

## Chapter 5 - Research, Development, and Acquisition Modernization Strategy



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smaller scale contingency operations, and fighting and winning major theater wars. The materiel and combat developers, working together, have identified the systems and system upgrades required to meet the current and evolving threat. The challenge is to have the system capabilities in the hands of well-trained soldiers, when they need them, in the most cost-effective manner possible.

This chapter describes the family of systems required to protect the force and selected geopolitical assets against the threat identified in Chapter 2. System development is in harmony with the warfighting concept and the required capabilities addressed in Chapter 3. The AMD modernization goal is to ensure that robust, flexible AMD systems, that can defeat the projected threat, are fielded and available to the user. To accomplish this goal, AMD systems will be upgraded via technology insertion or replaced with next-generation systems to ensure technological superiority over potential adversaries. The realization of the AMD goal and modernization strategy will incur some risk; funding constraints may delay fielding of required systems and system upgrades.

### INTRODUCTION

Complying with the National Security Strategy defined in the Quadrennial Defense Review and the Defense Planning Guidance (DPG), AMD pursues a focused modernization effort to replace aging systems and incorporate cutting-edge technologies into the force, thus ensuring continued superiority over time. The defense strategy requires that forces be capable of responding across the full spectrum of crisis – including deterring aggression and coercion in crisis, conducting

### Chapter 5 Key Points

- The AMD modernization strategy capitalizes on P<sup>3</sup>I of proven systems and the development of new systems to achieve Full Spectrum Dominance.
- The AMD modernization strategy emphasizes a family of systems to implement an overarching, tiered defense and interoperability in a joint and multinational environment.

## **AIR AND MISSILE DEFENSE MODERNIZATION STRATEGY**

The AMD strategy emphasizes a family of systems to implement an overarching, tiered defense and stresses interoperability in a joint and multinational environment, thus supporting the Army Vision 2010/Joint Vision 2010 goal of Full Spectrum Dominance. The AMD strategy capitalizes upon a combination of pre-planned product improvements (P<sup>3</sup>I) to proven systems and the development of new systems in step with the Army investment categories of Information Dominance, Combat Overmatch, Recapitalization, and Essential/Leap-ahead (S&T) capabilities. Information Dominance is the capability to collect, process, and disseminate an uninterrupted flow of information while exploiting or denying an adversary's ability to do the same. Combat Overmatch is an advantage in combat capabilities over current and potential opponents by virtue of superior combat systems that employ advanced technologies. Essential S&T/Leap-ahead capabilities are high-leverage, critical technologies that enable the Army patterns of operation (Essential S&T), and those technologies that can provide a significant, almost revolutionary, improvement over current capabilities (Leap-ahead). Recapitalization encompasses the replacement or retrofit of an existing system due to mechanical aging, technological obsolescence, or excessive expense to maintain.

As reflected in Figure 5-1, the SHORAD, TMD, and AMD C<sup>4</sup>I elements of the 2005 force will evolve into one interoperable, synergistic AMD Force of 2010 and beyond. The Stinger,

Avenger, and Bradley Linebacker modernization ensures these weapon systems maintain their overmatch capabilities against the low-altitude threats. Examination of Leap-ahead technologies will lead to the identification of potential advanced weapons systems. PATRIOT and THAAD, fielded and sustained in the corps and theater, will provide an expanded battlespace defense and ensure continued overmatch capabilities against TBMs and air-breathing threats. When fielded, MEADS will begin to replace PATRIOT in the corps and, with its mobility and 360-degree coverage, will provide a vital link between forward maneuver force defenses and the theater and corps defenses of forces and critical assets. The NMD system will protect the United States – its population, industrial base, infrastructure, and force projection base – against limited ICBM attacks. The C<sup>4</sup>I family of systems (JTAGS, FAAD C<sup>2</sup>, Sentinel, AMDPCS, and JLENS or an elevated sensor) enhances integration of the AMD weapon systems. The C<sup>4</sup>I family of systems is more than the sum of the separate programs. It also includes the C<sup>4</sup>I capabilities integral to the AMD weapon systems (e.g., tactical operations centers, sensors, and communications hardware and software). While the C<sup>4</sup>I family of systems enables and enhances integration, actual integration is achieved through common architectures and common or compatible hardware and software functionalities applied across the force.

The following paragraphs describe, by system, the AMD materiel solutions to the war

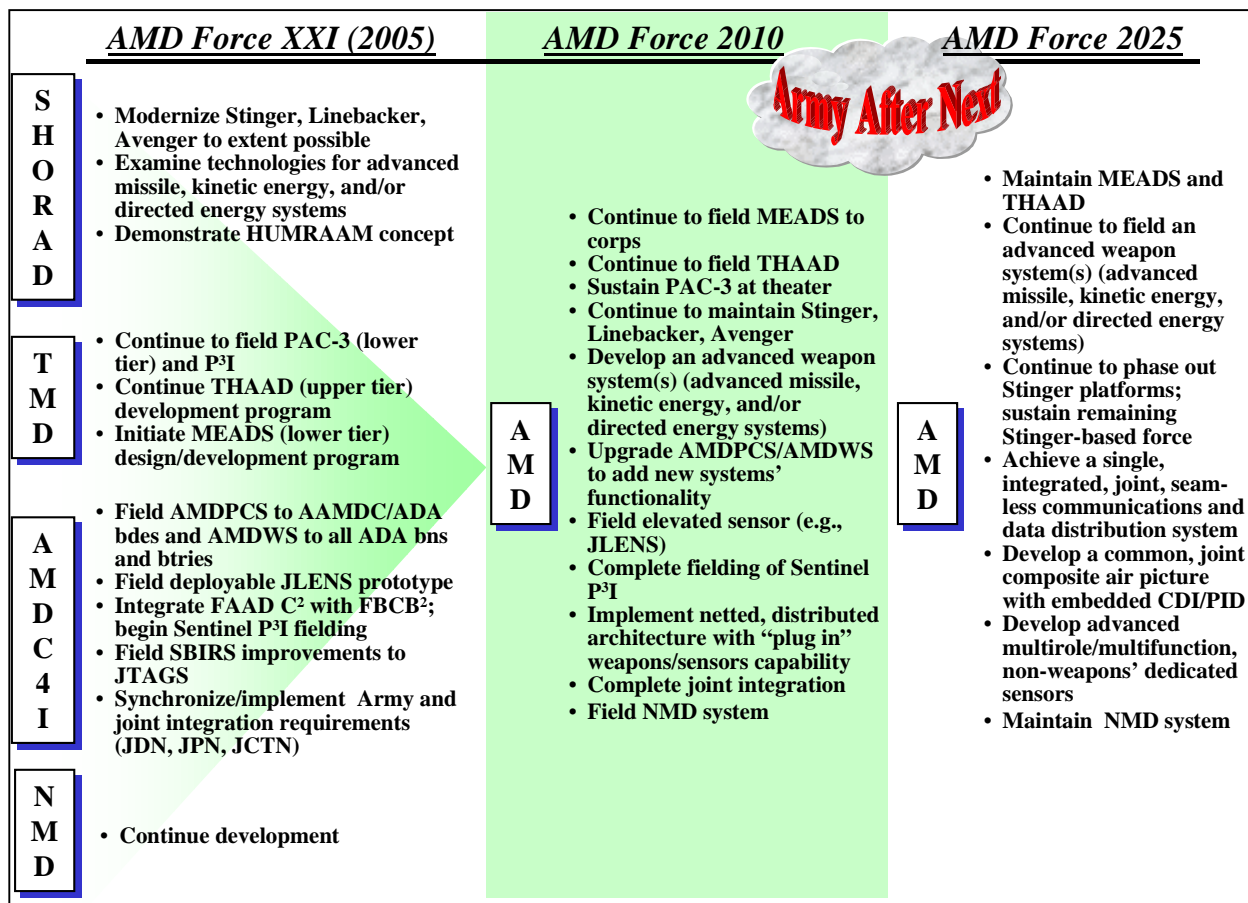


Figure 5-1. AMD Modernization Strategy

fighter requirements. The C<sup>4</sup>I architecture is in the integration section to emphasize the importance of information superiority. Each system also appears in a graphic format specifying the Army investment category under which it is grouped, system mission, funded improvements with corresponding operational payoffs, and issues (both programmatic and technical) that require resolution to avoid adversely impacting system capabilities. Unless oth-

erwise indicated, the referenced POM is the Army POM.

In addition, force packages (FPs) are frequently referenced in the SHORAD narratives. FP 1 consists of contingency response (rapidly deployable) forces; FP 2, rapid regional response (forward stationed) forces; FP 3, reinforcing response forces; and FP 4, the strategic reserve forces.

