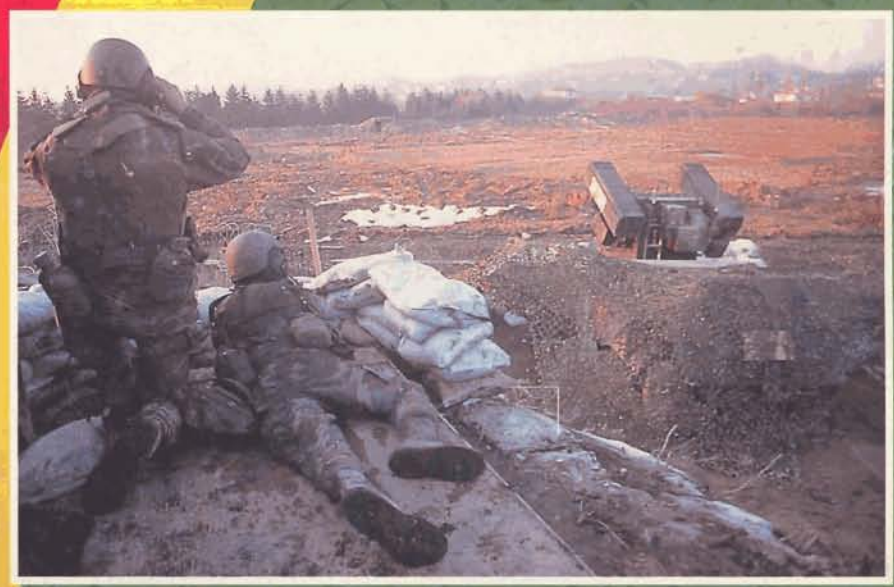
AIR DEFENSE ARTILLERY YEARBOOK 1996



INTO THE 21ST CENTURY

Leading the Charge

US Army ADA Association
PO Box 6101
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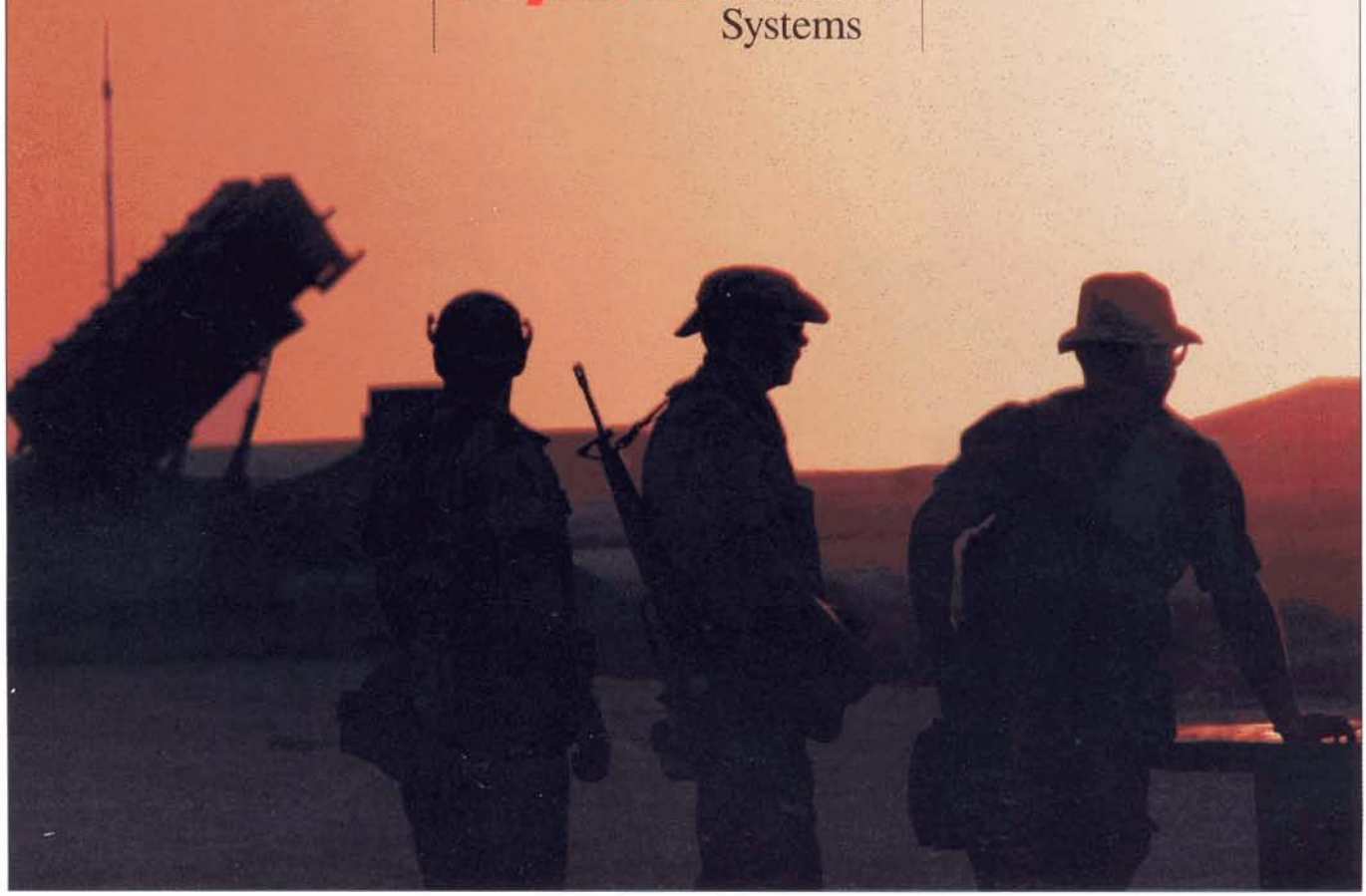

