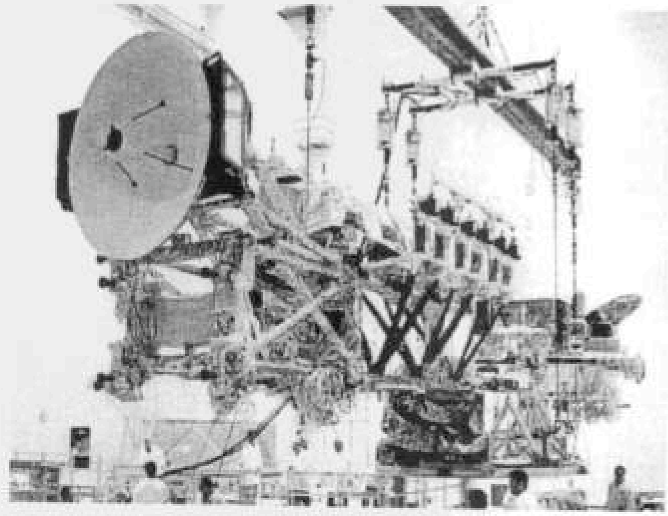
Developmental testing is being conducted, and if successful, operational testing will start in June 2006.

A proposed fix to the propeller problem has been installed on test aircraft. The fix must be tested in a hurricane environment, with some data being collected during the 2004 storm season. Integrated System Evaluations and combined developmental/operational test on the low power radar and propeller petal fixes are in progress. If the modifications are successful, then the next phase of OT&E can be performed on the WC-130J in storm season 2005. A possible fix to the excessive vibration problem is included in the Block 5.4 upgrade. Operational testing is planned for Fall 2005.

Milstar Satellite System

SUMMARY

- The Air Force Operational Test and Evaluation Center (AFOTEC) adjusted its test strategy in response to an Air Force Space Command (AFSPC) decision to use Milstar Communications Planning Tool-Integrated as the primary Milstar communications resource and management tool.
- The Milstar Ground Mobile van retest by AFOTEC demonstrated that the system can provide reliable, sustainable control for the required endurance period.
- Evaluation of three critical measures of effectiveness – Survivable Monitoring and Planning, Communication Area Denied, and Nuller Antenna Effects – has been rescheduled until a fully fielded capability is achieved and tested as a Force Development Evaluation.
- Testing on the nulling antenna has been insufficient for a realistic operational evaluation.



The Milstar Space Segment, as currently fielded with low-data rate/medium-data rate capability, continues to perform well.

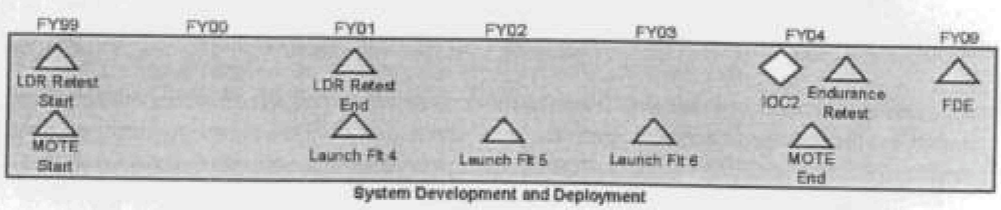
SYSTEM DESCRIPTION AND MISSION

The Milstar Satellite system accomplishes strategic and tactical missions through global communications that are secure, jam-resistant, survivable, and have a low probability of intercept. Milstar provides worldwide coverage for ground, airborne, submarine, and ship terminal communications connectivity. There are three Milstar segments: space, terminal, and mission control.

The Air Force launched six Milstar satellites between 1994 and 2003. The third Milstar launch placed the first low-data rate/medium-data rate satellite (Flight 3) in a non-operational orbit. In lieu of an additional Milstar satellite to replace Flight 3, AFSPC and the United States Strategic Command elected to wait for the first flight of the Advanced Extremely High Frequency satellite program currently scheduled for launch in 2007.

AFSPC declared Initial Operational Capability 1 for the low-data rate Milstar system in July 1997 and declared Initial Operational Capability 2 for the medium-data rate system in December 2003.

TEST AND EVALUATION ACTIVITY



System Development and Deployment

During FY04, AFOTEC completed some open test activity and integrated all its test results in preparation of the final multi-Service operational test and evaluation (MOT&E) report. DOT&E has not yet received the final report.

MOT&E of the low-data rate/medium-data rate satellites began in late FY01. AFOTEC completed low-data rate initial operational test and evaluation (IOT&E) in March 1997. DOT&E and AFSPC recommended that AFOTEC retest six measures of performance. Of these, AFOTEC retested three connectivity measures of performance during 1QFY00 and two suitability measures of performance between June 2000 and May 2001. AFOTEC completed the last of the six retests - Milstar System Endurance - during 2QFY04. DOT&E requested that AFOTEC retest System Endurance because the endurance capability test duration was insufficient. In response, AFOTEC conducted a full endurance test in FY04 using two Ground Mobile vans to control portions of the Milstar satellite constellation.

During FY04, AFSPC decided to use Milstar Communications Planning Tool-Integrated as the primary Milstar communications resource planning and management tool and Automated Communications Management System for specific functions to meet United States Strategic Command requirements. This decision, along with the launch failure of the third Milstar satellite, contributed to delays in completing critical operational evaluations required before Initial Operational Capability 2 declaration. Consequently, AFSPC redefined Initial Operational Capability 2 and postponed operational evaluation of three critical Milstar II requirements until 2005 when Milstar achieves a fully fielded capability. With AFOTEC's Milstar testing participation complete, responsibility shifts to AFSPC for this final phase of operational testing as a Force Development Evaluation. In addition, AFOTEC will test a hybrid version of the Mission Planning Element composed of a combination of both Milstar Communications Planning Tool-Integrated and Automated Communications Management System capabilities as indicated above.

The following measures of effectiveness remain under evaluation for Milstar II:

- Medium-data rate downlink antijam.
- Medium-data rate LPI/LPD.
- Medium-data rate uplink antijam.
- Medium-data rate uplink antijam.
- Information assurance.
- Survivable planning.
- Survivable monitoring and planning.
- Terminal data flow.
- Payload table generation.
- Problem resolution.
- Communication denied area.
- Nuller antenna effects.
- Resource utilization and requirements analysis.

TEST AND EVALUATION ASSESSMENT

The Milstar Space Segment, as currently fielded with low-data rate/medium-data rate capability, continues to perform well. Full assessment by DOT&E of medium-data rate operational effectiveness and suitability will follow after AFOTEC releases its MOT&E report.

The non-availability of Flight 3 capability reduces operational utility. Worldwide coverage from 65 degrees South to 65 degrees North latitude will not be available for the Milstar medium-data rate terminals until the launch of the Advanced Extremely High Frequency satellite in FY07. The lack of a fourth medium-data rate satellite limits the ability to provide two-satellite coverage to some contingency operations and, therefore, limits the throughput of protected communications. In addition, there is no medium-data rate coverage for approximately 25 degrees of longitude.

Proper interoperability evaluation of the Milstar system and terminals in an operational context requires testing of the Joint Task Force mission. Interoperability demonstrations conducted during developmental testing include the Joint Interoperability Test Command medium-data rate interoperability test. Initial results from these tests show coding, encryption, and modulation equipment incompatibility issues between Army and Navy terminals. Until the Joint Task Force concept of operations is better defined, it will be difficult to determine if the limited equipment used in these tests is operationally representative.

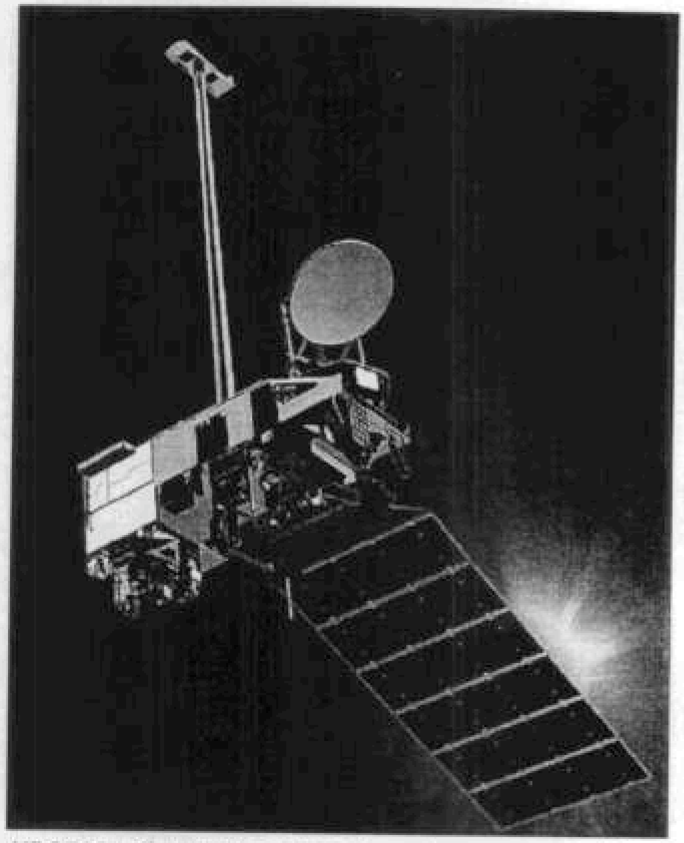
The system endurance retest demonstrated that the Ground Mobile vans could provide reliable, sustainable control of the Milstar constellation for the required endurance period. In this retest, AFOTEC evaluated system endurance, mission effectiveness, human factors, and the ability to rekey distant terminal crypto systems over-the-air.

The nulling antenna testing to date has been insufficient because it was not conducted in an operationally realistic scenario. The direct testing demonstration of communication during jamming has provided limited data collection to characterize the predicted and actual location of the antenna null in any particular event. In addition, no nuller models have been accredited for use in the evaluations of nuller performance during operationally realistic events.

National Polar-Orbiting Operational Environment Satellite (NPOESS)

SUMMARY

- The National Polar-Orbiting Operational Environmental Satellite System (NPOESS) is making adequate progress as system plans mature.
- Concerns remain in the areas of testing, design, and requirements that warrant special attention as the program progresses.
- Test and evaluation activity this past year included completion of an operational assessment and refinement of test planning and documentation.



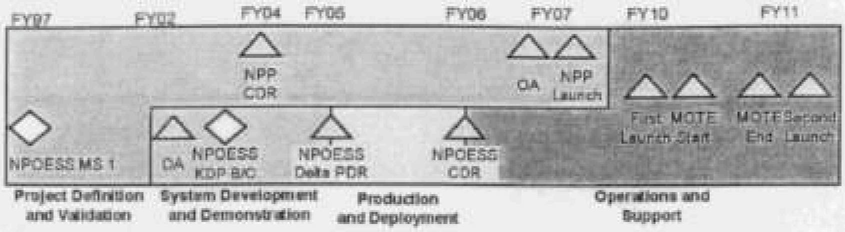
NPOESS will provide a national remote sensing capability to acquire and disseminate global and regional environment data.

SYSTEM DESCRIPTION AND MISSION

The NPOESS architecture includes four major segments plus launch support. The four major segments are Space; Command, Control, and Communications (C3); Interface Data Processing; and Field Terminals. The Space Segment consists of three satellites in sun-synchronous, near polar orbits with multiple, complex sensors that collect electromagnetic radiation in several bands. The C3 Segment provides all inter-segment communications to include routing of stored data to processing centers (Centrals) and routing of telemetry data to Mission Management Centers. The Interface Data Processing Segment (IDPS) consists of ground hardware and software at Centrals and software for use in Field Terminals. The IDPS converts raw sensor data into formats used to develop environmental, meteorological, and oceanographic products for weather users. The fixed and mobile Field Terminals are tactical systems designed to accept data directly from satellites and produce products needed by weather users. NPOESS provides capability for both civilian and military weather missions. Those NPOESS missions include aviation and space forecasts, ocean surface and internal structure forecasts for ship movements, search and rescue, and tropical storm reconnaissance and warnings.