## AIR AND MISSILE DEFENSE PROGRAMS

### Stinger

Stinger (Figure 5-2), mounted on a variety of platforms, is the only air defense weapon in the

forward area. Stinger missile platforms provide defense against low-altitude CMs, UAVs, heli-

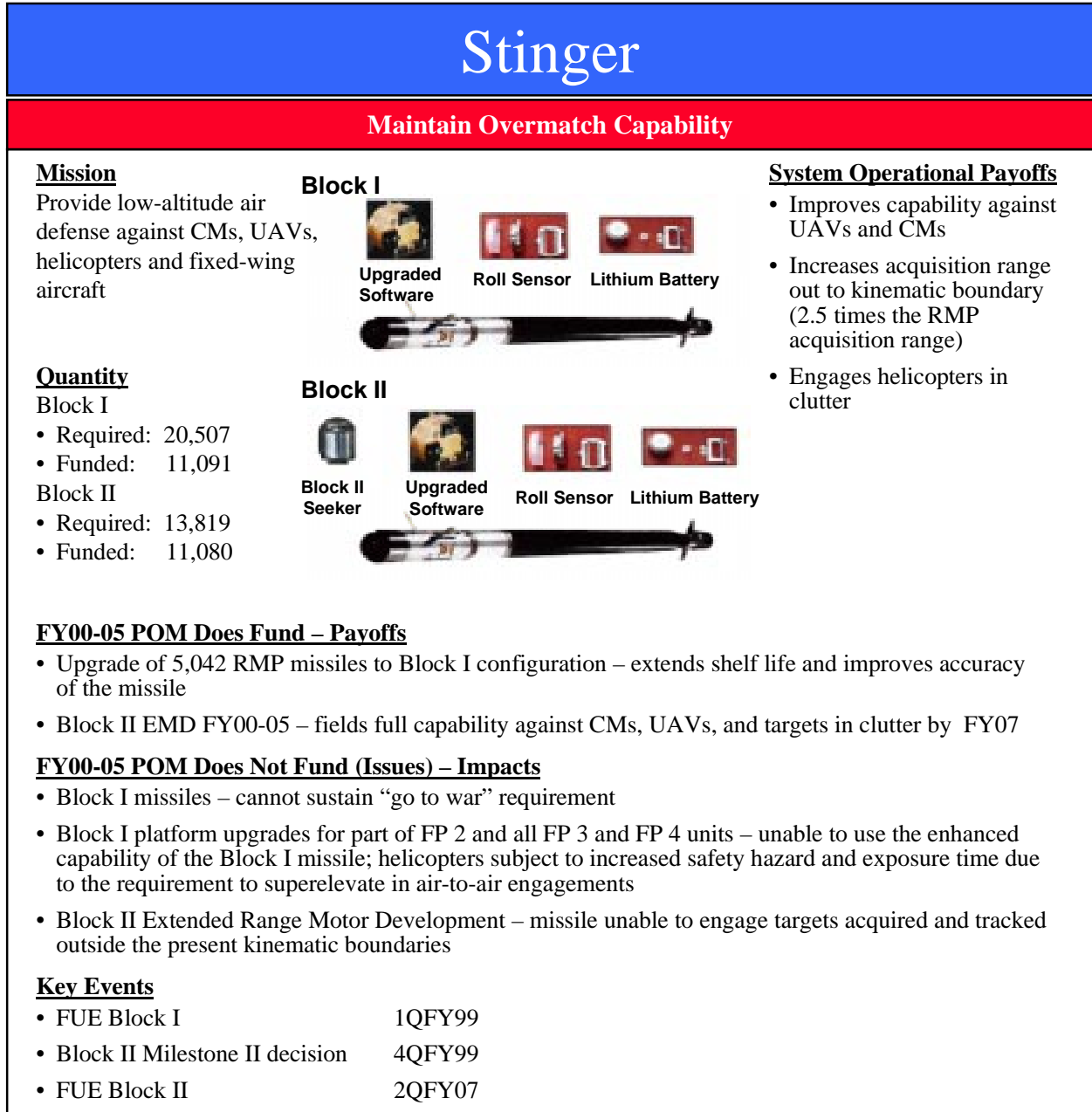


Figure 5-2. Stinger

copters, and fixed-wing aircraft throughout the theater of operations.

Stinger consists of a weapon (missile in launch tube); identification, friend or foe (IFF) unit; trainers; and ancillary equipment. The software-controlled guidance functions are reprogram- mable via a memory module external to the missile (located in the launcher). The Block I and

II software and hardware changes to the reprogram-mable microprocessor (RMP) missile provide the capability to meet the emerging, technologically advanced UAV and CM threats.

To enhance deployability and versatility, the Stinger missile system expanded from its original MANPADS configuration to employment on several low-altitude air defense platforms, includ-

ing Avenger, Bradley Linebacker, helicopters (Kiowa, Apache, Comanche), and the U.S. Marine Corps (USMC) Light Armored Vehicle-Air Defense (LAV-AD).

FY00-05 POM Does Fund - Payoffs.

*Block I Upgrade.* The POM funds the upgrade of 5,042 RMP missiles to Block I. The Block I missile upgrade increases the missile's accuracy, improves performance against counter-countermeasures, improves lethality against all targets, eliminates the need for superelevation in air-to-air applications, improves the night capability, and extends the missile's shelf life. Block I fills the go-to-war requirement for FPs 1 and 2.

*Block II EMD.* The Block II missile Engineering and Manufacturing Development (EMD) funding extends the missile's service life and improves the capability of the missile against lower signature targets (e.g., helicopters in clutter, UAVs, CMs, and low observables [LOs]) and "head-on" aspect angles presented to the gunner. The Block II upgrades the existing Stinger RMP seeker with a focal plane array seeker that provides a 2.5 times increase in acquisition range out to the missile's kinematic boundary.

FY00-05 POM Does Not Fund (Issues) - Impact.

*Block I Missile Quantities.* There are insufficient Stinger missiles to sustain the 23,225 "go to war" inventory requirement after FY05. Inadequate Block I funding and the RMP's expiring shelf life reduces the FY06 inventory to some 13,000 missiles, the amount needed for FP 1 and 2 units. Without additional funding, many FP 2 units and all FP 3 and 4 units will not have Stinger mis-

siles by FY07. The SHORAD forces' ability to sustain operations in two major theaters of war is at jeopardy.

*Block I Platform Upgrades.* Upgrading the Stinger missile platforms is absolutely necessary to take advantage of the missile improvement. The upgrade consists of installing new circuit cards in the Avenger and Bradley Linebacker assemblies and a new memory module in the Stinger MANPADS. Failure to fund these platform upgrades negates the Stinger Block I missile's improved performance for part of FP 2 and all FP 3 and 4 units.


*Block II Extended Range Rocket Motor Development.* The extended range rocket motor increases the kinematic boundary of the missile out to the Block II acquisition range. This allows the missile system to engage UAVs, CMs, and helicopters in clutter at extended range. Additional research, development, test and evaluation (RDTE) funds are required in the FY00-02 time frame to continue exploring kinematic range increase options (e.g., increasing the length of the motor and modifying the missile dome to reduce drag). Without this enhancement, the missile cannot fully capitalize on the enhanced detection and tracking ability of the Block II FPA seeker.

**Avenger**

The Avenger weapon system (Figure 5-3) is a lightweight, day and night, limited adverse weather fire unit for countering the threat of low-altitude, high-speed CMs, UAVs, helicopters, and fixed-wing aircraft. The fire unit consists of two

# Avenger

## Maintain Overmatch Capability

<p><b><u>Mission</u></b> Provide low-altitude AMD against CMs, UAVs, helicopters, and fixed-wing aircraft for brigade through theater forces and critical assets</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 1,213</li> <li>• Funded: 1,205</li> </ul> <p><b><u>FY00-05 POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• 60 additional fire units to up-gun active heavy divisions – increases division night-fighting capability; permits MANPADS force reduction</li> <li>• 165 fire units for ARNG corps battalions – meets objective Army requirements</li> <li>• Partial procurement of Block I (Obsolescence Mitigation/LO Enhancement) upgrade – corrects most serious Avenger obsolescence issues, enhances digitization capability, and provides more than a 50% increase in system effectiveness</li> </ul> <p><b><u>FY00-05 POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• Sufficient Avenger systems to sustain production line – without additional FMS or accelerated buys, active force up-gunning and ARNG procurement will not occur</li> <li>• Sufficient yearly quantities of STC/AFCC for economic buy – increases costs</li> <li>• Configuration of Block I (Obsolescence Mitigation/LO Enhancement) upgrade – Avenger fleet may become non-sustainable due to lack of parts; decreases engagement capability against LO threats</li> <li>• Block II (Battlefield Digitization/Integration) – prevents required incorporation of FBCB<sup>2</sup> ground situational awareness, BCIS friendly protect, and FAAD C<sup>2</sup>I fix</li> <li>• Block III (Force XXI) – prevents incorporation of a modernized sensor package and processing to defeat the post-2010 threat; no rebuild to extend service life through 2020</li> <li>• Trainer Modernization – required TTTs not procured; TTTs and ICOFTs not upgraded to reflect system improvements (to include the STC upgrade) and not supportable; adversely impacts soldier training as these training devices become non-operational due to lack of maintenance and parts</li> <li>• 144 ECU/PPUs for ARNG units – limits system employment and subjects troops to continued heat stress</li> </ul> <p><b><u>Key Events</u></b></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">• STC fielding</td> <td>3QFY99 (training base); 1QFY01 (FUE)</td> </tr> <tr> <td>• Fire unit production award</td> <td>1QFY99</td> </tr> </table>	• STC fielding	3QFY99 (training base); 1QFY01 (FUE)	• Fire unit production award	1QFY99		<p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• All weather operations</li> <li>• Shoot on the move</li> <li>• Strategically deployable (C130)</li> <li>• Mobility commensurate with supported force</li> </ul>
• STC fielding	3QFY99 (training base); 1QFY01 (FUE)					
• Fire unit production award	1QFY99					

**Figure 5-3. Avenger**

turret-mounted Stinger missile pods, a .50-caliber machine gun, a forward-looking infrared (FLIR) system, a laser rangefinder (LRF), and an IFF system. The fully rotatable turret is mounted on the HMMWV. The sensor components and armament system are gyro-stabilized for shoot-on-the-move capability. The unit can fire missiles or the ma-

chine gun on the move or from a stationary position. The gunner operates the system from inside the turret or from a remote control unit (RCU) away from the HMMWV. On-board communications equipment provides for radio and intercom operations.