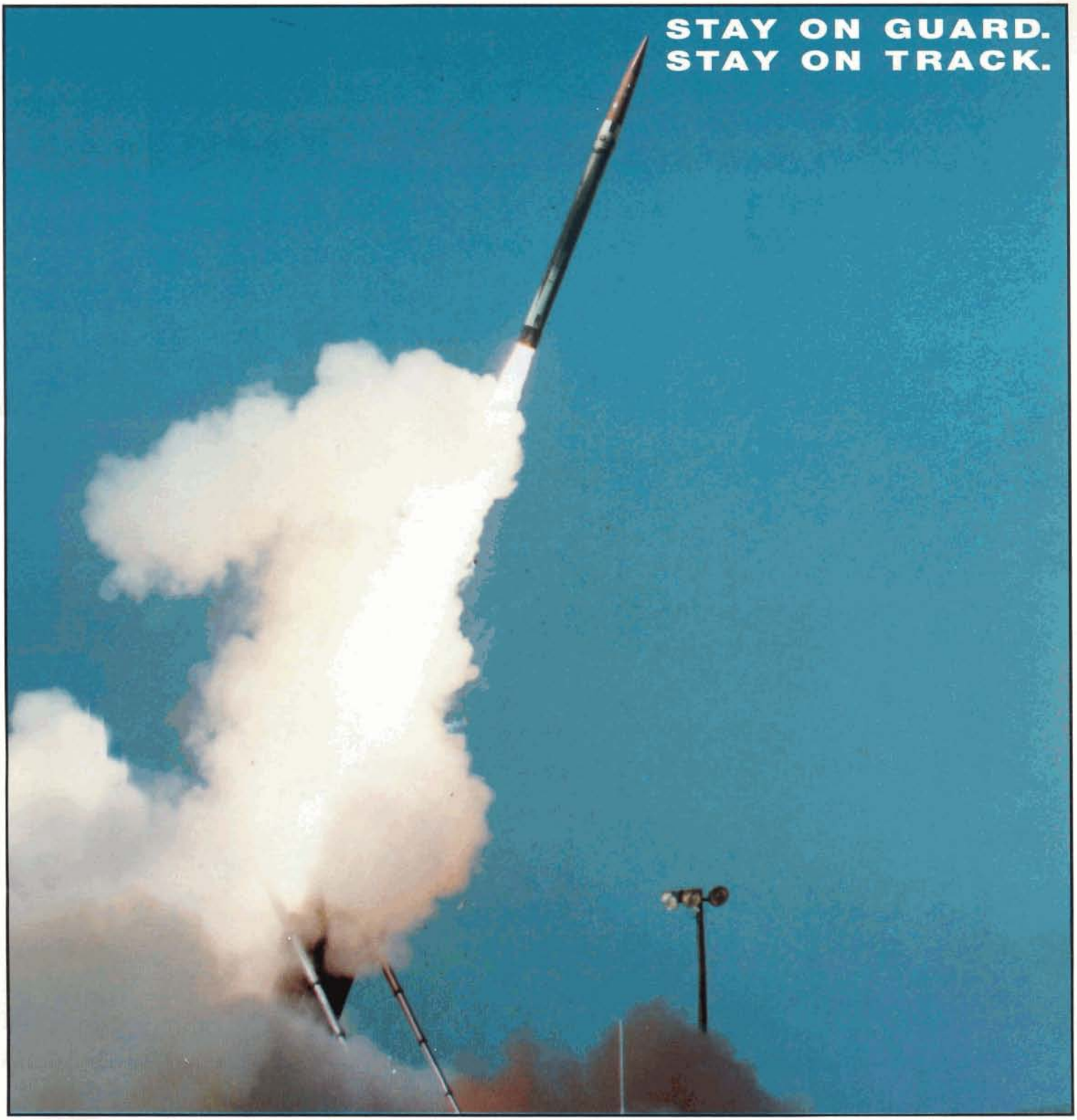

The Cold War has gone away. Danger hasn't. Ballistic missiles are still very much a part of enemy arsenals. And every missile represents a potential threat to civilians and military personnel. That's why Lockheed Martin is dedicated to the steady progress of the Theatre High Altitude Area Defense System. As THAAD intercepts and destroys missiles at high altitudes and long ranges, targeted cities and critical military assets will remain safe from hazardous missile debris. Because THAAD is such a critical component of our overall defense, we're developing it under one of the most aggressive