NPOESS is a tri-agency program jointly administered by the DoD, the Department of Commerce's National Oceanic and Atmospheric Administration (NOAA), and the National Aeronautics and Space Administration (NASA). An NPOESS Executive Committee provides program management through an Integrated Program Office (IPO) with the Air Force as acquisition authority. NPOESS will provide a national remote sensing capability to acquire and disseminate global and regional environment data for a period of at least ten years. In 2003, the IPO restructured the program in response to funding constraints. A key risk reduction activity is the NPOESS Preparatory Project, which is a joint Integrated Program Office/NASA spacecraft with selected critical imaging and sounding sensor systems. As part of restructuring, the IPO delayed the Critical Design Review, NPOESS Preparatory Project launch, and the first potential NPOESS launch. Office of Secretary of Defense approval of the NPOESS Test and Evaluation Master Plan occurred in October 2002, with an update planned prior to the Critical Design Review in FY06.

TEST AND EVALUATION ACTIVITY



The Air Force Operational Test and Evaluation Center is the lead agency for all operational test and evaluation events, but will combine other Service operational test agencies, NOAA, and NASA efforts as appropriate to make efficient use of expertise and resources. The Air Force Operational Test and Evaluation Center completed the first part of an operational assessment and issued an Interim Summary Report in July 2002. The operational assessment completed in 2004 with a final report issued in December 2004 to support the April 2005 Delta Preliminary Design Review. The plan is for a new operational assessment to occur after the NPOESS Preparatory Project launch, currently planned for October 2006.

Test and evaluation efforts during this past year focused on planning to ensure that events synchronize with the program's restructure and that testing contributes to overall risk reduction and sound decision making. Activities in 2004 included publication of a Combined Test Force charter to define organizational roles and responsibilities, continuation of Direct Readout User Forum meetings to mature field terminal development and test planning, and meetings of the Test Planning Working Group to refine overall test planning and synchronize events.

TEST AND EVALUATION ASSESSMENT

NPOESS progress is adequate, but concerns remain in the areas of testing, design, and requirements that warrant special attention as plans continue to mature. In addition, the program's sensors, their integration, and algorithm development remain on a tight schedule and continue to face technical challenges.

Test-related concerns include Field Terminals and planning for Information Assurance testing. Field Terminal interoperability is one of the critical Information Exchange Requirements for the Interoperability Key Performance Parameter. Although the IPO is not responsible for developing Field Terminals, it plans to provide software and a demonstration terminal at each of two data rates to assist in terminal development by user agencies. In addition, risk reduction testing of individual agency Field Terminal prototypes should take place before launch, with terminals operationally interfacing with realistic NPOESS data sources in a controlled setting. Information assurance testing will be a focus area in the DOT&E evaluation, but is not addressed in the current NPOESS System Test Plan. The System Test Plan should incorporate information assurance, Electromagnetic Environmental Effects testing, and Air Force Satellite Control Network testing to support an integrated developmental and operational test program.

Design concerns relate to the Centrals, which were not designed to receive and process the magnitude of data expected from NPOESS. Furthermore, the models used by Centrals require modifications in order to match new NPOESS sensors. While these concerns are outside the IPO's control, allocation of resources for these improvements is critical to NPOESS success.

Requirements concerns involve differences between the system specification and Integrated Operational Requirements Document, and the lack of low-rate data thresholds. The cases of differences between the system specification and the Integrated Operational Requirements Document (such as the initial lack of space environment sensors on the first spacecraft and the potential lack of NPOESS satellite compatibility with the Air Force Satellite Control Network) require understanding and resolution so that developmental and operational testing goals are in consonance. In addition, the lack of adequate threshold definitions for low-rate data field terminal users will make it difficult to conduct integrated operational testing on low rate data terminals. The IPO has recently taken action to understand and address resolution of these differences.

RQ-4 Global Hawk Unmanned Aerial Vehicle (UAV)

SUMMARY

- Operational deployments, late deliveries of air vehicles and sensors, and slow development of sensor and mission software resulted in deferral of the operational assessment from FY04 to 2QFY05.
- The Air Force plans to continue to purchase and field Global Hawk systems without conducting and reporting the results of the operational testing outlined in the Test and Evaluation Master Plan (TEMP).
- The Air Force must submit a new TEMP with a new test strategy to account for program delays and reduce risk to the user.

The Global Hawk UAV operates at high-altitude with long range and long endurance.

SYSTEM DESCRIPTION AND MISSION

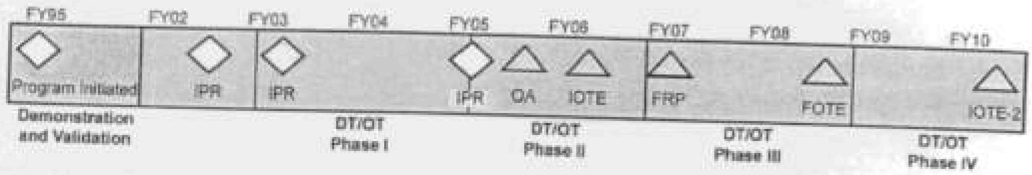
The RQ-4 Global Hawk Unmanned Aerial Vehicle (UAV) system is a theater commander's asset designed to satisfy surveillance and reconnaissance shortfalls. The Air Force intends the Global Hawk air vehicle to provide high-resolution Synthetic Aperture Radar and Electro-Optical/Infrared imagery, as well as signal intelligence data at long range with long loiter times over target areas. Potential missions for the Global Hawk cover the spectrum of intelligence collection capabilities to support joint combatant forces in worldwide peace, crisis, and wartime operations.

The Global Hawk UAV system consists of an air vehicle component with air vehicles, sensor payloads, avionics, and data links; a ground segment with a launch and recovery element; a mission control element with embedded ground communications equipment; a support element; and trained personnel.

The Global Hawk air vehicle operates at high-altitude with long range and long endurance. It must provide 28 hours endurance while carrying 2,000 pounds (RQ-4A) or 3,000 pounds (RQ-4B) of payload and operating at 60,000 feet mean sea level. Each of the sensors provides wide area search imagery and a high-resolution spot mode. The radar also has a ground moving target indicator mode. Prior to the Initial Operational Test and Evaluation (IOT&E) in FY06, production aircraft will have an initial signal intelligence capability. The program plans include a more capable Airborne Signals Intelligence Payload prototype, available for operational testing prior to the full-rate decision. The Air Force intends for a follow-on operational test and evaluation of the production system. The program will integrate the Multi-Platform Radar Technology Insertion Program radar and test it in a second IOT&E.

Global Hawk operates autonomously using a satellite data link (either Ku-band or UHF) for sending sensor data from the aircraft to the mission control element. The common data link directly down-links imagery when the UAV is operating within line-of-sight of users with compatible ground stations. The ground segment consists of the mission control element for mission planning, command and control, and image processing and dissemination; the launch and control element for controlling launch and recovery of the UAV; and associated ground support equipment. By having separable elements in the ground segment, the mission control element and the launch and control element can operate in geographically separate locations. The user may then deploy and locate the mission control element with the supported command's primary exploitation site. Military shelters with external antennas for line-of-sight and satellite communications with the air vehicles contain both ground segments.

TEST AND EVALUATION ACTIVITY



The March 2003 TEMP provides for an FY04 operational assessment, IOT&E in FY06, follow-on operational test and evaluation on the full-signal intelligence system, and a second IOT&E on the Multi-Platform Radar Technology Insertion Program configuration. The Air Force intended to conduct combined phases of developmental test/operational test between dedicated operational test events. These systems-level developmental test/operational test evaluations were intended to support yearly Configuration Control Board decisions on technology integration into production lots, as well as entry into operational testing.

The Air Force did not execute the test strategy in FY04. There were no operational test events during FY04. The scheduled operational assessment did not occur because of delays in the delivery of sensors, software, and source data (required for developing technical orders and training courseware). The Air Force does not plan operational scenarios until the end of the current developmental test/operational test phase, projected to end in February 2005. At that time, they plan to conduct Integrated System Evaluation flights. These may provide the first end-to-end system-level evaluation of production-representative mission capability. In the meantime, the contractor will continue to deliver production air vehicles. The FY04 operational assessment was to be a dedicated, robust evaluation that provides an independent mission-level evaluation of the capability first fielded to the user. DOT&E has not yet received an adequate plan for the operational assessment, now scheduled for early FY05.

Developmental testing during FY04 included data acquisition for Synthetic Aperture Radar development, testing of the Spiral 1 Electro-Optical/Infrared/Synthetic Aperture Radar air data system, and communications using the test air vehicle. The test team demonstrated JP-8+100 fuel compatibility and a "see and detect" capability to improve situational awareness during launch, recovery, and ground operations using an infrared nose camera. Flight testing also characterized reported deficiencies in Air Traffic Control voice quality to help identify root causes. A technical order validation and verification effort examined the accuracy and usability of maintenance job guides. Ground testing of the new Automatic Contingency Generation software has also been ongoing in the 6-Degree Of Freedom simulators.

In addition to the Spiral 1 development efforts, flight testing supported a number of other activities. The contractor integrated and tested the Advanced Information Architecture payload. This payload provides storage and data links on the aircraft that allows users with line-of-sight to the aircraft to download stored imagery. A European aeronautic defence and space company signal intelligence sensor was integrated and its capability demonstrated during a deployment to Germany.

The contractor delivered Air Vehicles 9, 10, and 11 (designated AF-2, AF-3, and AF-4, respectively). Air Vehicle 9 participated in the technical order validation and verification effort. Air Vehicles 10 and 11 only underwent production acceptance flight tests.

TEST AND EVALUATION ASSESSMENT

The program encountered unexpected difficulty in the development of the Airborne Synthetic Aperture Radar System Improvement Program Synthetic Aperture Radar modes. This delayed testing of the Spiral 1 sensor. The first flight test of the integrated Spiral 1 sensor took place on August 25, 2004.

Significant developmental/operational testing remains before an operational assessment can take place:

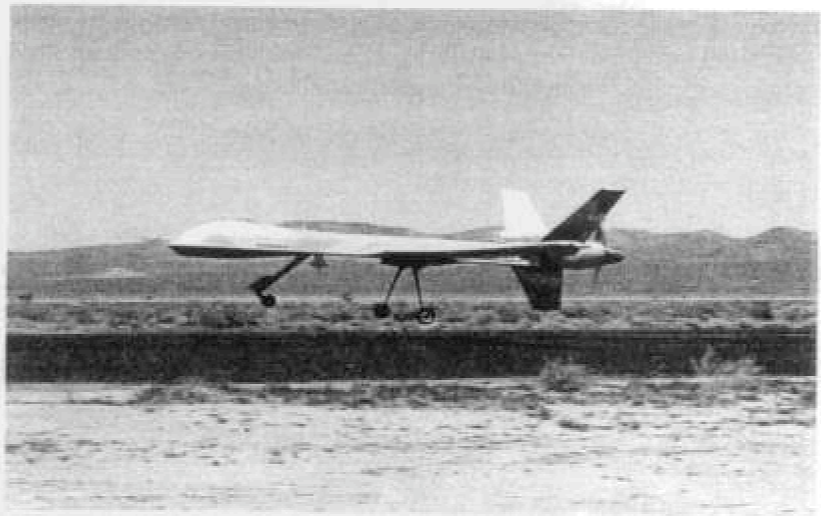
- Testing to verify image quality and geo-location accuracy.
- Automatic Contingency Generation capability—a significant change that the user needs to meet requirements for rapid mission planning.
- Manual Collection Management software, which provides the ability to manually re-task a sensor in real-time, will also be delivered and tested.

The program cannot execute the test strategy in the current TEMP. Delays in development and slips to significant test events will require a new test strategy and a new TEMP. The decoupling of production and fielding decisions to both testing and the progress of development contributes to a schedule-driven approach. This puts the user at increased risk of not being able to accomplish the mission.