The planned Avenger modernization program will maintain Avenger's operational effectiveness against the threat and counter the impact of system obsolescence. The program consists of three block modifications and related upgrades.

The Block I modification, Obsolescence Mitigation/LO Enhancement, will be implemented during FY98-06. Block I resolves the most critical obsolescence issues facing Avenger while upgrading system performance to counter the new LO threat. It will incorporate the slew-to-cue (STC)/Avenger fire control computer (AFCC) for all fielded systems and an improved FLIR, automatic video tracker (AVT), and LRF for FP 1 units. The AFCC, with embedded STC capability, will resolve the critical deficiencies of the existing computer – an advanced state of obsolescence, unsustainable, and no additional processing capability to accommodate growth. STC will automatically place a FAAD C<sup>3</sup>I selected target into the gunner's field of view to increase detection, speed engagements, and buyback battlespace lost to LO threats. STC provides the system with a 55-percent increase in engagement opportunities and a 66-percent increase in kills. Improved FLIRs, AVTs, and LRFs will overcome false target returns and the inability to track through clutter; they will provide a foundation for the future fire-on-recognition capability. In addition, current versions are becoming unsustainable due to obsolescence and perform poorly against LO threats.

The Block II modification, Battlefield Digitization/Integration, will be implemented during FY00-12. Block II fully integrates Avenger

with required Force XXI digitization initiatives. This block mod will initially support the fielding of the first digitized corps. It will provide integration with Force XXI Battle Command Brigade and Below (FBCB<sup>2</sup>) for required ground situational awareness, with the Battlefield Combat Identification System (BCIS) to reduce fratricide, and with the near-term digital radio. Block II will also add a Single Channel Ground and Airborne Radio System (SINCGARS) radio mount and remoted antenna for FP 3 and 4 units without the Enhanced Position Location Reporting System (EPLRS). Currently, units suffer from equipment damage problems and poor FAAD C<sup>3</sup>I reception without the mount and antenna to secure and aid the radio.

The Block III modification, Force XXI Avenger – Integrated Weapons Control System (IWCS), will be implemented during FY04-12. Block III adds advanced sensors and processing capabilities, integrating the new sensors, to defeat the mid- to far-term threat and provides for a rebuild program to extend system service life. The advanced sensor suite includes a second and third generation FLIR, positive hostile identification (PHID) capability, modernized IFF, increased daytime acquisition (television with magnified optics), sensor countermeasure hardening, and an integrated weapon system display. These elements allow full use of the Stinger Block II missile capabilities to defeat the evolving threat. The RCU redesign will accommodate new sensors and processing, eliminate obsolescence, reduce weight, and increase mobility. In addition, Block III will refurbish the fire units to extend service life through

2020, incorporate a user required embedded trainer, and allow access to the SIAP, thereby enhancing Avenger's effectiveness.

The Avenger trainer modernization efforts, to be conducted during the FY01-06 period, will procure required trainers and upgrade them to reflect improved system capabilities. Modernization will occur in two phases. Phase I procures 91 additional tabletop trainers (TTTs) to meet the user requirement of one per active component (AC) and Army National Guard (ARNG) platoon (TTT use provides up to an 80-percent increase in success in live-fire engagements); upgrades all fielded TTTs and institutional conduct-of-fire trainers (ICOFTs) with STC, FBCB<sup>2</sup>, and BCIS; and procures unit blank firing adapters for machine gun training (one per three Avengers). Phase II upgrades the ICOFTs to reflect Avenger Block III system improvements and ground-to-air BCIS.

FY00-05 POM Does Fund – Payoffs.

*Upgunning of Heavy Divisions.* Funding provides for the addition of 12 Avengers to each heavy division, thus increasing LO and night-fighting capabilities, permitting a reduction in manpower (MANPADS elimination) and standardizing SHORAD organizations. This payoff depends upon sufficient yearly foreign military sales (FMS) to permit economic buys and sustain yearly production, thus avoiding costly restart and increased per unit costs.

*ARNG Avenger Fire Units.* Funding allows for the procurement of the remaining seven ARNG corps Avenger battalions (less eight fire units) to meet objective force requirements. This

payoff, like that of the heavy division upgunning, depends upon FMS sales and sustained production.

*Block I Modification (Obsolescence Mitigation/LO Upgrade).* POM partially funds Block I. It procures STC/AFCC for 574 of 767 fielded Avengers, 382 AVT kits, and 54 upgraded FLIRs. These improvements overcome the most serious obsolescence and sustainment issues, improve system performance by 45 percent, and result in greater than a 50-percent increase in system effectiveness.

FY00-05 POM Does Not Fund (Issues) – Impact.

*Sustain Production Line.* If FMS sales do not materialize, POM does not fund sufficient Avengers per year to sustain the production line. Current production gaps of one year or more will result in production line shutdown and cost-prohibitive price increases. Upgunning and the ARNG force requirements will not be met.

*STC/AFCC Quantities.* POM does not fund sufficient STC/AFCC quantities to sustain a yearly economic buy of 100 items. This will increase costs and result in fewer STC/AFCCs procured for the force.

*Block I Modification (Obsolescence Mitigation/LO Enhancement).* POM does not complete Block I. The improved AVTs and FLIRs are not procured for the remaining 25 percent of FP 1 units and for FP 2, 3, and 4 units. The LRF replacement, to enhance engagements, is not procured. The non-Block I Avengers will have reduced engagement capabilities and cannot be sustained due to FLIR, AVT and LRF parts shortages, thus endangering operations and fleet readiness.

*Block II Modification (Battlefield Digitization/Integration).* POM does not fund Block II. This prevents the incorporation of FBCB<sup>2</sup> for ground situational awareness, integration of BCIS for fratricide protection (initially ground-to-ground; upgrade to add ground-to-air and air-to-ground), and resolution of the FAAD C<sup>2</sup> radio deficiency for FP 2 and 3 units. The ADA battalion will be unable to integrate with the digitized force.

*Block III Modification (Force XXI Avenger – IWCS).* POM does not initiate Block III RDTE for the advanced sensors and processing capabilities, thus limiting the system's ability to defeat the post-2010 threat.

*Trainer Modernization.* POM does not provide funding for the procurement of 91 more TTTs (to meet the one per platoon requirement); STC, FBCB<sup>2</sup>, and BCIS upgrades to trainers; and machine gun blank firing adapters to permit lower cost training. In addition, the continued maintenance and sustainment of ICOFTs and TTTs is unfunded. These funding shortfalls will result in the inability of soldiers to train as they fight (trainers will not have the system improvements and cannot replicate the enhanced capabilities) and nonoperative trainers (requiring soldiers to use tactical equipment and thereby increasing training costs).

*ECU/PPUs for ARNG Units.* The POM does not procure 144 environmental control units/prime power units (ECU/PPUs) for fielded ARNG units. The ARNG Avengers will continue to be operationally limited to avoid soldier injury or death caused by turret heat stress. In addition,

no funds are available for maintenance or spare parts.

### **Bradley Linebacker**

The M6 Bradley Linebacker (Figure 5-4) is the improved version of the Bradley Stinger Fighting Vehicle (BSFV). While the BSFV provides air defense of the heavy maneuver force, the Stinger team must dismount to engage targets. The Bradley Linebacker corrects BSFV limitations with respect to Stinger team survivability, fire control, target acquisition, and identification. The M6 Bradley Linebacker consists of the M2A2 (Operation Desert Storm [ODS]) Bradley with an integrated, externally mounted launcher that can fire four Stinger missiles while stationary or on the move. The Bradley Linebacker can thus maintain pace with the armored force while the Stinger team remains under armor protection during engagements. An integrated position, navigation, and north seeker capability allows for on-the-move cueing. FAAD C<sup>2</sup> and Sentinel provide targeting information to assist in acquisition. The Bradley Linebacker is being fielded to the armored and mechanized infantry divisions and to the armored cavalry regiments (ACRs).