program schedules in U.S. Army history. We're using every ounce of our battlefield and advanced guided missile experience to get THAAD up and running quickly— including designing the entire system to exploit commonality with other Army equipment. THAAD is well into demonstration phase and on track to move into the field in 1997. And as we make steady progress toward further protecting our people and military assets, Lockheed Martin is ready to assist U.S. allies in acquiring the same degree of peace of mind for their citizens.

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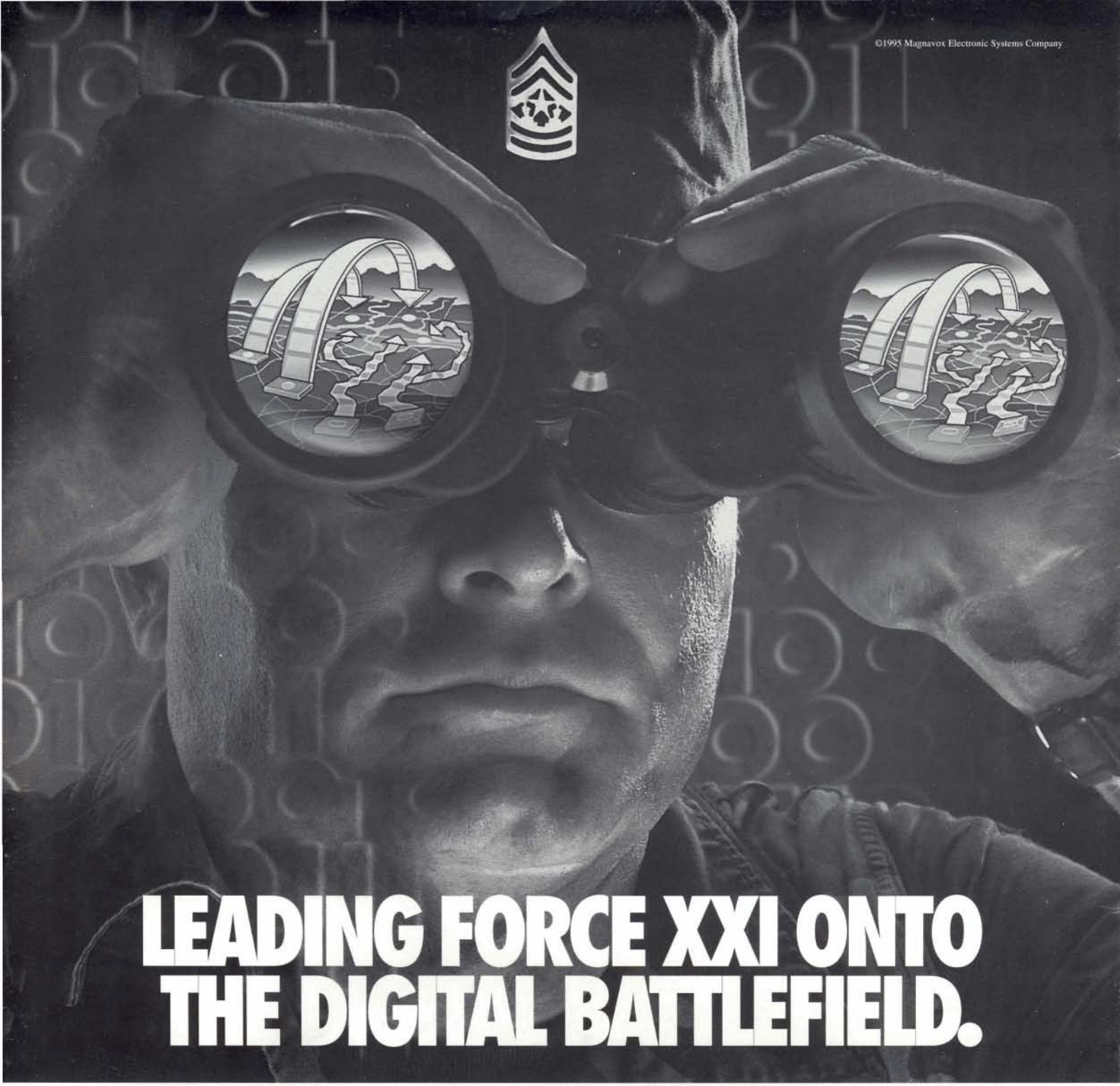