RQ/MQ-1 and MQ-9 Predator Unmanned Aerial Vehicle System

SUMMARY

- In February 2004, the Air Force Program Executive Officer approved entry into Increment 1 System Development and Demonstration. Milestone B in fall 2004 is contingent on the delivery of an approved Capabilities Description Document and Test and Evaluation Master Plan.
- The Air Force plans to purchase 23 of 55 total air vehicles and field a limited number prior to the FY07 Initial Operational Test and Evaluation (IOT&E) and full-rate production decision in FY08.
- The Air Force proposes no dedicated operational test prior to IOT&E.



The user plans to use MQ-9 in an armed reconnaissance ("hunter-killer") mission to find, identify, and kill targets.

SYSTEM DESCRIPTION AND MISSION

The RQ/MQ-1 Predator is a medium-altitude unmanned aerial vehicle intended to provide reconnaissance, surveillance, and target acquisition support to a theater, as well as a limited strike capability. Originally designated RQ-1, the Air Force changed the designation to MQ-1, acknowledging the system's multi-role capability. The RQ-1 underwent IOT&E in 2001 and the one-hundredth RQ/MQ-1 was delivered in FY04.

The Air Force plans for the MQ-9 to fly higher and faster, provide more power, and carry larger payloads than the original Predator system. To do so, it must include a more robust airframe and power plant. The user plans to use MQ-9 in an armed reconnaissance ("hunter-killer") mission to find, identify, and kill targets. Reconnaissance, surveillance, and target acquisition is a secondary mission. The combination of intelligence, surveillance, and reconnaissance capability and the ability to engage with onboard weapons or coordinate off-board strike assets should increase the probability of detecting - and successfully attacking - time sensitive targets.

The Air Force built two prototypes, designated YMQ-9, but they do not have the desired payload capacity. Subsequent air vehicles will have an increased gross takeoff weight along with added payload capacity, more thrust, and triple redundant avionics.

The ground station provides command and control of the air vehicle through pilot stations. The operator flies the air vehicle using stick and rudder control. The ground station also provides mission planning, communications, targeting, and imagery dissemination. The ground station must present the operator a coherent picture utilizing onboard systems, off-board data, and automatic target cueing. The program plans ground station commonality with MQ-1 for logistics purposes.

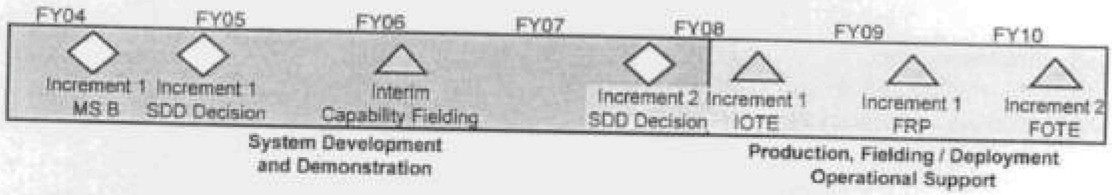
The current Air Force strategy anticipates incremental delivery of capability. Increment 1 of System Design and Development will incorporate improved sensor, communications, stores management, and ground station systems intended to provide an integrated system for accomplishing the hunter-killer mission. An IOT&E in 2007 and a full-rate production decision in 2008 will follow Increment 1 System Design and Development. Concurrent with Increment 1

GBU-12 only; and interim systems developed in 2005 and delivered to Air Combat Command in 2006 will deliver both GBU-12 and GBU-38.

The contractor will complete the production of 16 aircraft that have some mission capability (initial, interim, or Increment 1 capability) and the Air Force will contract for 23 total air vehicles before the IOT&E. The Air Force plans to retrofit the remaining air vehicles to Increment 1 capability following IOT&E.

The Air Force plans to proceed to Increment 2 before the end of IOT&E, and before the delivery of the beyond low-rate initial production report on Increment 1.

TEST AND EVALUATION ACTIVITY



YMQ-9 Number 3, which has the higher takeoff weight capacity, greater thrust, and triple-redundant avionics, first flew on October 17, 2003.

During FY04, developmental testing accumulated over 100 sorties and 250 flight hours. The primary objectives of the testing were integration of the LYNX Synthetic Aperture Radar, Multispectral Targeting System-B, and GBU-12, as well as flight performance testing. An MQ-9 also carried and released a Silent Eyes Micro unmanned aerial vehicle that delivered imagery through the MQ-9 to a ground station.

The Air Force accepted three new aircraft (numbers 3, 4, and 5) in FY04. These are the first vehicles intended to meet the Air Force's payload requirement.

The Air Force plans to submit a Test and Evaluation Master Plan to the Office of the Secretary of Defense for approval in November 2004.

TEST AND EVALUATION ASSESSMENT

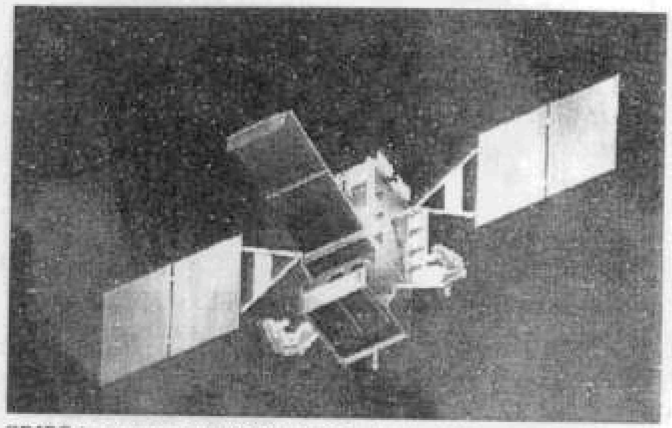
The early, rapid procurement of air vehicles and limited fielding to the user calls for early, rigorous operational testing. However, the Air Force does not plan to conduct any dedicated operational testing until FY07. The Air Force briefed DOT&E that it plans to have the Air Force Operational Test and Evaluation Center write an operational assessment in FY05. If completed, this operational assessment would not be based on a dedicated test event. It would be an operational test agency report on its evaluation of developmental test activities. Although the Air Force Operational Test and Evaluation Center expects to have some input into test conduct, there is no dedicated period of operational testing, funding, nor acquisition or fielding decision dependent on the event. The current test strategy does not identify specific operational assessment objectives, scope, or resources.

The user will take delivery of numerous MQ-9 systems and may deploy them into combat operations before the Air Force conducts dedicated, independent operational testing and evaluation.

Space Based Infrared System (SBIRS) High

SUMMARY

- The Space Based Infrared System (SBIRS) control segment, operating with Defense Support Program (DSP) satellites, continues to demonstrate improved performance over the earlier DSP ground system.
- The Highly Elliptical Orbit (HEO) payload tests demonstrated that the payloads meet acceptable electromagnetic interference limits, and the first HEO shipped to the host.
- Concerns remain with requirements definition, concepts of operation, definition of operational dependability, software maturity, concurrency between space and ground segment development, and the operational impact of any further program delays.



SBIRS improves capability for Combatant Commanders, deployed U.S. forces, and allies.

SYSTEM DESCRIPTION AND MISSION

SBIRS replaces the current DSP system. SBIRS improves capability for Combatant Commanders, deployed U.S. forces, and allies by providing better data quality and timeliness in four mission areas: missile warning, missile defense, technical intelligence, and battlespace characterization.

SBIRS acquisition includes two increments. Increment 1, which attained Initial Operational Capability in December 2001, consolidated DSP and Attack and Launch Early Reporting to Theater ground stations into a U.S. mission control station. Increment 1 operates with DSP satellite data. Increment 2 develops software and hardware to operate SBIRS satellites. SBIRS includes two hosted payloads in HEO, with first delivery in 2004, and four satellites in Geosynchronous (GEO) orbit, with first launch in 2006. A fifth GEO satellite will be a replenishment/spare.

SBIRS Increments 1 and 2 entered the Engineering and Manufacturing Development phase following a Milestone II Defense Acquisition Board review in October 1996. In 2002, the Air Force restructured the program due to schedule and cost overruns. In the restructure, the first GEO satellite launch shifted from 2004 to 2006 with ground segment incremental deliveries rescheduled to align with revised satellite schedules.

TEST AND EVALUATION ACTIVITY

Test and evaluation activity during 2004 involved continuing identification and resolution of HEO problems, test tool development, and revision of the Test and Evaluation Master Plan to realign the test concept and events with the revised program schedule and content.

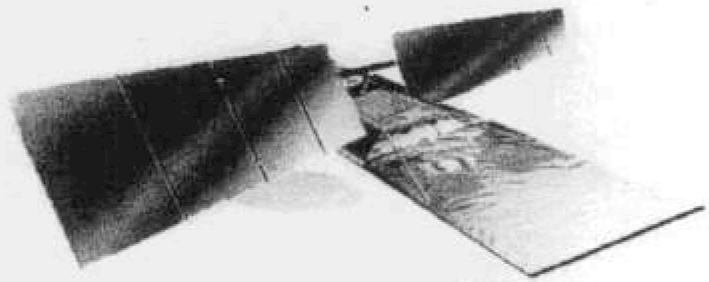
operating with DSP satellites, demonstrates improved performance over the earlier DSP ground system. As SBIRS satellites begin deployment, the test and evaluation focus will shift from DSP-based operations to the new operational capabilities provided by SBIRS. Plans call for delivery and testing of these capabilities incrementally though 2010. Although test planning is progressing satisfactorily, several areas of concern remain: requirements definition, concepts of operation, and definition of operational dependability. Requirement definition must precede each effectivity to provide for test planning and evaluation of test results, but at this time only the DSP-capable Mobile Multi-Mission Processor effectivity and the end system have well-defined requirements. The concepts of operations used during developmental and operational testing should be the same, but at present there are differences between the two. Operational dependability has a standard definition involving operational uptime and downtime, but SBIRS developmental testing uses a different method and needs to be reconciled with the standard definition.

Besides these specific concerns, DOT&E remains concerned with ongoing software maturity problems, the degree of concurrency between space and ground segment development, and the operational impact of any further program delays.

Spaced Based Radar (SBR)

SUMMARY

- Space Based Radar (SBR) test and evaluation planning is proceeding at an adequate pace to provide an assessment of operational effectiveness and suitability.
- During Phase A, the test and evaluation strategy should focus on the mitigation of key risk areas.
- The initial Test and Evaluation Master Plan (TEMP) should emphasize developmental testing, with a well-structured path towards operational testing, based on an understanding of the SBR program at Key Decision Point (KDP)-B.



SBR improves near real-time targeting and situational awareness.

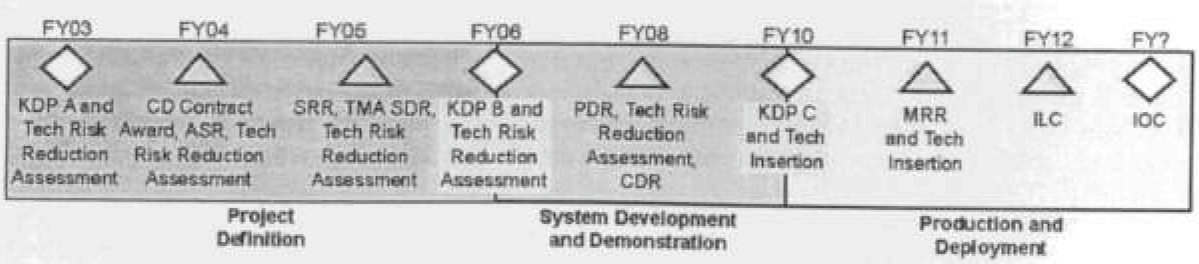
SYSTEM DESCRIPTION AND MISSION

The SBR system is a planned constellation of satellites that can be tasked in near real-time to provide a rapid response to real-time Combatant Commander requirements. Moving Target Indicator data and Synthetic Aperture Radar imagery will transmit directly, or via relay satellites, to earth receiving stations. SBR information users include Air Expeditionary Forces, Army objective forces, naval forces, intelligence components, and Homeland Security networks. Fused with current Moving Target Indicator systems data, SBR improves near real-time targeting and situational awareness.