### FY00-05 POM Does Fund – Payoffs.

*Additional M6 Bradley Linebackers.* The POM funds procurement of an additional 40 to the current funded fleet of 99. This continues fielding to FP 2 units, thus enhancing forward area protection of the heavy maneuver forces.

# Bradley Linebacker

## Maintain Overmatch Capability

### Mission

Provide the heavy maneuver forces with dedicated low-altitude AMD against CMs, UAVs, helicopters and fixed-wing aircraft

### Quantity

- Required: 209
- Funded: 139



### System Operational Payoffs

- Increased survivability in the forward area of the battlefield
- Increased mobility to support heavy maneuver forces
- Shoot-on-the-move
- Improved engagement and kill capability
- Fully digitized to enhance situational awareness

### FY00-05 POM Does Fund – Payoffs

- 40 additional M6 Linebackers – fielded to a portion of FP 2 units

### FY00-05 POM Does Not Fund (Issues) – Impacts

- Procurement of 70 Bradley Linebackers for remaining FP 2 units – decreases survivability, lethality, and mobility (cannot maintain coverage of the force); increases potential for fratricide
- Upgrade of the BCEs – increases O&S costs, reduces operational readiness, continues obsolescence; no embedded battlefield digitization capability
- Training aids and training devices for FP 1 and 2 units – increases unit training cost, adversely affecting soldier proficiency

### Key Events

- Fielding to AC units beginning 2QFY99

Figure 5-4. Bradley Linebacker

### FY00-05 POM Does Not Fund (Issues) – Impact.

*Bradley Linebackers for Remaining FP 2 Units.* POM does not fund the procurement of 70 M6s for the remaining FP 2 units. These units must rely upon BSFVs, with mounted Stinger MANPADS teams. This lack of funding significantly reduces Stinger team survivability and heavy force protection and increases the potential for fratricide. Operating and support (O&S) costs in the out-years will also increase.

*Bradley Control Electronics.* The Bradley Control Electronics (BCE) faces serious obsoles-


cence problems that will result in high O&S costs and limited growth. FY00-02 RDTE funding is necessary to modify and adapt the AFCC to the Bradley Linebacker. The commonality achieved by incorporating the AFCC into the Bradley Linebacker reduces support costs and alleviates the logistics burden in the out-years. Failure to fund will result in increased O&S costs, reduced operational readiness, continued obsolescence, and the lack of an embedded battlefield digitization capability, resulting in decreased interoperability with the supported force.

*Training Devices.* Bradley Linebacker training devices – TTT, conduct-of-fire trainer (COFT), and force-on-force trainer (FOFT) – and an embedded training capability are unfunded. These training devices enable training under realistic, but simulated, conditions and provide for sustained warfighter proficiency. Failure to fund these devices will result in the inability to train at the combat training centers and continued reliance upon training on tactical equipment, with increased O&S costs, reduced realism, and reduced system proficiency.

**MEADS**

MEADS is a cooperative program of the United States, Germany, and Italy designed to protect the maneuver force and critical assets from such threats as low-altitude CMs and SRBMs (armed with conventional weapons and WMD warheads), UAVs, and rockets. MEADS (Figure 5-5) will consist of missiles, launchers, sensors, and a BM/C<sup>4</sup>I element.

MEADS is the key AMD weapon system to complement the forward area capability of the Stinger-based platforms and the fixed, rear area

<h1>MEADS</h1>													
<b>Maintain Overmatch Capability</b>													
<p><b><u>Mission</u></b> Provide low- to medium-altitude air defense, theater ballistic missile defense, and CM defense of the maneuvering force and critical assets</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 8 battalions</li> <li>• Funded: 0</li> </ul> <p><b><u>FY00-05 BMDO POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Unfunded</li> </ul> <p><b><u>FY00-05 BMDO POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• MEADS Design and Development and follow-on development/procurement – terminates the DoD “flagship” international cooperative program; leaves maneuver force without TBM and CM defenses in the forward area</li> </ul> <p><b><u>Key Events</u></b></p> <table border="0"> <tr> <td>• Milestone I/II DAB (Design and Development)</td> <td>2QFY99</td> </tr> <tr> <td>• Design and Development MOU signature</td> <td>3QFY99</td> </tr> <tr> <td>• Preliminary Design Review</td> <td>4QFY00</td> </tr> <tr> <td>• Critical Design Review</td> <td>2QFY02</td> </tr> <tr> <td>• System development DAB</td> <td>2QFY02</td> </tr> <tr> <td>• Production DAB</td> <td>FY05</td> </tr> </table>	• Milestone I/II DAB (Design and Development)	2QFY99	• Design and Development MOU signature	3QFY99	• Preliminary Design Review	4QFY00	• Critical Design Review	2QFY02	• System development DAB	2QFY02	• Production DAB	FY05	 <p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Strategically deployable (C130)</li> <li>• Tactically mobile</li> <li>• 360-degree coverage</li> <li>• Netted, distributed operations</li> </ul>
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• Production DAB	FY05												

**Figure 5-5. MEADS**

capabilities of the PATRIOT and THAAD systems, thus contributing to the layered, synergistic TMD architecture. MEADS modularity, strategic deployability, tactical mobility, 360-degree coverage, netted and distributed architecture, and enhanced firepower and lethality will make it the sole TMD system that can provide protection of the maneuver forces against the threat spectrum throughout all phases of operations. MEADS is strategically deployable by C-130 aircraft, thereby alleviating strategic airlift (C-141, C-5, C-17).

FY00-05 BMDO POM Does Fund – Payoffs.

There is no MEADS funding in the FY00-05 POM.

FY00-05 BMDO POM Does Not Fund (Issues) – Impacts.

MEADS is funded through the Concept Exploration or Project Definition/Validation Phase ending in FY99. Without funding in the FY00-05 POM, the MEADS program will not progress with the Design and Development phase. The FY00-05 requirements have been developed to support a tri-national operational in-service date in FY07.

**PATRIOT**

PATRIOT is a long-range, mobile, theater and corps AMD system that protects critical assets and maneuver forces from TBMs, CMs, UAVs, helicopters, and fixed-wing aircraft. PATRIOT is the centerpiece of the Army's TMD force and is the world's only battle-proven TMD system. The PATRIOT system, with the PATRIOT Anti-

Tactical Missile Capability-2 (PAC-2) and Guidance Enhanced Missile (GEM), is currently the only fielded TMD system. To accomplish the PATRIOT mission requires the upgraded PAC-2 system and the timely acquisition of system enhancements (e.g., engagement control station, radar, launcher, and new missile) that will culminate in the new PAC-3 system (Figure 5-6).

The PAC-3 missile is a high-velocity, HTK, surface-to-air missile capable of intercepting and destroying the evolving TBM and air-breathing threats. The PAC-3 missile provides the range, accuracy, and lethality necessary to effectively defend against WMD. It uses interceptor-to-target body contact to generate a high destructive energy level against TBMs. Additionally, a two-ring lethality enhancer deployed near intercept further increases single-shot probability of kill against air-breathing threats.

FY00-05 BMDO/Army POM Does Fund – Payoffs.

*EMD Program.* The POM funds the completion of the PAC-3 EMD program. Materiel changes are effected to the interceptor (PAC-3 missile), radar, communications equipment, and BM/C<sup>3</sup>I to enhance system capabilities. EMD activities include flight tests, target and test support, and lethality efforts.

*PAC-3 Configuration 3 Battalion Upgrades.* The POM upgrades seven PATRIOT battalions (six AC and one battalion set in southwest Asia; 36 fire units) to PAC-3 Configuration 3.