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AIR DEFENSE ARTILLERY
YEARBOOK 1996

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ON THE COVER
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Creating a tactically and technically capable, flexible and strategically deployable air defense force

FORCE XXI ADA

by
Maj. Gen. John Costello
Chief of ADA

Moving Toward the Millenium

The "peace dividend" of the mid-1990s was a knife at the throat of national defense. Precipitous cuts, made with little thought of consequences, might not have turned the U.S. Army into a rabble in uniform, but they could have produced a "hollow force," a force that might have encouraged rather than discouraged global aggression. Instead, we have managed a force reduction of historic proportions in such a manner that we may now refer to "downsizing" as "rightsizing" without indulging in euphemism.

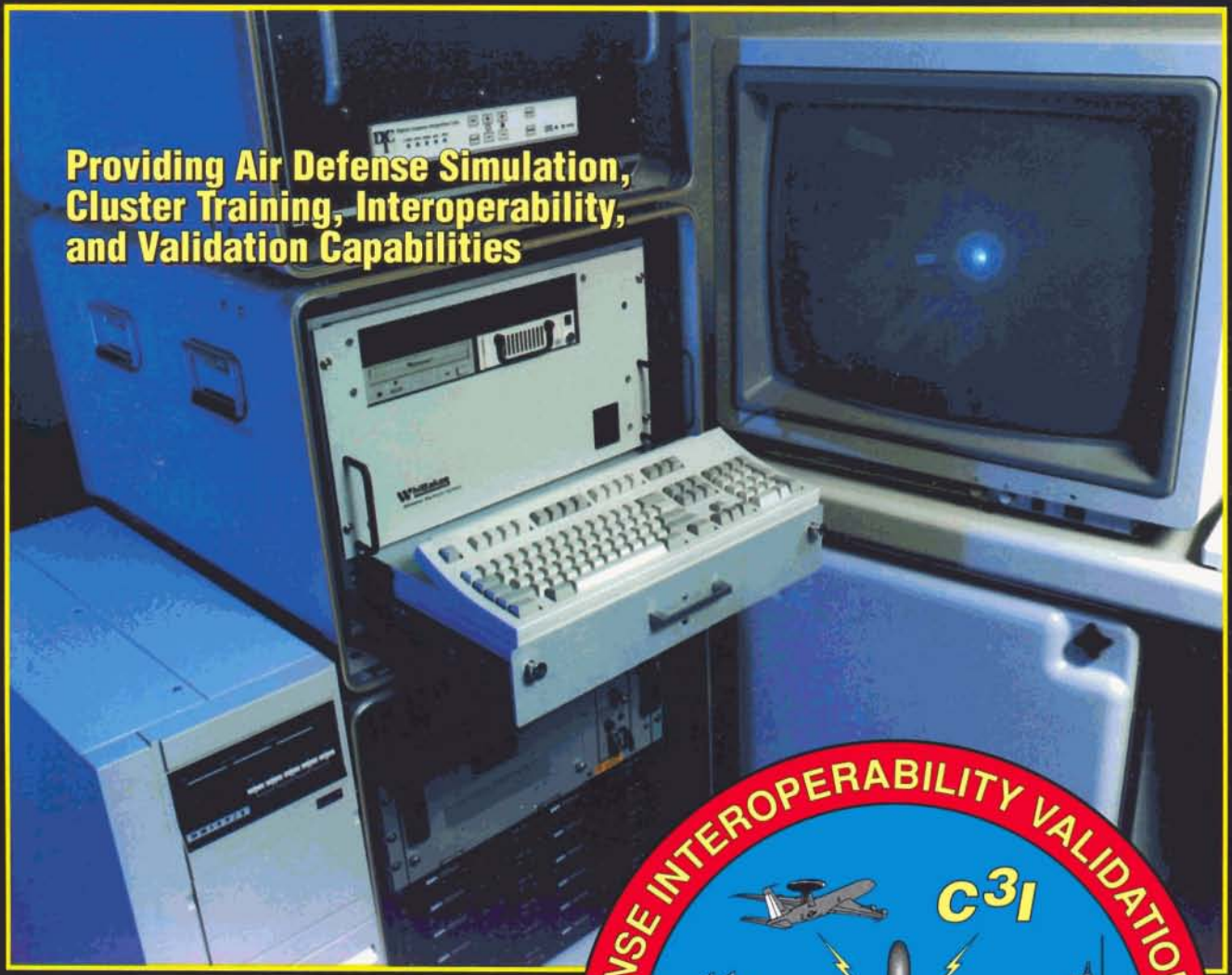
Ranks filled with bright, physically fit, aggressive, caring men and women with potential for important leadership positions.

As the "First to Fire" branch moves toward the millenium, we can leverage maturing information technology, increased air defense firepower and enhanced system lethality to offset force reductions and budget cuts. Air Defense Artillery is becoming a smaller but a more capable air defense force.

This, the 1996 edition of the *ADA Yearbook*, unveils the "ADA Vision," a roadmap to the future (see "ADA Vision," page 6). It also celebrates combat developers, the soldiers and civilians who, despite shrinking resources, found ways to redirect air defense programs conceived in the crucible of the Cold War to meet the requisites of Force XXI and the challenges posed by 21st century threats. This edition of the yearbook is also a tribute to ADA officers, NCOs and soldiers who, during a period of extreme personnel turbulence and major career uncertainties, fought a major regional conflict, endured frequent deployments, played new roles in operations other than war and, throughout it all, maintained the highest standards of professionalism.

There are still funding battles to win, roles and mission issues to debate and new weapon systems to develop and field, but we have made a good start toward reinventing Air Defense Artillery for the 21st century. Force XXI Air Defense Artillery will be tactically and technically capable, flexible and strategically deployable. Its ranks will be filled with bright, physically fit, aggressive, caring men and women with potential for important leadership positions. And the soldiers of Air Defense Artillery will confidently face the future, ready as always to be **"First to Fire!"**

Validating System Interoperability into the 21st Century



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Stabilize, reorganize, standardize, modernize, modularize and rightsize

ADA Vision

The ground-based sensor will increase the battlefield vision of forward area air defense units.

by Maj. Gen. John Costello, Col. Michael Vane and Douglas Agee

Maj. Gen. John Costello, Chief of Air Defense Artillery, has articulated the following vision for the early 21st century:

"I want a force that is tactically and technically capable, flexible and strategically deployable — a force that can fight and win. I want to attract, assess, train, educate, motivate and develop bright, physically fit, aggressive, caring men and women with potential for positions of important leadership. I want a force that meets the National Security Strategy and National Military Strategy; a force that is economical for the nation and accepts risk; a total force that has building blocks for the future — a future that is uncertain."