The Secretary of Defense appointed the Secretary of the Air Force as the DoD Executive Agent for Space in 2002. The Air Force is acquiring SBR under new DoD National Security Space Policy directives tailored for space programs. SBR is in the initial phase of development, and passed its first Key Decision Point A (KDP-A), to enter Phase A (the Concept Study Phase) in July 2003. The purpose of this study phase is to develop concepts and architectures to a sufficient level of maturity to enter the KDP-B Design Phase. The study phase consists of further concept definition, concept of operations, requirements development, risk reduction, and initial planning to develop a test and evaluation strategy prior to KDP-B. After KDP-B, the program should enter a system pre-acquisition period lasting through a planned KDP-C, when system acquisition activities will begin.

The System Program Office accomplishments include formulation of a draft acquisition strategy and award of key contracts to support ongoing risk reduction activities.

TEST AND EVALUATION ACTIVITY



Test activity during 2004 focused on development of a Combined Test Force charter that defines agency roles and responsibilities for testing, and maturing a test strategy document that will serve as the basis for a TEMP. The test strategy document emphasizes combined developmental and operational testing in order to maximize testing efficiency, and addresses critical operational issues, measures of effectiveness, and measures of performance.

TEST AND EVALUATION ASSESSMENT

SBR is at an early stage, but test and evaluation planning proceeds at an adequate pace to support an assessment of operational effectiveness and suitability. During Phase A, the test and evaluation strategy should focus on the mitigation of key risk areas. Generally these areas involve:

- Information management.
- The capability of the system to manage very large amounts of expected data.
- Satellite on-board processing capability and reliability needed to "pre-digest" the collected radar data before transmitting to ground.
- The ability of signal processing algorithms to present radar-derived data for rapid analysis and dissemination.
- Spacecraft technology in terms of power, structural integrity, and detection technology.
- Communications reliability and system survivability.

The initial TEMP should emphasize developmental test, with a well-structured path towards operational test, based on an understanding of the SBR program at KDP-B. Because the Air Force has selected two contractors for competition in the Concept Development Phase A, the government test communities need to be aware of both concepts - and interact with - developmental test and operational test representatives from both contractors. At KDP-B, the TEMP should include separate appendices, marked for government use only, prepared by each contractor. These appendices should reflect individual contractor test concepts. The government and each of the two contractors are developing test concepts according to their own set of Critical Operations Issues. Although each contractor should follow their own Critical Operations Issues, the government should ensure they cover the parameter space indicated by the government.

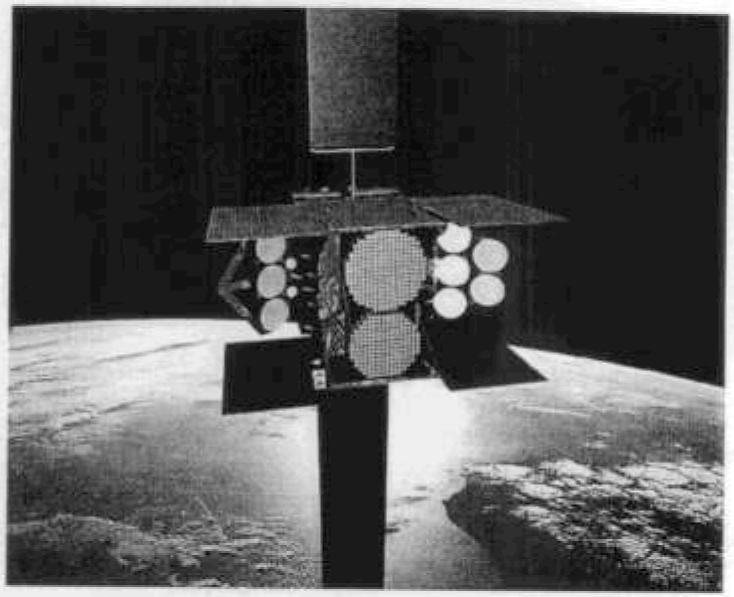
The current Test Strategy for the Air Force Operational Test Center consists of over 2,500 test events, most of which are projected to be covered by developmental test activities. The magnitude of the testing program envisioned for SBR underscores the need for combined developmental/operational testing as an efficient and effective strategy for performing SBR testing.

Current budget reductions will cause delays in SBR development; however, the TEMP's general test concepts objectives should remain fixed.

Wideband Gapfiller Satellite (WGS)

SUMMARY

- The system test planning process continues through the Air Force Operational Test and Evaluation Center and Army-sponsored working groups.
- The test "insight" process following a commercial approach is not currently yielding adequate test information 15 months prior to launch of the first satellite.
- Areas of continued interest include platform and payload control, evaluation of satellite capacity, and anti-jam survivability.



The test results and analysis presented at the Critical Design Review indicate the design is progressing with no major problems.

SYSTEM DESCRIPTION AND MISSION

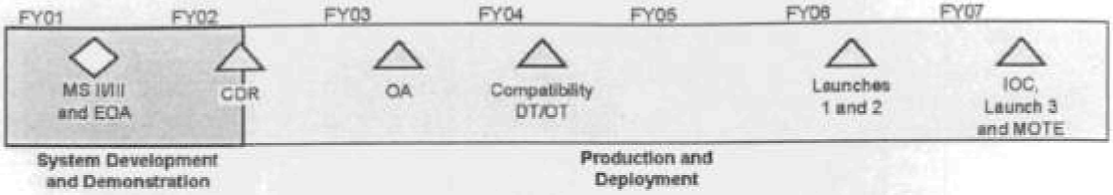
The Wideband Gapfiller Satellite (WGS) system will provide communications to U.S. warfighters, allies, and coalition partners during all levels of conflict short of nuclear war. It is the next generation wideband component in the DoD's future Military Satellite Communications architecture.

WGS will satisfy military needs by providing communications in both the X-band and military Ka-band frequencies. It will combine capabilities onto a single satellite for tactical X-band communications, augment the Global Broadcast Service (GBS) Phase II system, and provide new two-way Ka-band services. The Air Force is introducing this new service to alleviate the spectrum saturation of X-band, and it should greatly increase both the available single-user data rate and total satellite capacity over today's Defense Satellite Communications System (DSCS) III satellites.

The WGS consists of two segments. The Air Force is acquiring the satellite segment under the Federal Acquisition Regulation Part 12 rules for commercial item acquisition. First launch is projected for 2QFY06 with the second and third launches following at approximately six-month intervals. The Army is acquiring the ground control segment, and the Military Satellite Communications Joint Program Office is integrating the WGS and GBS space and ground segments. The 2001 Defense Appropriations Act signed on August 9, 2000, limited funding to two satellites. Subsequently, the Office of the Secretary of Defense (OSD) issued a Program Decision Memorandum on August 22, 2000, supplementing WGS funding by $272.9M to ensure funding of the complete constellation of three satellites. In December 2003, OSD directed the acquisition of two additional WGS satellites. The System Program Office projects launch of Satellites 4 and 5 in FY09 and FY10, respectively.

The Program Office plan for WGS satellite launch is to integrate them on both Delta and Atlas Evolved Expendable Launch Vehicles. The first launch will be on Delta and the second on Atlas. Boeing added extra solar panels to their original design, which added weight and changed the class of the Evolved Expendable Launch Vehicle. The availability of the launch vehicle and an aggressive integration schedule, less than the normal 24 months, are sources of schedule risk.

TEST AND EVALUATION ACTIVITY



Test and evaluation planning continued in FY04 for the WGS system. The Air Force Operational Test and Evaluation Center completed an early operational assessment of the WGS system in September 2000 to support a combined Milestone II/III review. The Air Force Operational Test and Evaluation Center performed an operational assessment based primarily on the Critical Design Review data package and briefed DOT&E in May 2003. Government developmental and operational test members started observing contractor developmental testing and inter-segment testing in FY03. Following the Federal Acquisition Regulation Part 12 commercial model, government testing has been limited to "insight" of the contractor test process. To date, DOT&E has received very limited feedback from that insight process.

TEST AND EVALUATION ASSESSMENT

The 2000 WGS early operational assessment highlighted risk areas posed by complexity of X-band and Ka-band satellite cross-banding; and interoperability and compatibility requirements during the concurrent development of the Gapfiller Satellite Configuration Control Element; and the automation upgrades of the Satellite Operations Center and DSCS Operations Center (DSCSOC) networks.

WGS and GBS must also be interoperable and compatible. GBS will structure broadcasts and control the payloads on the ultra-high frequency follow-on satellites. Modified DSCSOCs will control WGS payloads (at X-band and Ka-band), currently only capable of controlling X-band payloads. Interoperability between these two systems must be synergistic and not compete to ensure high speed access for broadcast users.

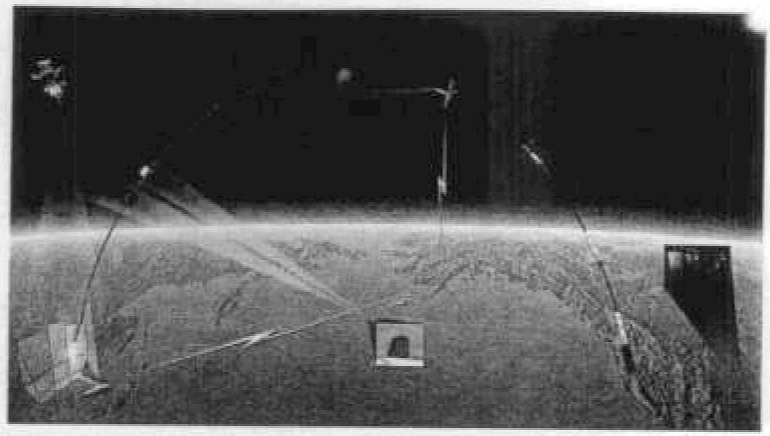
The test results and analysis presented at the Critical Design Review indicate the design is progressing with no major problems. In addition to the risk areas identified during the early operational assessment, the Critical Design Review identified frequency reuse, satellite orbital placement, and launch service availability as additional risk areas.

WGS should provide added capacity using the same bandwidths presently allocated to DSCS and GBS. The added capacity comes through same-frequency reuse over geographically separated beams. This requires a more detailed Concept of Operations to ensure that beam allocations for concentrated troop positions do not cause overlap of beams on the same frequency. It also requires that the WGS and the DSCS satellite be separated sufficiently in their orbits so that the less capable X-band antenna can discriminate between the two satellites.

Ballistic Missile Defense System (BMDS)

INTRODUCTION

This report provides an unclassified assessment of the Ballistic Missile Defense System (BMDS) test program during FY04. Classified discussions will be included in the Annual Operational Test & Evaluation Assessment of the Ballistic Missile Defense System Test Program that DOT&E will submit in February 2005.



Numerous ground tests and exercises have demonstrated system interconnectivity and limited interoperability.

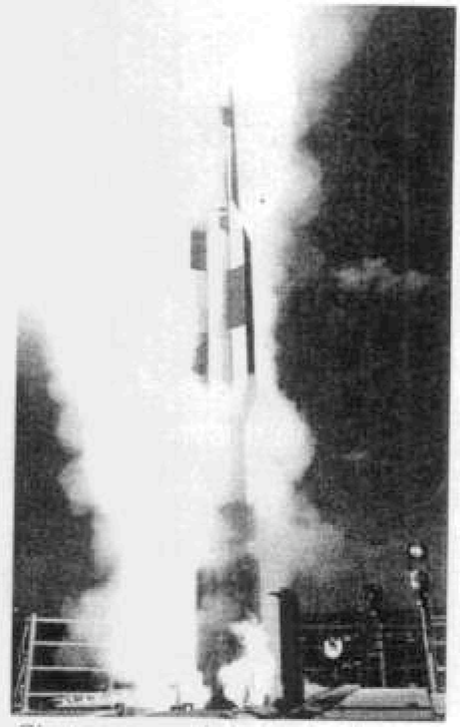
The Missile Defense Agency (MDA) continues to develop a missile defense capability to defend the United States, our deployed troops, friends, and allies from ballistic missile threats of all ranges and in all phases of flight. During FY04, MDA focused on system integration testing. Numerous ground tests and exercises have demonstrated system interconnectivity and limited interoperability. However, the components of the BMDS remain immature. It is not possible to estimate the current mission capability of the BMDS with high confidence. Any such assessment of mission capability and military utility will rely heavily on models and simulations of individual elements and the integrated BMDS. The lack of flight-testing has delayed the validation and accreditation of some key performance models and simulations. Nevertheless, MDA has made significant progress in the construction and equipping of the BMDS test bed. Ground testing has improved our confidence that military operators could exploit any inherent capability that may exist in the test bed, if needed in an emergency. Our assessment of the major BMDS elements follows.