# PATRIOT

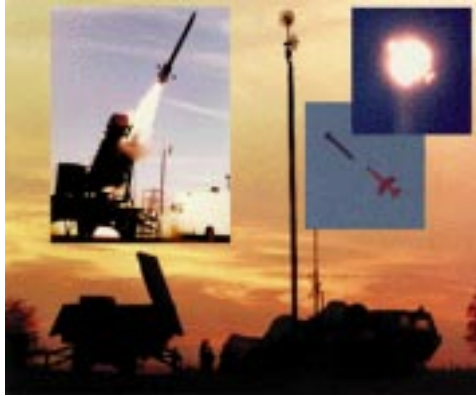
## Maintain Overmatch Capability

### Mission

Provide AMD against airborne threats at all altitudes for critical assets and maneuver forces belonging to corps and theater

### Quantity

- Required: 2,200
- Funded: 560



### System Operational Payoffs

- More than doubles the defended area on the ground against the TBM threat
- Increases battlespace tenfold and delivers direct HTK of WMD
- Enhances joint force interoperability
- Kills TBMs with four times the range of the Desert Storm threat
- Buys back battlespace lost to LO CMs and aircraft

### FY00-05 BMDO/Army POM Does Fund – Payoffs

- Completion of PAC-3 missile EMD program – improves performance against the threat spectrum and intercept performance
- Upgrade of 7 PATRIOT battalions (36 fire units) to PAC-3 Configuration 3 – improves search, detection, track and discrimination by the radar; increases battlespace; improves communications; enhances lethality
- PAC-3 missile production (560 missiles) – provides range, accuracy, and lethality to defeat evolving TBM threat
- PATRIOT Product Improvement Program – increases PATRIOT’s effectivity, survivability, and flexibility of defense design

### FY00-05 BMDO/Army POM Does Not Fund (Issues) – Impacts

- 640 PAC-3 missiles – inadequate inventory for second theater of war mission; increases cost per missile
- Upgrade of 5 PATRIOT battalions to PAC-3 Configuration 3 – does not provide best capability to balance of the force; increases per unit cost
- Battery Command Post and Tactical Command System conversion to CHS II, battery Link 16 capability – decreases joint interoperability
- PAC-2 (GEM+) upgrade – does not provide missile inventory upgrades to counter current TBM and evolving CM threats
- Continuing PATRIOT upgrades and improvements – decreases effectiveness against evolving threat; decreases system capability and maintainability
- Second ARNG PATRIOT battalion – decreases capability against AMD threat; does not meet Vice Chief of Staff’s commitment

### Key Events

- LRIP DAB decision - 2QFY99
- LRIP contract award - 3QFY99
- FUE PAC-3 Missile - 3QFY00
- FRP contract award - 1QFY01

Figure 5-6. PATRIOT

The upgrades include the addition of medium- and high-range resolution waveforms, a dual traveling wave tube, and a new exciter to the radar; upgrades to the PATRIOT battery communications equipment; and the ability to remotely locate launchers up to 30 kilometers from the radar. These changes will improve search, detection, track, and discrimination by the radar; increase battlespace; and improve communications.

*PAC-3 Missiles.* The POM provides for the production and fielding of 560 PAC-3 missiles.

*PATRIOT Product Improvement Program.* The POM provides RDTE funding for improvements and applicable testing related to responsive threat analysis, enhanced CM defense capabilities, horizontal battlefield digitization, and communications upgrades.

FY00-05 BMDO/Army POM Does Not Fund (Issues) – Impacts.

*640 PAC-3 Missiles.* Ammunition studies concluded that 2200 PAC-3 missiles were needed to meet the future threat. The APO was set at 1200. The POM only purchases 560 missiles, 640 less than the APO. PATRIOT units deploying to a "near simultaneous" second theater of war will have insufficient PAC-3 missile inventories, exposing the force to grave risk.

*Upgrades of Remaining Battalions to PAC-3 Configuration 3.* The POM does not fund the upgrade of four AC PATRIOT battalions and one ARNG battalion to PAC-3 Configuration 3, nor provide for the purchase of two additional fire units for the second ARNG PATRIOT battalion. These battalions will have less than optimal

equipment to meet the future threats. Two PATRIOT configurations must also be simultaneously supported, thereby increasing the operations and maintenance cost of the system.

*CHS-2 Conversions and Battery Link 16 Capabilities.* The POM does not fund C<sup>3</sup> upgrades to enhance interoperability. Upgrading CHS-1 to CHS-2 workstations results in automated support for staff planning and management functions and enhanced interoperability with other ABCS systems. The tactical command system (TCS) configuration is converted from the battalion tactical operations center; the TCS will automate defense planning for the battalion and increase the commander's situational awareness. The integration of the joint tactical terminal with the TCS will enable continued receipt and processing of PHID to allow assured, expedited engagements of air-breathing threats. Link 16 at battery level allows the battery to participate (receive and process information) in the joint network when deployed without its parent information and coordination central. Without funding for these upgrades, interoperability with joint elements and system effectiveness will be reduced, and the potential for fratricide will remain unchanged.

*PAC-2 (GEM+) Upgrade.* The GEM+ upgrade greatly increases the current missile capability against CMs and TBMs. Without this upgrade, PAC-2 missile effectiveness against the advanced threats will be limited. The resulting combination of "vanilla" PAC-2 missiles and limited inventory PAC-3 missiles will be insufficient to counter the proliferating CMs and TBMs.

*PATRIOT Continuing Upgrades and Improvements.* The POM does not fund hardware and software upgrades and improvements (post-deployment build [PBD]-5, smart crane ammunition transfer system, reliability and maintainability, radar enhancement phase IV, and CDI phase IV) to sustain system maintainability and optimize system performance. Post PBD-5 constitutes the continuous software effort to enhance system capabilities; the software changes focus on the advanced TBM and CM threats, interoperability improvements (e.g., CEC interface), and CDI enhancements. The smart crane ammunition transfer system automates loading and reloading of missiles, reducing the current 55+ minutes to approximately 20 minutes. The reliability and maintainability improvements are continuing efforts to sustain system readiness; failures and shortfalls identified by field units are collected, and requisite hardware and software to fix the deficiencies are developed. Radar enhancement phase IV incorporates hardware and software changes to increase the range of the radar's receiver and digital signal processor, improving system capability against the advanced CM threat in clutter. CDI phase IV incorporates hardware and software changes to improve system classification and identification capability against non-TBM targets.


*Second ARNG PATRIOT Battalion.* The POM does not fund a second ARNG battalion per commitment made by the Vice Chief of Staff to the Chief, National Guard Bureau. The battalion (2d Battalion, 200th ADA) is assigned to the 111th (New Mexico ARNG) Brigade and will initially

consist of a PATRIOT battery (equipment transferred from the Alabama ARNG battalion). Funding is required to procure the remaining equipment for the objective organization of a battalion headquarters and three firing batteries, each upgraded to Configuration 2 with PDB-5 software. Without funding, the 2d Battalion, 200th ADA's one firing battery configuration will not allow it to provide the required TBM and CM defense of its assigned corps.

#### **THAAD**

The THAAD system (Figure 5-7) is the most mature upper-tier TMD system under development. THAAD will provide the high-altitude, upper-tier intercept response for the Army's two-tier TMD concept. It will intercept TBMs in both the exo- and endoatmosphere. This capability allows THAAD to destroy incoming TBMs at longer ranges from defended assets, provides for multiple shot opportunities, and minimizes the likelihood of damage caused by WMD and falling debris.

The THAAD program is developing a complete integrated weapon system consisting of the radar; BM/C<sup>4</sup>I system, launchers, and missiles. The fully integrated, X-band radar is highly accurate and is the most powerful TMD radar in the world. The BM/C<sup>4</sup>I system will be the brains of the system, fully operational with PATRIOT and other AMD systems, and will execute engagement operations (EO) and force operations (FO). The launcher uses a modified M1075 Palletized Loading System (PLS) truck to load the complete missile module within minutes. The missile consists

THAAD			
Maintain Overmatch Capability			
<p><b><u>Mission</u></b> Provide long-range/high-altitude area defense of ground forces and high-value assets against TBMs</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 1233 missiles</li> <li>• Funded: 1233 missiles</li> </ul> <p><b><u>FY00-05 BMDO POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Completion of PDRR and EMD through DT/OT – increases the theater commander’s capability to defend against SRBMs; provides the only near-term solution for defeating the MRBM threat</li> </ul> <p><b><u>FY00-05 BMDO POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• To be determined</li> </ul> <p><b><u>Key Events (Based on FY00-05 POM; subject to change)</u></b></p> <table style="width: 100%; border: none;"> <tr> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> <li>• Software specification review - 1QFY99</li> <li>• Integrated system tests complete - 1QFY00</li> <li>• Milestone II - 1QFY00</li> <li>• Limited User Test - 4QFY00</li> <li>• EMD Radar 1 I&amp;T complete - 1QFY03</li> </ul> </td> <td style="vertical-align: top; width: 50%;"> <ul style="list-style-type: none"> <li>• DT begins - 2QFY03</li> <li>• EMD Radar 2 I&amp;T complete - 3QFY03</li> <li>• LRIP award - 4QFY04</li> <li>• DT/OT complete - 3QFY05</li> <li>• FUE - 2QFY07</li> </ul> </td> </tr> </table>	<ul style="list-style-type: none"> <li>• Software specification review - 1QFY99</li> <li>• Integrated system tests complete - 1QFY00</li> <li>• Milestone II - 1QFY00</li> <li>• Limited User Test - 4QFY00</li> <li>• EMD Radar 1 I&amp;T complete - 1QFY03</li> </ul>	<ul style="list-style-type: none"> <li>• DT begins - 2QFY03</li> <li>• EMD Radar 2 I&amp;T complete - 3QFY03</li> <li>• LRIP award - 4QFY04</li> <li>• DT/OT complete - 3QFY05</li> <li>• FUE - 2QFY07</li> </ul>	 <p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Near-leakproof defense of critical CINC priorities, in conjunction with PATRIOT and/or MEADS</li> <li>• Wide area defense covering both endo- and exo-atmospheric threats and engagements</li> </ul>
<ul style="list-style-type: none"> <li>• Software specification review - 1QFY99</li> <li>• Integrated system tests complete - 1QFY00</li> <li>• Milestone II - 1QFY00</li> <li>• Limited User Test - 4QFY00</li> <li>• EMD Radar 1 I&amp;T complete - 1QFY03</li> </ul>	<ul style="list-style-type: none"> <li>• DT begins - 2QFY03</li> <li>• EMD Radar 2 I&amp;T complete - 3QFY03</li> <li>• LRIP award - 4QFY04</li> <li>• DT/OT complete - 3QFY05</li> <li>• FUE - 2QFY07</li> </ul>		

**Figure 5-7. THAAD**

of a single-stage, solid rocket booster and a kill vehicle that separates from the booster prior to intercept. All elements are currently being designed, developed, and tested.