MDA, DOT&E, and the Service Operational Test Agencies are finalizing an Integrated Master Test Plan that details the combined developmental and operational testing planned in 2005. MDA and DOT&E will approve the plan in November 2004.

Aegis Ballistic Missile Defense (Aegis BMD)

SUMMARY

- The Aegis BMD system has demonstrated that it can intercept a unitary, short-range target in the ascent and descent midcourse phases of flight.
- The kinetic kill vehicle has demonstrated that it can divert to an impact point on the payload section of the target.
- Improper functioning of the kinetic kill vehicle Divert and Attitude Control System, when using the pulsed thrust modes, occurred during Flight Mission 5 in June 2003. Flight-testing planned in 2005 should validate design changes intended to resolve this issue.
- The program demonstrated Long-Range Search and Track capability in GMD flight-tests and in Glory Trip 185.
- The BMDS has not used Aegis track data in real time to support an intercept of a long-range ballistic missile.
- All Aegis BMD flight-testing employs operational Navy ships with operational crews.

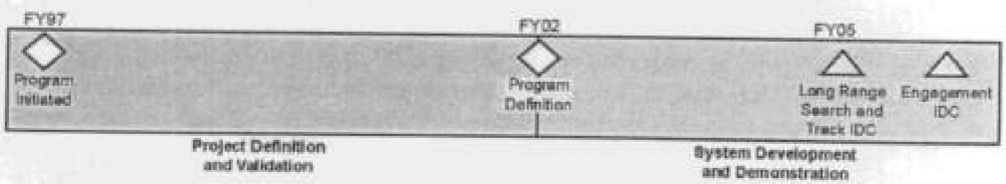


Given a command, the Aegis ship launches the three-stage SM-3 hit-to-kill missile and kinetic warhead.

SYSTEM DESCRIPTION AND MISSION

The Aegis BMD element design provides the ability to defeat short-range (less than 600 kilometers), medium-range (600 to 1,300 kilometers), and intermediate-range (1,300-5,500 kilometers) ballistic missiles outside the atmosphere. The Aegis BMD element consists of the shipboard Aegis Weapon System and the Standard Missile-3 (SM-3) missile. Aegis BMD includes a Long Range Surveillance and Track capability (Aegis BMD 3.0E software) to support BMDS engagements of intercontinental ballistic missile threats. The Aegis Weapon System detects and tracks the threat, and provides guidance information to the SM-3 missile. Given a command, the Aegis ship launches the three-stage SM-3 hit-to-kill missile and kinetic warhead.

TEST AND EVALUATION ACTIVITY



Aegis BMD conducted Flight Mission-6 (FM-6) at the Pacific Missile Range Facility on December 11, 2003. FM-6 was the first Aegis BMD mission to guide a kill vehicle to intercept the target at the lethal aim point on the warhead section. Aegis also provided real time kill assessment. A "no notice" target launch and the use of intelligence messages developed by the Navy's Operational Test Agency enhanced the test's operational realism.

MDA conducted multiple tests during FY04 to demonstrate the Aegis BMD element's ability to transmit data to other BMDS elements. These included Pacific Explorer II in March, targets of opportunity including Glory Trip 185 in June, Pacific Explorer III in July, and Pacific Explorer IV (in conjunction with SICO-6A) in September. This is also a test objective for GMD IFT-13C.

... Divert and Attitude Control System, noted during Flight Mission 5, remain a concern. Plans are to flight-test the updated design for the Divert and Attitude Control System in FY05. Separating target tests scheduled for the second and third quarter of 2005 will confirm divert capability.

GMD has not yet used actual long-range missile track data from Aegis BMD to develop a Weapons Task Plan in real time. GMD has demonstrated this capability during ground tests using previously recorded data transmitted from Aegis BMD. MDA plans to use the Long Range Surveillance and Track data to develop a Weapons Task Plan in real time during IFT-14 - Engage on Aegis - in 3QFY05, and Flight Test Ground-Based Interceptor 04-1 - Engage on Beale - in 4QFY05.

Airborne Laser (ABL)

SUMMARY

- The program demonstrated Beam Control/ Fire Control functionality in the laboratory.
- Subsystem integration and test aircraft assembly continue.
- ABL has no operational capability since it is currently in the design/development phase.

SYSTEM DESCRIPTION AND MISSION

The Airborne Lasesr (ABL) element mission is to negate enemy ballistic missiles during their boost phase. The ABL engagement concept involves placing sufficient laser energy on the missile booster motor tank in order to weaken the casing. This weakening allows internal pressure to rupture the booster motor tank and destroy the missile. A successful engagement in the boost phase kills the threat missile before it deploys its decoys, warheads, or submunitions.

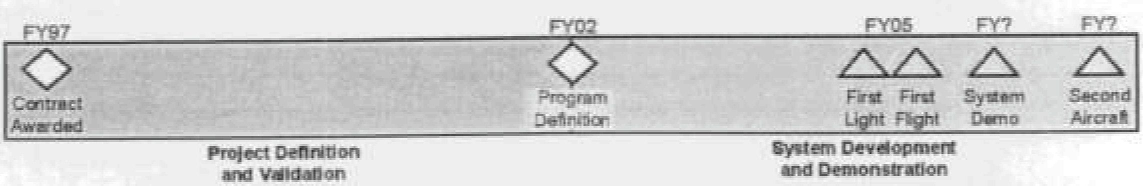
ABL is a modified Boeing 747-400F commercial aircraft with the military designation YAL-1A.

ABL is a modified Boeing 747-400F commercial aircraft with the military designation YAL-1A. Major weapon components include:

- A Megawatt chemical oxygen-iodine high-energy laser.
- The Beam Control/Fire Control: Nose-mounted turret and optical benches containing highly sensitive cameras, sensors, deformable and steering mirrors, and a set of Illuminator Lasers (Beacon and Tracking) that enable the system to track the target.
- The Battle Management, Command, Control, Communications, Computers, and Intelligence hardware and software.
- The ground support equipment for chemical storage, mixing, and handling; transport carts for loading/unloading chemicals at the aircraft.

MDA restructured the program during the year to focus on achieving specific technical goals each year. The 2004 goals include first light of the High Energy Laser in the System Integration Laboratory at Edwards Air Force Base, California; integration of the Beam Control/Fire Control on the aircraft; and passive (no lasing) flight-tests to evaluate the integration and performance of the Beam Control/Fire Control and the Battle Management, Command, Control, Communications, Computers, and Intelligence subsystem.

TEST AND EVALUATION ACTIVITY



ABL demonstrated Beam Control/Fire Control functionality in the laboratory at Sunnyvale, California. The Beacon and Tracking Illuminator Lasers have since experienced power losses. The root cause of reduced power output over time from each laser has been determined, and a plan is in place to correct the performance of the illuminator lasers. Boeing is integrating the Beam Control/Fire Control onto the aircraft, and will be testing it in passive (no lasing) flight-tests, without the Beacon and Tracking Illuminator Lasers. Component integration and testing will continue over the next several years.

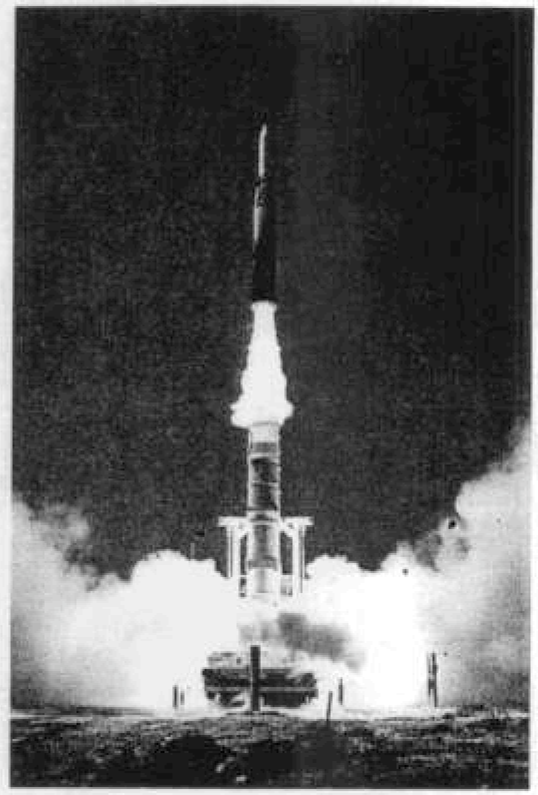
TEST AND EVALUATION ASSESSMENT

ABL successfully demonstrated Beam Control/Fire Control functionality in the laboratory. The subsequent issues with the Beacon and Tracking Illuminator Lasers are typical of this highly complex, state-of-the-art developmental program. The deliberate approach that progresses testing from the developer's laboratory Beam Control/Fire Control testing to the system integration laboratory and, finally, to the aircraft, is prudent. The program's focus on specific and increasingly difficult technical goals each year systemically reduces program technical risk.

Arrow Weapon System (AWS)

SUMMARY

- The Arrow Weapon System (AWS) conducted two flight-tests in the United States:
  - Flight-test-1 successfully intercepted a short-range liquid fueled target.
  - Flight-test-2 failed to intercept a longer-range target due to a failed component in the kill vehicle's propulsion system.



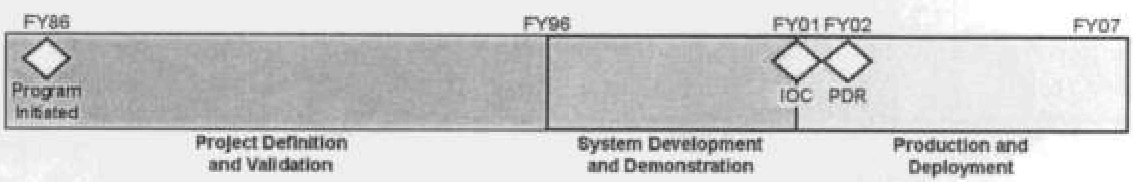
In the first flight-test, the AWS successfully intercepted a unitary liquid-fueled ballistic missile.

SYSTEM DESCRIPTION AND MISSION

Israel's AWS provides missile defense against short- and medium-range ballistic missiles. It consists of the Arrow II interceptor and launcher, the Green Pine fire control radar, the Citron Tree battle management center, and the Hazelnut Tree launch control center.

TEST AND EVALUATION ACTIVITY

Due to the smaller test ranges in Israel that limited all previous system testing, the AWS conducted two flight-tests in FY04 at the Point Mugu Naval Air Warfare Station in California. The larger Point Mugu test range can accommodate longer-range ballistic missile targets that are representative of the threat. These two flight-tests assessed AWS performance against longer-range targets than those tested previously. The first Point Mugu flight-test occurred July 29, 2004. The second flight occurred August 26, 2004.



TEST AND EVALUATION ASSESSMENT

In the first flight-test, the Arrow Weapon System successfully intercepted a unitary liquid-fueled ballistic missile. The second flight-test was against a more stressing, longer-range target with a separating reentry vehicle. The Arrow interceptor failed to hit the second target because of a malfunction in the kill vehicle's sustainer motor. The malfunction resulted in the loss of the kill vehicle's maneuver control. As a result, the kill vehicle's guidance sensor never entered the endgame to acquire the target. The program is currently investigating the cause of the malfunction.

Command, Control, Battle Management, and Communications (C2BMC)

SUMMARY

- Command, Control, Battle Management, and Communications (C2BMC) provides situational awareness for the Limited Defensive Operations system.
- MDA will use GMD Fire Control to conduct battle management functions during FY05 (Block 04).
- Consistency between the C2BMC and other sources of information available to the warfighter remains a high priority test issue.

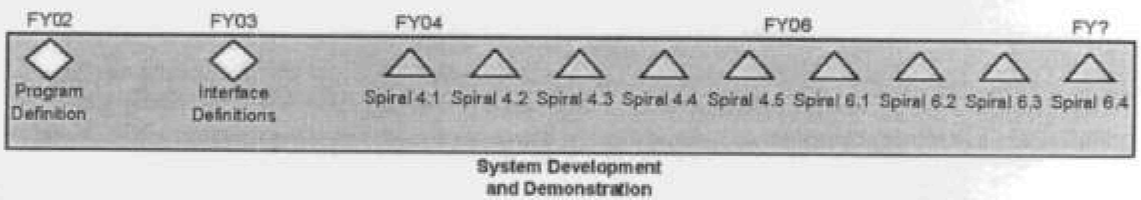
C2BMC will participate in many events throughout Block 2004 testing.

SYSTEM DESCRIPTION AND MISSION

The C2BMC element will be the battle manager for the objective BMDS. Current C2BMC element capability is limited to providing situation awareness information to the U.S. Strategic Command and U.S. Northern Command.

Future capabilities potentially include providing a common operational picture, voice authorization for weapons release, track correlation and fusion for multiple BMDS sensors, and an integrated BMDS communications network.

TEST AND EVALUATION ACTIVITY



Missile Defense Integration Exercise 04a (MDIE-04a) occurred in February-March 2004. MDA completed MDIE-04b in October 2004.

C2BMC will participate in many events throughout Block 2004 testing.

TEST AND EVALUATION ASSESSMENT

MDIE-04a demonstrated the ability to receive information and provide limited situational awareness. MDIE-04b demonstrated the ability to receive information and provide improved situational awareness.

Ground-Based Midcourse Defense (GMD)

SUMMARY

- Ground-Based Midcourse Defense (GMD) assets required for limited defensive operations are in place.
- Limited end-to-end system-level test data precludes characterizing GMD capabilities with confidence.
- Test data indicate that some limited defensive capability likely exists.
- System development and integration issues indicate that the system is still maturing.
- Continued progress developing the Test Bed will increase flexibility for future testing options.

GMD contains a fire control system, sensors, and Ground-Based Interceptors.

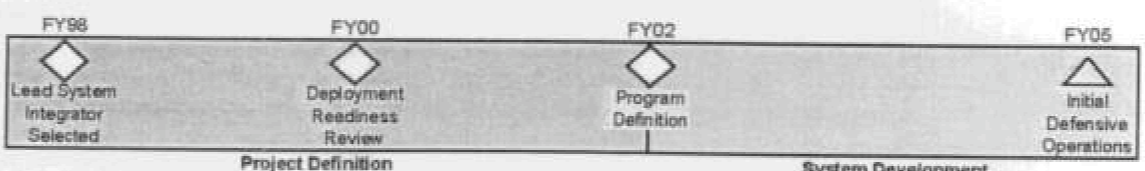
SYSTEM DESCRIPTION AND MISSION

The GMD mission is to negate long-range ballistic missiles in midcourse of their trajectory. GMD accomplishes this by launching a maneuvering kill vehicle that intercepts the threat warhead outside the atmosphere. GMD contains a fire control system, sensors, and Ground-Based Interceptors. The GMD Fire Control and Communications network links the element components via fiber optic links and satellite communications. There are two GMD Fire Control and Communications control nodes: one at Fort Greely, Alaska, and one at Colorado Springs, Colorado. MDA uses an additional control node at the Reagan Test Site to support flight-testing. The Reagan node is not currently part of the operational configuration.

Several long-range sensors provide target detection and tracking. The Cobra Dane early warning radar at Shemya, Alaska, and the upgraded early warning radar at Beale Air Force Base, California, are both part of the initial GMD system. In December 2005, the program plans to deploy a sea-based X-band radar. The sea-based radar will add flexibility and capability for conducting more complex testing. It should also significantly increase BMDS capability to engage potential threats when deployed as an operational sensor. The ground-based radar prototype at Kwajalein Atoll is a risk reduction effort for the sea-based X-band radar and currently supports test events.

MDA is installing Ground-Based Interceptors at two missile fields for the initial configuration of the BMDS. MDA installed six Ground-Based Interceptors at Fort Greely between July and November 2004. Two Ground-Based Interceptors should be emplaced at Vandenberg Air Force Base, California, by the end of December 2004. These early Ground-Based Interceptors use Orbital Sciences Corporation boosters and Raytheon exoatmospheric kill vehicles.

TEST AND EVALUATION ACTIVITY



MDA focused on system-level test events in FY04 to provide data for characterizing the Limited Defensive Operations capability. The test events included System Integration and Checkout (SICO) exercises, Integrated Ground Tests (IGT), Pacific Explorer exercises, and targets of opportunity. The primary purpose of SICO exercises was to confirm that the elements of the BMDS could function as an integrated system. IGT-2 and IGT-4a/b were higher fidelity hardware-in-the-loop tests designed to characterize performance of the GMD system in several engagement sequences. Military operators have participated throughout these tests to confirm human-in-control functions. At the conclusion of SICO-6a, warfighters executed Missile Defense Integration Exercise (MDIE-4b) using operational procedures on mission equipment.

MDA conducted two non-intercept flight-tests in FY04, each using a different booster design. The Boost Vehicle-5 test event on January 9, 2004, was a successful test of the Lockheed Martin prototype boost vehicle. On January 24, 2004, Integrated Flight-test (IFT)-13B successfully tested the Orbital boost vehicle that will be used for Limited Defensive Operations. IFT-13B was a system-level mission that included participation from the Command, Control, Battle Management, and Communications (C2BMC), Aegis, and warfighters participating at key positions issuing engagement commands.

IFT-13C is the next planned flight-test and will exercise the Limited Defensive Operations system. While an intercept is not a test objective, a successful intercept could occur. MDA will launch the target from Kodiak, Alaska, and the Ground Based Interceptor from Kwajalein Atoll in the Marshall Islands. IFT-13C will be first system-level flight-test to use the Kodiak, Alaska, facility to launch a target missile. IFT-13C will also be the first flight-test using the Limited Defensive Operations-configured Ground-Based Interceptor hardware and software. This flight-test will provide new engagement geometry against a dynamic target. MDA has rescheduled IFT-13C several times due to manufacturing and design problems discovered during ground testing. Before announcing the reschedules, MDA provided DOT&E details on the rationale for each reschedule. DOT&E concurred with each reschedule.

TEST AND EVALUATION ASSESSMENT

System-level test events have demonstrated basic BMDS functionality. Military operator personnel participated effectively, and demonstrated proficiency with the system. Delays in the flight-test program have put some of the ground test results at risk, since simulations used in ground testing require flight-test data for validation. MDA has not yet confirmed hardware and software changes in the Limited Defensive Operations interceptors through flight-testing. Limited availability of end-to-end system-level test data precludes characterizing GMD capabilities with confidence.

Test capabilities and range safety issues continue to limit test realism. The location and orientation of legacy radars relative to the flight-test range require GMD to use other means to provide midcourse tracking data. IFT-13C will be the first flight-test to include data from a realistic midcourse sensor. While still not an end-to-end test of the Cobra Dane radar, IFT-13C will use Global Positioning System data from the target to stimulate a Cobra Dane radar simulator to provide midcourse tracking data to the GMD fire control system. MDA will conduct the first flight-test that exercises end-to-end midcourse sensor performance in FY05, using the upgraded Beale early warning radar to track a target out of the Kodiak launch facility. This new Kodiak target launch capability, and the addition of the Sea-Based X-band radar in FY05, will increase the Test Bed capability and allow more engagement geometries to be tested.

The GMD program has demonstrated the technical feasibility of hit-to-kill intercepts against reentry vehicles in limited target complexes. The Test Bed architecture is now in place and should have some limited capability to defend against a threat missile from North Korea. Kill vehicle performance against threat representative targets remains a high priority test objective for future testing. Testing delays reflect the significant challenges of integrating a complex, globally distributed system with prototype components.

Kinetic Energy Interceptor (KEI)

SUMMARY

- Kinetic Energy Interceptor (KEI) is an early developmental boost/ascent phase kinetic energy hit-to-kill element with potential midcourse capability.
- MDA recently completed a programmatic restructuring of KEI.

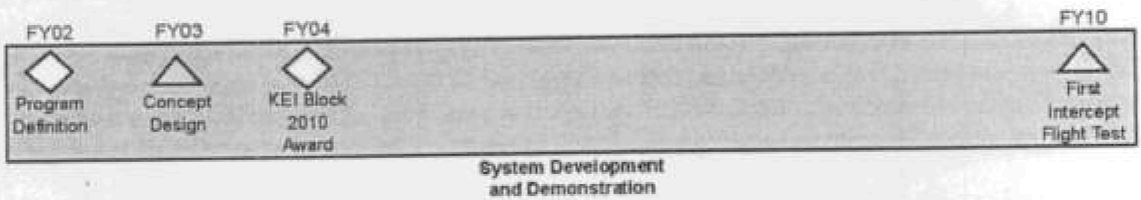
The restructured program schedules development of a land-based KEI capability in Block 2012 and a sea-based KEI in Block 2014.

SYSTEM DESCRIPTION AND MISSION

The KEI effort is developing a hit-to-kill element that can be land or sea-based to destroy intermediate range and intercontinental ballistic missile threats in their boost/ascent phase. If feasible, the program may modify KEI to provide intercept capability in the midcourse phase of flight. The KEI element will consist of three components: high velocity interceptors, a launcher, and a command and control system for fire control. KEI will have no organic sensor for target detection and tracking; it will rely on targeting information provided directly from overhead sensors or through the external, BMDS Command, Control, Battle Management, and Communications network. The restructured program schedules development of a land-based KEI capability in Block 2012 and a sea-based KEI in Block 2014.

Boost phase defense relies on extremely rapid detection and tracking of threat missiles. In FY06-07, the program is planning the Near-Field Infrared Experiment, a satellite-based data collection activity to acquire target signatures to support the KEI development test and evaluation program.

TEST AND EVALUATION ACTIVITY

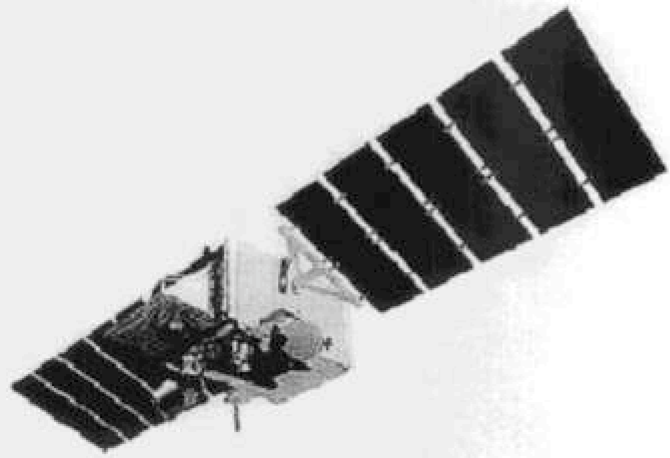


In December 2003, after a competitive concept design phase, MDA awarded a KEI development contract through January 2012 to a Northrop Grumman-led team. The flight-test schedule begins with booster testing in FY08 and FY09, followed by seven intercept tests between FY10 and FY12. Four of the KEI interceptor launches will be from San Nicholas Island, part of the Point Mugu, California, test complex. The other three tests will fire KEI interceptors from a container ship located off the California coast. Use of the ship will permit the KEI to achieve the desired engagement geometries. In these tests, the container ship is merely a mobile launch platform, and is not the eventual sea-based KEI platform. The program will launch all targets used in KEI intercept tests from Vandenberg Air Force Base, California.