FY00-05 BMDO POM Does Fund – Payoffs.

The POM completes program definition and risk reduction (PDRR) and provides funding for EMD through developmental/operational testing (DT/OT) to include software development.

The POM also provides first unit equipped (FUE) hardware via the award of a low-rate initial production (LRIP) contract. (Note: Subsequent to the POM, BMDO is considering options for restructuring the THAAD development effort.)

FY00-05 BMDO POM Does Not Fund (Issues) – Impacts.

Funding issues are to be determined.

## INTEGRATION

The key to effective AMD is efficient integration and interoperability of all systems, especially in the joint environment, to obtain informa-

tion dominance. The C<sup>4</sup>I family of systems approach accomplishes technical, functional, and mission interoperability within the AMD force and

with joint and multinational forces. C<sup>4</sup>I integration, as previously cited, is achieved through common architectures and common or compatible hardware and software functionalities. The strategy for accomplishing this commonality and compatibility within the joint integrated architecture is to apply and adopt joint solutions wherever possible; work closely with the joint community (JTAMDO, BMDO, and the other services) in analyses, experiments, demonstrations, prototyping, and trades; and implement resulting common solutions within Army programs.

Digitization of the battlefield is a critical element in providing information dominance. Digitization provides the technology to ensure that vertically and horizontally integrated TAMD C<sup>4</sup>I centers will synchronize the AMD battle, linking AMD systems and disseminating early warning and cueing information. As demonstrated during Task Force XXI and the Division XXI advanced warfighting experiment (DAWE), AMD C<sup>4</sup>I modernization is leading the way in providing an integrated, digitized family of systems capable of effective combat operations. This section describes the JTAGS, FAAD C<sup>2</sup>, Sentinel, and AMDPCS systems that digitally meet the interoperability requirements for AMD (active defense) elements, other Army systems, other services, and multinational forces to effectively integrate AMD information operations.

### **JTAGS**

JTAGS (Figure 5-8) is a transportable information processing system that receives and pro-

cesses in-theater, direct down-linked data from Defense Support Program (DSP) satellites and the follow-on Space-Based Infrared System (SBIRS) satellites. JTAGS disseminates warning, alerting, and cueing information on TBMs and other tactical events of interest throughout the theater using existing communications networks. JTAGS supports all TMD pillars (attack operations, active defense, passive defense, and BM/C<sup>4</sup>I) and provides the shortest sensor-to-shooter connectivity. Its in-theater location offers the warfighter two advantages: it provides the earliest warning, and it can be readily tailored for and linked to theater-unique terrestrial C<sup>3</sup>I systems. The five production units were fielded to the Army Space Command (ARSPACE) in 1997.

JTAGS is currently in the product improvement phase. Improvements include the integration of the Joint Tactical Information Distribution System (JTIDS) into the communications net, increased system accuracy and timeliness, and the upgrade of JTAGS into the MultiMission Mobile Processor (M3P) for operation with SBIRS. The Air Force has delegated management of the SBIRS M3P development to the Army JTAGS Product Office.

The M3P will provide the theater commanders in chief (CINCs) with an improved, in-theater capability to receive and process space-based IR data on TBM launches and disseminate warning, alerting, and cueing information to the warfighters. It will also support Air Force strategic missions. The M3P will meet the requirements specified via use of a common, multifunctional



**Figure 5-8. JTAGS**

unit that has additional hardening and is capable of providing all functions necessary for the receipt, processing, correlation, and distribution of time-critical data to the selected area of interest. The design will provide connectivity to improved sensors with a faster scan rate and increased sensitivity. These improved sensors will permit the realization of improvements in predicted ground impact points (PGIPs), estimated launch points (ELPs), cueing, and reporting as well as higher operational availability, greater survivability, enhanced operations, and improved down-links. Improved communications will be available via the integration of Milstar.

FY00-05 POM Does Fund – Payoffs.

The POM funds SBIRS M3P for joint service use when DSP converts to SBIRS. This upgrade will greatly enhance JTAGS performance by improving PGIP and ELP predictions and cueing accuracy, and will correct data collection, processing, and dissemination deficiencies.

FY00-05 POM Does Not Fund (Issues) – Impacts.

The POM fully funds the JTAGS program.

**FAAD C<sup>2</sup>**

FAAD C<sup>2</sup> (Figure 5-9) provides SHORAD weapons and C<sup>2</sup> centers with digital automated target information from Sentinel and joint sensors

# FAAD C<sup>2</sup>

## Achieve Information Dominance

### Mission

Provide an automated means of transmitting timely target data to SHORAD systems to prevent fratricide and to manage the air battle

### Quantity

- Required: 30
- Funded: 30



### System Operational Payoffs

- Provides real-time automated engagement operations capability to SHORAD units
- Automated SHORAD C<sup>2</sup> on the move
- With Sentinel increases SHORAD weapon systems engagements by 134%, resulting in 152% more intercepts

### FY00-05 POM Does Fund – Payoffs

- Completion of objective system software development (Block III) – implements full vertical/horizontal interoperability; merges FAAD C<sup>2</sup> and FBCB<sup>2</sup>
- Fielding of an objective FAAD C<sup>2</sup> capability to 15 ARNG and 2 AC SHORAD units – digitizes engagement operations, increasing defense effectiveness and decreasing engagement time
- Initial development of Block IV software capabilities– provides digital integration with joint and NATO forces

### FY00-05 POM Does Not Fund (Issues) – Impacts

- JTIDS initial spares – delays fielding of JTIDS terminals to SHORAD units

### Key Events

- FAAD C<sup>2</sup> version 5.2                      Oct 99
- Field to first digitized division      Oct 00

Figure 5-9. FAAD C<sup>2</sup>

and with battle command information. Along with the Air and Missile Defense Workstation (AMDWS), it provides automated EO and FO capabilities in the SHORAD battalion. FAAD C<sup>2</sup> EO capabilities include real-time early warning and cueing information to SHORAD weapon systems, friendly aircraft identification, and air battle management. AMDWS FO capabilities include automated mission and staff planning (e.g., development and distribution of logistical and administrative orders and directives) and interoperability with other ABCS components.

The FAAD C<sup>2</sup> system integrates CHS equipment into Standard Integrated Command Post System (SICPS) shelters and SHORAD weapons platforms. A handheld terminal unit (HTU) is integrated into the BSFV, Bradley Linebacker, Avenger, and Stinger MANPADS team.

The EO and FO software functions at SHORAD battalion and battery command posts use the CHS computer workstations. The EO CHS workstation receives both local cueing and external warning air track information. Networked Sentinels provide a divisional air picture using EPLRS. The netted divisional air track information is cor-

related with other external air track sources (e.g., Navy and Air Force AWACS platforms), using JTIDS Class 2M radio terminal/TADIL-J, and with TMD and adjacent SHORAD battalions via TADIL-B mobile subscriber equipment links.

FY00-05 POM Does Fund – Payoffs.

*Objective System Software.* POM funding completes objective system software development (Block III), implements two-way TADIL-J and TADIL-B, merges FAAD C<sup>2</sup> and FBCB<sup>2</sup> software on a single computer at ADA platoon and below, implements full horizontal and vertical interoperability, and provides EPLRS redesign. Funding also initiates fielding of these software capabilities.

*Fielding of the Objective FAAD C<sup>2</sup>.* POM funds the fielding of 15 ARNG SHORAD units and two AC SHORAD units with an objective FAAD C<sup>2</sup> capability that includes both Block III EO software and AMDWS hosted on CHS-2 and CHS-3 workstations.

*Block IV Software.* POM funding initiates development of Block IV software capabilities as defined in the FAAD C<sup>2</sup> ORD (e.g., IFF and continuity of operations).

FY00-05 POM Does Not Fund (Issues) – Impacts.


JTIDS initial spares remain unfunded. This will delay fielding of JTIDS terminals to FP 1 units, thus precluding the provision of early warning against CMs and UAVs. Additionally, the Force XXI first digitized division operational requirements mandate cannot be met.

**Sentinel**

Sentinel (Figure 5-10), used with the Army's FAAD C<sup>2</sup> system to provide critical air surveillance of the forward areas, automatically detects, tracks, classifies, identifies, and reports targets (CMs, UAVs, helicopters, and fixed-wing aircraft). Sentinel can provide targeting information on hovering to fast-moving aerial platforms, and on those that are flying at altitudes from nap of the earth to the maximum engagement altitude of SHORAD weapons. Sentinel acquires targets sufficiently forward of the defended forces or assets to improve SHORAD weapon reaction time and allow engagement at optimum ranges. The Sentinel IFF reduces the potential for fratricide. Sentinel supports Army divisional, corps, and theater AMD operations across the full spectrum of conflict.

Sentinel consists of a radar-based sensor system mounted on a HMMWV. The sensor is an advanced, three-dimensional, X-band, phased-array radar with an instrumented range of 40 kilometers. The Sentinel is capable of operating day and night, in adverse weather conditions, and in battlefield environments of dust, smoke, aerosols, and enemy countermeasures. It provides 360-degree coverage for acquisition and tracking. It is transportable without disassembly and can be march-ordered and emplaced by two soldiers.

Sentinel capabilities are being enhanced via a P<sup>3</sup>I program. These improvements fall into three executable blocks that leverage each succeeding effort. Block I (Acquisition Range Improvements) efforts include a transmitter upgrade,

<h1>Sentinel</h1>		
<b>Achieve Information Dominance</b>		
<p><b><u>Mission</u></b> Provide acquisition, tracking, classification, and identification of CMs, UAVs, helicopters, and fixed-wing aircraft and provide adequate target location to cue SHORAD weapons into field of view</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 231 (AAO) 208 (APO)</li> <li>• Funded: 196</li> </ul> <p><b><u>FY00-05 POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Hardware to complete fielding of AC and a portion of ARNG – provides divisional units with detection and identification capability in day/night and all weather conditions</li> <li>• P<sup>3</sup>I program – enhances target detection and identification of LOs and stealthy targets at greater ranges</li> </ul> <p><b><u>FY00-05 POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• Accelerated fielding to achieve minimum economic order quantity (12 systems per year) in FY01-03 – increases unit cost and delays fielding to ARNG units, affecting operational readiness</li> <li>• Tactical quiet generator for ARNG – cannot field ARNG Sentinels</li> <li>• Spares to support P<sup>3</sup>I requirement – cannot field P<sup>3</sup>I upgrades without spares support</li> <li>• FP 2-3 Adjunct Sensors and associated spares – no passive sensor operations for FP 2-3 units</li> </ul> <p><b><u>Key Events</u></b></p> <ul style="list-style-type: none"> <li>• Fieldings to 13 AC and ARNG units      FY00-02</li> <li>• FUE for P<sup>3</sup>I items                              2QFY04</li> </ul>		<p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• With FAAD C<sup>2</sup>, increases SHORAD weapon systems' engagement by 134%, resulting in 152% more intercepts</li> <li>• Expanded situational awareness</li> <li>• 360-degree acquisition/tracking of CMs, UAVs, other aircraft</li> </ul>

**Figure 5-10. Sentinel**

implementation of enhanced waveforms with supporting hardware modifications, and the implementation of a low-altitude search raster. Block II (Target Classification Improvements) implements Hostile Aircraft Identification (HAIDE) and a high-range resolution waveform capability. Block III (Complementary Adjunct Sensor Additions) adds an adjunct sensor to provide passive acquisition and additional target classification capabilities.

FY00-05 POM Does Fund-Payoffs.

*Completion of Fielding to AC Units.* The POM funds sufficient hardware (59 systems) to complete fielding to AC units and to cover a significant portion of the ARNG requirement (38 of 96 systems).

*P<sup>3</sup>I Program.* The POM funds development and modifications for improvement of the Sentinel radar. These upgrades will enhance target

detection and identification of LOs and stealthy targets at greater ranges than currently available.

FY00-05 POM Does Not Fund (Issues)-Impacts.

*Fielding Delays.* During FY02-05 reduced funding severely restricts fielding. The lack of hardware restricts fielding to only the 2d Battalion, 174th ADA and 2d Battalion, 263d ADA. Additional funding is necessary to accelerate fielding to three ARNG battalions and to separate brigade units. Accelerated funding will complete the ARNG fielding in FY08 versus FY10. This increased funding will reduce unit costs (achieved through minimum economic production rates) and will free up significant dollars in FY08-10 for other modernization improvements.

*Tactical Quiet Generators for the ARNG.* Tactical quiet generators (TQGs) for the AC units were purchased prior to the determination of the ARNG requirement. Thus, the TQGs for the ARNG (16 battalions and 14 batteries in the separate brigades) will not be provided “free issue” and must be funded. Without TQGs, the Sentinels will not have a tactical power source and cannot be fielded.

*Spares to Support P<sup>3</sup>I Fielding.* The POM does not fund the P<sup>3</sup>I spares. Without these spares, the P<sup>3</sup>I upgrades will not be fielded because they cannot be maintained.

*FP 2 and 3 Adjunct Sensors.* Without the adjunct sensor, FP 2 and FP 3 units will not have passive target acquisition and CM and UAV classification capabilities and will be unable to operate during emissions control periods. The addition of a passive sensor will enhance classification and


tracking of CMs and UAVs and improve operational capabilities against sophisticated electronic countermeasures.

**AMDPCS**

The AMDPCS (Figure 5-11) provides a common, integrated, digitized, air defense C<sup>2</sup> capability that automates and integrates the performance of EO and FO functions for AMD (battery through theater) as well as joint force elements (e.g., battlefield coordination detachment [BCD]). It is the AMD battlefield system in the Army Battle Command System (ABCS). It provides AMD brigades with a Fire Direction Center (FDC) for monitoring and controlling subordinate battalions. Additionally, it provides the AMDWS, a common automated defense planning and situational awareness workstation that allows sharing of vital FO information with AMD, other Army, and joint forces.

The AMDPCS has been developed using CHS, standard Army shelters, and common Army and Air Force communications equipment. There is no new hardware development associated with the AMDPCS.

Prototype software, exercised in numerous Army and joint exercises worldwide, has a high degree of maturity. The software for the brigade AMDWS and FDC was exercised with great success during the DAWE. In addition, the air defense system integrator (ADSI), a component of the brigade FDC, has already received limited certification from the Joint Interoperability Test Command.

AMDPCS	
Achieve Information Dominance	
<p><b><u>Mission</u></b> Integrate and automate the performance of EO and FO at all echelons of command</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 12</li> <li>• Funded: 8</li> </ul> <p><b><u>FY00-05 POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Procurement of objective AMDPCS for AMD brigades, AAMDC, and BCDs – incorporates vertical and horizontal exchange of information with SHORAD, PATRIOT and III Corps AMD elements</li> <li>• Partial development of objective software and AMDWS software – improves vertical and horizontal information exchange and BCDs for SHORAD, PATRIOT, THAAD and MEADS units</li> </ul> <p><b><u>FY00-05 POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• RDTE funding (FY00 - FY01) to support complete software development for AMDWS version 2.0 and higher and ADSI – precludes the integration of air defense into ABCS; delays C<sup>2</sup> of the digitized battlefield</li> </ul> <p><b><u>Key Events</u></b> AMDWS Version 3.0 objective phase planning 1QFY00</p>	<div style="text-align: center;">  </div> <p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Enables fully integrated AMD force operations in theater</li> <li>• Assures synchronization with and responsiveness to the supported force</li> </ul>

**Figure 5-11. AMDPCS**

WRAP funding completes development, testing, and materiel release of the 31st ADA Brigade prototype and the Air Defense Element at III Corps headquarters. The FAAD C<sup>2</sup>, PATRIOT, THAAD, MEADS, and JLENS project offices will share the majority of the AMDWS future software upgrading and developmental funding.

The AMDPCS will undergo operational tests in conjunction with major weapon system tests and during major warfighter training exercises. The test strategy consists of a three-phased test and evaluation process for the ADA brigade

AMDPCS/AMDWS version 1.1. The first phase includes participation in the PAC-3 force development test and experimentation (FDTE) using AMDWS version 1.1. The second phase includes participation in the III Corps warfighter exercise in November-December 1998. The third phase includes participation in the PAC-3 initial operational test and evaluation (IOTE) in April 1999. Participation in the PAC-3 IOTE will serve as the OT for the AMDPCS at the ADA brigade with AMDWS version 1.1. The objective of this final

test is to gain certification and material release of the objective AMDPCS system.

FY00-05 POM Does Fund – Payoffs.

The POM funds the procurement and training of upgrades for objective AMDPCS functionality at the ADA brigades, AAMDC, and BCDs. This will incorporate vertical and horizontal exchange of information with SHORAD, PATRIOT, and III Corps ADA elements, as well as provide the air defense to the ABCS and joint C<sup>4</sup>1 systems.

FY00-05 POM Does Not Fund (Issues) – Impacts.

FY00-01 RDTE funding is insufficient to support AMDWS version 2.0 (the AMDWS software version for the first digitized division) and higher software development and the ADSI software and hardware modification. Without full funding, software development to provide C<sup>2</sup> capability to all command echelons (battery to theater) will not be accomplished, the obsolete AN/TSQ-73 brigade fire control system will not be replaced, and the Army will not have a common planning module that is interoperable with joint planning and control systems.