TEST AND EVALUATION ASSESSMENT

Since the KEI element is early in development and in the midst of program restructuring, MDA has not fully defined the test and evaluation plans. However, MDA has begun developing a Live Fire Test and Evaluation strategy for KEI. The KEI element is also participating in MDA's Test Envelope Expansion Working Group, which is developing policies to enable realistic missile defense tests while limiting the risk to space assets from intercept debris.

Space Tracking and Surveillance System (STSS)



The STSS is the space-based sensor element of the BMDS.

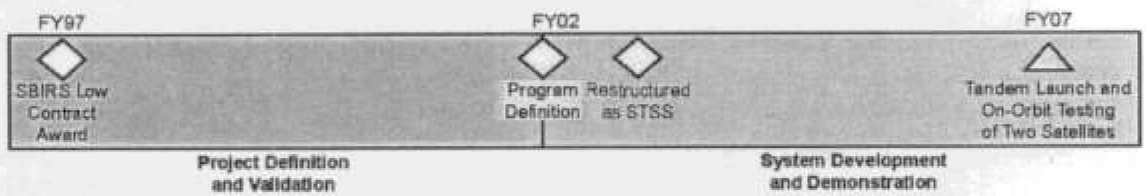
SUMMARY

- The Space Tracking and Surveillance System (STSS) program is concentrating on assembly, integration, and test of the first two demonstration satellites, scheduled to launch in FY07.
- Additional activities have focused on the STSS Surrogate Test Bed integration with the BMDS Command, Control, Battle Management, and Communications.
- STSS has no operational capability since it is currently in the design/development phase.

SYSTEM DESCRIPTION AND MISSION

The STSS is the space-based sensor element of the BMDS. It will be a low-earth-orbit satellite constellation with cross-link capabilities. Its mission is to acquire, track, assess, and report ballistic missile and target complex objects from launch lift-off through intercept.

TEST AND EVALUATION ACTIVITY



Block 2004 STSS test activities consist of ground tests, simulations, and dry runs using the STSS Surrogate Test Bed. The program is evaluating communications protocols and procedures to assess the ability to disseminate STSS data through BMDS Command, Control, Battle Management, and Communications to other BMDS elements. System and software integration tests began in FY04. The STSS Surrogate Test Bed participated in the Critical Measurements Program 4 flight-test in FY04, and plans to participate in Integrated Flight-test 13C. Test objectives are to demonstrate data flow and target information to the to BMDS Command, Control, Battle Management, and Communications element.

The STSS Surrogate Test Bed will continue to participate in BMDS flight-tests throughout FY05. MDA has a STSS Development Master Test Plan, with an updated version due at the end of the year. Testing of the full capabilities of the STSS will occur in Blocks 2006 and 2008.

TEST AND EVALUATION ASSESSMENT

The STSS Block 2006 Critical Design Review in FY04 was successful. It is currently in development for a Block 2006 launch. The earliest operational capability will be after the launch of the first two satellites. The early STSS capability will have major onboard power constraints and coverage limitations.

Terminal High Altitude Area Defense (THAAD)

SUMMARY

- The Terminal High Altitude Area Defense (THAAD) element radar and Command, Control, Battle Management, and Communications (C2BMC) Test Bed hardware are deployable in contingency operations.
- MDA plans to deliver hardware for a single THAAD fire unit in FY09.
- MDA and the Army are developing a plan to transition the first fire unit to the Army.
- There are currently no plans for dedicated operational testing of the THAAD element.
- The flight-test program delays are due to programmatic issues and frequent budget reprogramming actions. Also contributing to the delay was a factory explosion in 2003 that forced the program to seek and qualify a second source for rocket motor manufacturing.

THAAD is a mobile ground-based element of the terminal defense segment of the BMDS.

SYSTEM DESCRIPTION AND MISSION

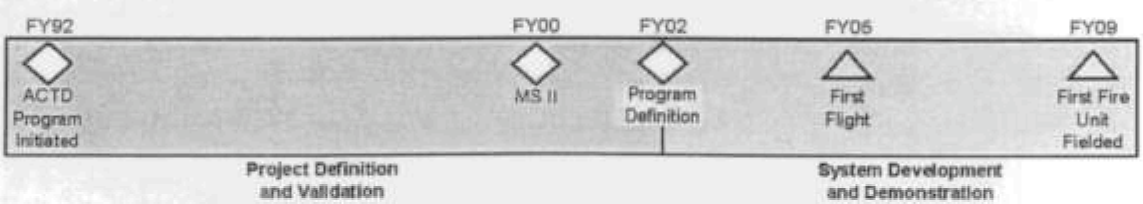
THAAD is a mobile ground-based element of the terminal defense segment of the BMDS. It will protect forward-deployed military forces, allies, and population centers from short-, medium-, and intermediate-range ballistic missile attacks. The system consists of four segments:

- Missile
- Launcher
- Radar
- Battle Management/Command, Control, Communications and Intelligence

The THAAD missile uses a kinetic energy kill vehicle to intercept incoming ballistic missile warheads in the late midcourse or terminal phases of their trajectories - either outside the atmosphere (exoatmospheric intercepts) or very high in the atmosphere (endoatmospheric intercepts).

The THAAD element continues to mature. The program completed the Element Critical Design Review in December 2003. White Sands Missile Range received THAAD radar in March 2004, where it is tracking targets of opportunity. The Missile Production Facility in Troy, Alabama, activated in May 2004, has started producing and testing the pathfinder missile. MDA conducted an initial readiness review for Flight-test – 1 (FT-1) in June 2004.

TEST AND EVALUATION ACTIVITY



The THAAD program accomplished extensive component level testing in FY04. Missile assembly testing progressed well. The THAAD launcher demonstrated the ability to roll-on/roll-off a C-17. MDA performed a Short Hot Launch test using missile rounds that contain only a fraction of the normal missile propellant. This test evaluated the new missile egress out of a new canister and launch environments. The test also provided data to address range safety issues associated with firing a missile round. The Short Hot Launch test also provided data on the adequacy of the missile design, and increased confidence in the success of first flight-test, FT-1.

FT-1 is on schedule to launch in 3QFY05 at White Sands Missile Range. FT-1 will measure THAAD missile dynamic performance in a high endoatmospheric environment. FT-2, scheduled for 4QFY05, will demonstrate integrated THAAD system closed-loop operations and engagement functions against a simulated unitary target. MDA has scheduled two additional THAAD element flight-tests for early FY06 at White Sands Missile Range. The first BMDS flight-test event that THAAD will participate in is Flight Test THAAD 06-1, scheduled for 4QFY06, at the Pacific Missile Range Facility in Hawaii.

No integrated system-level testing occurred in FY04; however, the program conducted assembly level qualification testing in FY04. The program developed numerous ground test missiles to support various engineering and developmental test activities necessary to reduce flight-test risk. Production software development continues on two of the ground test missiles to support production and test at the Troy Production Facility. Integration testing between the missile and Launch and Test Support Equipment continues at the Software Integration Laboratory to surface and correct integration issues before moving to the range to perform these functions. Extensive contractor testing of missile and radar components continues.

TEST AND EVALUATION ASSESSMENT

Several issues have affected the THAAD test program progress:

- Budget reprogramming actions have resulted in test program restructuring and delays.
- The program successfully demonstrated the redesigned missile canister in an October 2004 Short Hot Launch test.
- The program postponed the 56-inch missile drop test from 1QFY05 to 1QFY06 to support the fielding approach. In the interim, the program will move the missile on the transporter, which has already demonstrated aircraft roll-on, roll-off to the Air Force.
- Due to funding issues, delayed development of the prime power unit for the radar requires the use of other generators during testing at White Sands Missile Range. The program is investigating the possibility of using type-classified generators from the Air Force or the Army to field the THAAD Radar.
- The contractor changed the fuel for the Divert and Attitude Control System to improve stability. This change caused the system to fail the original cold temperature specification.

Target development continues at a defined pace. Of the four target types planned for testing, MDA has approved one, has made progress approving another, and has delayed approving the last two until range safety issues at the Pacific Missile Range Facility are resolved. MDA is examining various alternatives to provide flight-test realism.

It is uncertain how THAAD will transition to the Army. As a result, there are no plans at this time for operational testing of the THAAD element or an initial THAAD fire unit. Operational testing is necessary to improve understanding of THAAD performance, military operational capabilities, and to justify procurements beyond the first tactical fire unit.

Joint Cruise Missile Defense (JCMD)

SUMMARY

- JCMD is a five-year test that is in its final year of execution. It is located at Eglin AFB, Florida. The Air Force is the lead Service. JCMD has completed two simulation tests and two major field tests.
- During FY04 the final field test was executed during CJTFEX 04-2. JCMD is completing data analyses and formulation of final recommendations and reports.
- JCMD's schedule was shortened by six months to accelerate delivery of final reports to the warfighter and initiate close down early.
- JCMD prepared and submitted a Transformation Change Proposal to JFCOM as part of the effort to transition the capability and products developed.
- JCMD quantifies the effects of procedural and hardware enhancements to the Joint Integrated Air Defense System (JIADS) in a cruise missile defense role and makes recommendations to Combatant Commanders and the Services.
- JCMD products provide warfighters with a baseline effectiveness evaluation of current JIADS capabilities and procedures to meet the requirements of the JCMD mission area.

Phase 2 [testing] evaluated the value of identified enhancements and provided the Combatant Commanders with both an assessment of the near-term (FY04) capabilities as well as recommendations for further areas of improvement.

TEST DESCRIPTION AND MISSION

JCMD was chartered to employ multi-Service and other DoD agency support, personnel, and equipment to investigate and evaluate the operational effectiveness of joint operations against land attack cruise missiles (LACMs).

JCMD provides crucial information on near-term LACM defense capabilities and supports future architecture, technologies, and operational concepts. The basic JCMD test approach integrates a series of field tests and simulations in three phases to answer the program issues. Phase 0 addressed risk-reduction and ensured the program was prepared to collect and assess JIADS LACM capabilities. Phase 1 assessed JIADS current capabilities and identified potential problem areas and enhancements. Phase 2 evaluated the value of identified enhancements and provided the Combatant Commanders with both an assessment of the near-term (FY04) capabilities as well as recommendations for further areas of improvement.

TEST AND EVALUATION ACTIVITY

JCMD Phase 1 activities took place in FY02. Field Test 1 was conducted in FY03 as part of the U.S. Joint Forces Command (JFCOM) Joint Combat Identification Evaluation Team (JCIET) event in Gulfport, Mississippi. Field Test 1 assessed the current JIADS cruise missile defense capability in a live test environment using operational forces and an operationally representative scenario. JCMD flew BQM-74E (unmanned drones) and BD-5J (manned micro jets) to represent the current land attack cruise missile threat. More than 25 sorties were flown over land and sea, simulating surface and air launched land attack cruise missile profiles.

JCMD's second Phase 1 test in FY02 was a simulation evaluation of the JIADS. JCMD executed Simulation Test 1 in September 2002, at the Boeing Virtual Warfare Center (VWC), St Louis, Missouri, and the Aegis Training and Readiness Center, Dahlgren, Virginia. Operator-in-the-Loop (OITL) systems in the evaluation included the Joint Air Operations Center, Tactical Air Operations Center, Patriot, Airborne Warning and Control System, F-15C, Air Battle Management Operations Center, and Aegis Command Information Center.

JCMD Phase 2 test took place in FY04 and assessed the enhanced JIADS capability. JCMD conducted Simulation Test 2 in March 2004, with the hub of operations at the Virtual Warfare Center. Simulation Test 2 integrated eight sites across four time zones via the Joint Distributed Engineering Plant bridged with the Navy Distributed Engineering Plant. These facilities include the VWC, the AWACS Integration Lab in Seattle, Washington; the Aegis Training and Readiness Center in Dahlgren, Virginia; the Distributed Mission Operations Center in Albuquerque, New Mexico; the C4I Enterprise Integration Facility (CEIF) at Hanscom AFB, MA; the E-2C System Test Evaluation Lab (ESTEL) at Patuxent River, Maryland; and the Patriot simulation at Ft. Bliss, Texas. This robust distributed OITL JIADS simulation immersed more than 100 operators in an integrated air and missile threat environment, which included fixed wing, theater ballistic missiles, ship attack cruise missiles, and land attack cruise missiles.