**NATIONAL MISSILE DEFENSE GROUND-BASED ELEMENTS**

NMD is a joint service program to develop a fixed, land-based system to protect the United States against limited, long-range ballistic missile attacks. The objective of the NMD Deployment Readiness (or 3+3) Program is to develop and test an integrated system by the end of FY99 that could achieve an initial operational capability (IOC) as early as FY03.

The NMD system (Figure 5-12) will be capable of multiple, simultaneous, over-the-horizon engagements at long ranges and high altitudes (outside the earth's atmosphere) for highly effective protection of all 50 states. The NMD ground-based elements (GBEs) include the Ground-Based Interceptor (GBI), the Ground-Based Radar (GBR), and a part of the BM/Command, Control, and Communications (BM/C<sup>3</sup>) system.

The GBI, the “muscle” of the system, is being developed as a dormant, long-range, high-velocity missile consisting of an exoatmospheric kill vehicle (EKV) on a multiple-stage, solid rocket booster. The GBI will ensure reliable HTK destruction of reentry vehicles during their mid-course phase of flight. The GBI element also includes the necessary command, launch, and ground support equipment.

The GBR, the “eyes” of the GBE, is being developed as a wide bandwidth, solid-state, X-band, phased array radar sized for the NMD mission and capable of precision, long-range detection, acquisition, tracking, and classification of strategic ballistic missile target suites. It will also provide kill assessment data to the BM/C<sup>3</sup>. This radar uses the same solid-state transmit/receive modules as the THAAD radar and some common software and hardware. This technology can also


NMD GBE											
Focus Science and Technology											
<p><b><u>Mission</u></b> Protect the United States from limited ICBM attacks</p> <p><b><u>Quantity</u></b></p> <ul style="list-style-type: none"> <li>• Required: 1 system</li> <li>• Funded: 1 system</li> </ul>	<div style="display: flex; justify-content: space-around;">  </div> <p><b><u>System Operational Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• Provide highly effective protection of the U.S. against limited strategic ballistic missile attacks</li> </ul>										
<p><b><u>FY00-05 BMDO POM Does Fund – Payoffs</u></b></p> <ul style="list-style-type: none"> <li>• RDTE at FY99 President’s budget funding levels – enables deployment decision as early as FY00 and three-year deployment (RDTE only) if decision is positive</li> </ul>											
<p><b><u>FY00-05 BMDO POM Does Not Fund (Issues) – Impacts</u></b></p> <ul style="list-style-type: none"> <li>• Capability to maintain three-year deployment option beyond FY01 (in accordance with DPG) – increases the U.S. vulnerability period to ICBM attack</li> </ul>											
<p><b><u>Key Events</u></b></p> <table style="width: 100%; border-collapse: collapse;"> <tbody> <tr> <td style="padding: 2px;">• Complete development of BM/C<sup>3</sup> capability increments 1-4</td> <td style="text-align: right; padding: 2px;">2QFY99</td> </tr> <tr> <td style="padding: 2px;">• IFICS prototype operational at USAKA</td> <td style="text-align: right; padding: 2px;">2QFY99</td> </tr> <tr> <td style="padding: 2px;">• IST demonstrated in IFT 5</td> <td style="text-align: right; padding: 2px;">4QFY99</td> </tr> <tr> <td style="padding: 2px;">• Deployment Readiness Review</td> <td style="text-align: right; padding: 2px;">3QFY00</td> </tr> <tr> <td style="padding: 2px;">• Initial Operational Capability</td> <td style="text-align: right; padding: 2px;">FY03</td> </tr> </tbody> </table>		• Complete development of BM/C <sup>3</sup> capability increments 1-4	2QFY99	• IFICS prototype operational at USAKA	2QFY99	• IST demonstrated in IFT 5	4QFY99	• Deployment Readiness Review	3QFY00	• Initial Operational Capability	FY03
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Figure 5-12. NMD GBE

be used for new X-band radars to augment the early warning radar system.

The third element is BM/C<sup>3</sup>, the “brain” of the system. It provides the equipment, communications, operations, procedures, and personnel essential for planning, directing, and controlling operations of assigned assets to accomplish the NMD mission. The BM/C<sup>3</sup> element is involved with mission and engagement planning, situation assessment, system responses, and controlling sys-

tem assets. BM/C<sup>3</sup> provides the capability for external C<sup>2</sup> authorities via the “human in control” to exercise centralized C<sup>2</sup> of ballistic missile defense forces and decentralized mission execution.

**FY00-05 BMDO POM Does Fund – Payoffs.**

The POM maintains the FY99 President’s Budget funding levels that enable deployment decisions as early as FY00. NMD GBE could achieve an IOC as early as FY03 if the decision is favorable.

FY00-05 BMDO POM Does Not Fund (Issues) – Impacts.

The FY00-05 POM funding does not meet the DPG to maintain a three-year deployment option beyond FY01. Improvement in system component technology will wait until FY04, after demonstrated capability development is complete. Only one integrated flight test per year (beginning FY01) is funded, leading to reduced system confi-

dence. GBE development is minimally maintained at the FY00 demonstrated capability, with significantly reduced government and contractor staffing. Deployment capability increases to four years by FY02 and five years by FY03, due to required ramp up in personnel and lack of test spares necessary to ramp up testing program (for system confidence) at a deployment decision.

**MATURE TECHNOLOGY INFUSION**

Chapter 4 discussed the enabling initiatives, experiments, demonstrations and future technologies. This section focuses on the mature technologies that allow technology infusion in the PEO AMD weapon systems. The appropriate application of common technologies in the weapon systems will reduce cost, cycle time, and risk, and will improve technical diffusion, learning curves, interoperability, and safety.

The planning and development of cooperative technology insertion programs for space and missile defense is an ongoing, coordinated effort between BMDO, SMDC, AMCOM RDEC, and PEO AMD. Representative mature technologies identified through this effort are in Figure 5-13.

In addition, the Arrow program is a significant potential source of technology base contributions. Arrow is a U.S.-Israeli cooperative development program designed to assist Israel in the

development and testing of the Arrow weapon system. Four successful tests of the Arrow II missile have been completed. Mature technologies being examined in Arrow that could benefit U.S. TMD programs include improved thermal batteries (to increase battery power, life, and energy density with extended shelf life), improvements to indium antimonide FPAs (to increase range and performance and reduce signal processing), seeker high voltage power supply (to reduce weight and increase power output and reliability), and survivable radomes (to increase thermal shock resistance, decrease thermal conductivity, and resist rain and dust at hypersonic velocities).

Planning and executing coherent missile defense programs that infuse mature technologies may mitigate program risk, improve system performance and interoperability, reduce program costs, and overmatch the evolving threat.

<b>System</b>	<b>Mature Technology</b>	<b>Benefit</b>	<b>Planned Infusion Point</b>
THAAD	Radar real-time discrimination technology	More mission capable radar, less interceptor wastage	4QFY99
THAAD	TMD kill assessment program	More mission capable system, less interceptor wastage	2QFY03
THAAD	Reserve activated lithium oxyhalide batteries	Reduced interceptor battery weight, volume, cost and eliminate/minimize thermal energy	1QFY99
THAAD	Resonant fiber-optic gyroscope	Rapid interceptor gyrocompassing for alignment and reduced reliance on external navigation systems	3QFY00
THAAD	Low-cost, flipped form and function pilot arrays	Reduced number of antenna phase shifters and related costs	1QFY02
THAAD	Advanced FPA technology	Target engagement in the high endo- and the low exoatmosphere, detection of weak targets; discrimination enhancement	1QFY00
PATRIOT	Improved thermal batteries	Increased battery power, life, and energy density with extended shelf life	3QFY00
PATRIOT	Advanced master frequency generator	Reduced manufacturing cost, parts count, touch labor weight and phase noise	2QFY00
PATRIOT	Miniaturized uplink/ down link transceiver circuitry	Lower cost, smaller size, lower weight, more producible design	1QFY00
PATRIOT	Solid state transmitter	Improved seeker reliability, acquisition track in severe clutter; reduced power requirements and size	2QFY00
PATRIOT	Semi-active antenna element	Minimized radar signature and reduced susceptibility to RSTA systems	2QFY01
PATRIOT	Cast seeker chassis	Reduced cost, weight and complexity of chassis while maintaining structural integrity and performance	2QFY00
PATRIOT	RF target discrimination and recognition	Improved probability of kill and acquisition in ECM and rain; positive control and reduced radar duty cycle	1QFY00
PATRIOT	Converter technology/signal processing thru-put	Improved radar performance in clutter and more dynamic range	1QFY03

**Figure 5-13. Mature Technology Infusion Matrix**

**SUMMARY**

The AMD modernization strategy ensures that warfighters have timely, technologically capable and overmatching systems to counter the evolving threat. The AMD force will employ these

assets, with sound doctrine and tactics, to provide defense of the force and critical assets against the air and missile threats.