JCMD's Field Test 2 was conducted along the East Coast of the United States in June 2004 in conjunction with the Combined Joint Task Force Exercise 04-2 administered by Joint Forces Command (JFCOM) with 2nd Fleet being the primary executive agent. JCMD provided the Small Manned Aerial Radar Target Model-One as a cruise missile surrogate to fly against JIADS. In addition to flying 100 cruise missile sorties, JCMD demonstrated the Remote Operations Center capability by supporting the Joint Theater Air and Missile Defense daily After Action Review.

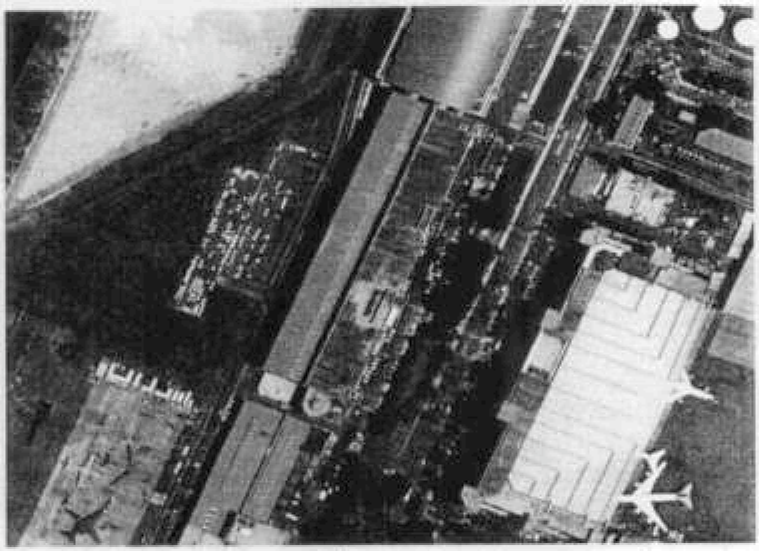
TEST AND EVALUATION ASSESSMENT

JCMD enhances the capability of U.S. JIADS to defeat a cruise missile attack. After evaluating baseline JIADS capabilities and procedures to meet cruise missile defense mission area requirements, JCMD quantifies the effects of procedural and hardware enhancements to JIADS in a cruise missile defense role and makes recommendations to Combatant Commanders and the Services. JCMD products provide warfighters with a baseline effectiveness evaluation of current JIADS capabilities and procedures to meet the requirements of the JCMD mission area. JCMD's final report to be published in March 2005 will report the effects of concept of operations and TTP changes as well as command and control, sensor, and shooter system enhancements to the JIADS in a cruise missile defense role.

Joint Space Control Operations- Negation (JSCO-N)

SUMMARY

- JSCO-N is a three-year test currently in its first year of execution. It is located at Colorado Springs, Colorado. The Air Force is the lead Service.
- Planning is for three Field Tests (Terminal Fury 05, 06, and Unified Endeavor 06).
- Field Test 1 will provide a mission area baseline to identify potential improvements for the joint warfighter.



JSCO-N focuses on better synchronization of space control operations through the Theater Combatant Commander's joint targeting cycle.

TEST DESCRIPTION AND MISSION

JSCO-N was chartered in March 2004 to address the threat of an adversary using space to threaten friendly space-based services (imagery systems, satellite communications, and satellite navigation systems). JSCO-N is sponsored by Air Force Space Command and is actively supported by U.S. Army Space and Missile Defense Command and U.S. Naval Network Warfare Command. STRATCOM, as the mission area "owner," and PACOM are both collaborating with JSCO-N as well.

The Space Control mission area is defined as "combat and combat support operations to ensure freedom of action in space for the United States and its allies and, when directed, deny an adversary freedom of action in space" (Department of Defense Directive 3100.10, July 1999). JSCO-N addresses the "negation" function of the Space Control mission area. Space Control Negation (SCN) may target an adversary's space capability by using a variety of permanent and/or reversible means to achieve five possible effects: deception, disruption, denial, degradation, and destruction. Because these effects focus on attacking the adversary's ability to use the "high ground" of space to its advantage, SCN planning must be fully integrated into the Joint Force Commander's targeting cycle.

TEST AND EVALUATION ACTIVITY

JSCO-N is planning and conducting test activity to identify, evaluate, and document improvements to the planning and assessment of Joint SCN combat capability. JSCO-N focuses on better synchronization of space control operations through the Theater Combatant Commander's joint targeting cycle. Test results will provide empirical data with recommendations to the operational, training, and acquisition communities, and will support Doctrine, Organization, Training, Leadership, Material, Personnel, and Facilities as well as Transformation Change Package recommendations coordinated through JFCOM.

The JSCO-N made significant strides in drafting a concept document that captures current "best practices" in command and control of space control negation capabilities. JSCO-N has been conducting extensive coordination and liaison with space control negation operators and stakeholders. JSCO-N personnel have comprehensively researched doctrine, existing standard operating procedures, emerging concepts of operation, and lessons learned from exercises and operational contingencies. This knowledge is being distilled into an in-depth "Procedures Document" addressing Inputs, Outputs, and Operational and command and control architecture, complete with matrixes, templates, and checklists. Due to the fact that there are no standard procedures among the combatant Area of Responsibilities for performing SCN, the detailed information within the Procedures Document will fill this void for the first time. The JT&E will use this material to aid the JSCO-N Detailed Test Plan refinement and test article development. STRATCOM is incorporating this procedural summary into its Strategic Directive on space control operations. In addition, work is being conducted with JFCOM Air, Land and Sea Applications Center to initiate a multi-Service tactics, techniques, and procedures effort following the first test event and the validation of the procedures.

TEST AND EVALUATION ASSESSMENT

As one of the first JT&E efforts under the new streamlined JT&E process, JSCO-N has successfully established and positioned itself to produce test products quickly. In preparation for the first test, JSCO-N has been integrated into the Initial Planning Conference, Mid Planning Conference, and various working groups associated with Terminal Fury 05 to be held in PACOM in December 2004. JSCO-N has been accepted as a participant in this Tier 1 exercise.

The team has conducted risk-reduction strategies by imbedding personnel into two related activities (Joint Expeditionary Forces Experiment 04 and the Schriever III Wargame and associated seminars, that will illuminate potential space control test articles that may be factors in our TF-05/06 field tests).

The third Joint Warfighter Advisory Group's was conducted in June 2004 and the fourth is planned for October 2004. Primary topics discussed at the JWAG included test design, draft command and control processes, data collection and analysis methodology.

JSCO-N's first General/Flag Officer Steering Committee (GOSC) is scheduled for October 2004. The JSCO-N GOSC is an advisory body that provides a forum for senior-level counsel and advocacy from the Military Services, the Unified Commands, and Department of Defense Agencies.

Joint Unmanned Aerial Vehicle in Time-Sensitive Operations (JUAV-TSO)

SUMMARY

- JUAV-TSO is a three-and-a-half-year test that is currently completing its final year. It is located at Fallon NAS, Nevada. The Navy is the lead Service.
- JUAV-TSO has completed two mini-tests and two field tests to date. Completing final phase of validation test in October 2004. Data analyses and final report have been accelerated by six months allowing for early shutdown of the test and transition of products to the warfighter.
- During FY04, conducted Field Test 2.
- JUAV-TSO implemented a test program to develop, refine, evaluate, and validate weapon-delivery methods, communications systems, control relationships, and command structures.

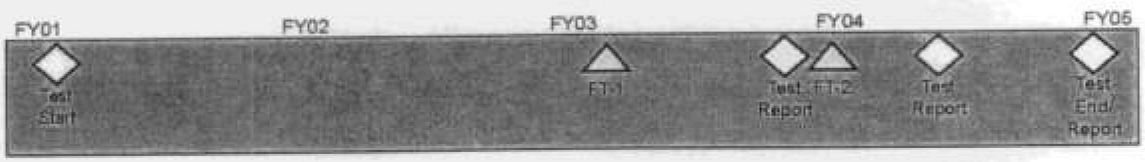
JUAV-TSO testing involves fixed-wing and rotary-wing air interdiction, artillery fire support, close air support, and personnel recovery within three command and control architectures.

TEST DESCRIPTION AND MISSION

The JUAV-TSO was chartered August 2001 to employ multi-Service and other Department of Defense agency personnel, support, and equipment to develop and document joint tactics, techniques, and procedures (JTTPs) for current and proposed tactical unmanned aerial vehicles (UAV). Historically, UAV mission areas included intelligence, surveillance, and reconnaissance. DESERT STORM in the Persian Gulf, Operations ALLIED FORCE in the Balkans, ENDURING FREEDOM in Afghanistan, and IRAQI FREEDOM showed the ability to expand UAV tactical employment during dynamic, time-sensitive, joint operations.

JUAV-TSO testing involves fixed-wing and rotary-wing air interdiction, artillery fire support, close air support, and personnel recovery within three command and control (C2) architectures. These architectures place weapon engagement decisions at various C2 nodes throughout JUAV-TSO-planned test events.

TEST AND EVALUATION ACTIVITY



FY04 testing included a JUAV-TSO JT&E capstone Joint Validation Test Event (JVTE). JVTE output is a set of JTTPs, provided to doctrine writers at the Air Land Sea Application Center, JFCOM, and the Services.

JUAV-TSO conducted FT-2 in conjunction with Marine Aviation Weapon and Tactics Squadron, Weapons and Tactics Instructor class 2-04 in Yuma, Arizona, in April 2004. JUAV-TSO conducted a multi-phased JVTE focused on data collection and validation of proposed JTTPs. JUAV-TSO subject matter experts developed a set of proposed JTTPs (during previous test events) for integrating UAVs into each mission area. JVTE was an opportunity to validate selected JTTPs.

In late January 2004, JUAV-TSO subject matter experts participated in a Global Hawk Air Force Tactics, Techniques, and Procedures 4-1 development conference at Nellis AFB, Nevada. This conference was the first opportunity for JUAV-TSO to directly influence the development of TTPs. JUAV-TSO's contribution was praised by the Global Hawk community. JUAV-TSOcontinues to work closely with the USAF Remotely Piloted Aircraft Center of Excellence (RPA COE) at Nellis AFB.

In FY04, JUAV-TSO supported numerous U.S. Navy Carrier Air Wing flight operations at Fallon by providing UAV system assets to augment pre-deployment training activities. While not considered structured JT&E events, flight operations provided the operational community venues in which to integrate a UAV platform into multiple training scenarios and JUAV-TSO staff opportunities to observe integration. Knowledge gained from these training events was used to refine planning activities associated with future JUAV-TSO field and validation test events.

TEST AND EVALUATION ASSESSMENT

JUAV-TSO products completed during FY04 include the JUAV-TSO MT-2 Report, the JUAV-TSO FT-2 Quick Look Report, and the FT-2 Test Event Report. To date, JUAV-TSO has evaluated the ability of tactical leaders to effectively and efficiently utilize UAVs in a tactical role within three C2 architectures. JUAV-TSO will develop joint, platform-independent TTPs for UAVs. These JTTPs will improve UAV employment in time-sensitive joint operations, with emphasis on air interdiction, fire support, and personnel recovery missions. JUAV-TSO maintains strong relationships in support of the JUAV-TSO mission to employ multi-Service and other DoD agency personnel, support, and equipment to develop and document JTTPs for current and proposed DoD UAVs in the tactical class of vehicles. All JUAV-TSO tests have produced invaluable data supporting the integration of time-sensitive tactical UAV operations in the warfighting community. The JUAV-TSO completion date is April 2005.