ADA Mission

Our mission in the 21st century will be to protect the force and selected geopolitical assets from aerial attack,

THE PAC-3 MISSILE.
THE CRUISE MISSILE KILLER.

The PAC-3 missile is specifically designed and proven to be fully capable against cruise missiles.

This capability has been demonstrated in the Army's recent testing which included intercepts of simulated cruise missiles.

The PAC-3 missile's lighter, smaller and highly-agile airframe, coupled with an advanced Loral Vought-developed seeker system means it delivers high velocity hit-to-kill lethality to all airborne threats in one simple weapon.

New PAC-3 system radar upgrades give greater coverage and make any threat fair game for a deadly encounter with this powerful missile.

All threats. One missile. No tolerance. On track and on line to be the cruise missile killer of choice, now and into the 21st century.

LORAL
Vought Systems

missile attack and surveillance. Our goal will be to prevent hostile forces from targeting or shooting our ground forces from the air.

Vision Development

The ADA vision is shaped by a number of factors, including national strategy, U.S. Army and U.S. Army Training and Doctrine Command visions, doctrinal considerations, warfighting concepts, fiscal realities, the current state of the branch, technology trends, threat capabilities and vulnerabilities, and ADA capabilities. Collectively, these factors influence the direction in which the ADA force must evolve and lead to the conclusion that Air Defense Artillery must implement six "enablers" to remain a relevant fighting force in the 21st century. These enablers are to stabilize, reorganize, standardize, modernize, modularize and rightsize the ADA force.

Stabilizing the force involves alleviating the turbulence in the ADA force by recruiting, training and retaining quality soldiers.

Reorganizing the force involves restructuring ADA organizations to allow them to function more effectively on the Force XXI battlefield.

Standardizing the force involves standardizing organizations, systems and operations throughout the branch to achieve compatibility and interoperability with ADA, Army, joint and multinational forces, and standardizing battle elements so they can be easily tailored to a wide range of task force applications.

Modernizing the force involves enhancing the capabilities of ADA systems and organizations by leveraging the latest technology and guiding future technology for system upgrades and new developments.

Modularizing the force involves making ADA organizations and systems modular to facilitate task force packaging for force projection and force protection operations.

Rightsizing the force involves optimally sizing ADA systems and organizations to balance affordability, effectiveness and operational risk.

To lay the foundation for the ADA Vision, this article assesses threat capabilities and vulnerabilities, examines ADA branch capabilities and deficiencies in the context of this threat, and identifies capabilities that Air Defense Artillery will need to remain an effective fighting force.

Threat Assessment

The 21st century threat environment will be characterized by a proliferation of technologies, such as advanced reconnaissance, intelligence, surveillance and target acquisition (RISTA) capabilities that will allow the enemy to quickly locate and target our critical assets; stealth technologies that will facilitate penetration of our defense systems; integrated guidance and weapons system technologies that will allow the enemy to accurately target our defended assets; and modern warhead technologies that will provide dramatically increased lethality and the potential for inflicting widespread destruction and mass casualties. These technologies will be selectively applied to a variety of threat platforms: helicopters, fixed-wing aircraft, unmanned aerial vehicles (UAVs), tactical air-to-surface missiles (TASMs), cruise missiles, tactical ballistic missiles (TBMs), rockets and surveillance satellites.

Helicopters will perform a variety of missions including attack, RISTA, electronic warfare (EW) and assault/transport. They will also attack and destroy armored and infantry units and a variety of high-value targets. Helicopter trends include future improvements in standoff and stealth capabilities, infrared (IR) countermeasures, avionics and weapons suites, and nighttime capabilities.

Fixed-wing aircraft will be modernized to improve their capability for attack, air interdiction, close air support, EW, suppression of enemy air defenses (SEAD) and RISTA missions. They will destroy ADA and other assets, attack convoys and command and control (C^2) centers, and disrupt lines of communications. Fixed-wing aircraft trends include increased use of precision-guided munitions, improved maneuverability and stealth, improved aircraft survivability equipment and all-weather, night and multirole capabilities.

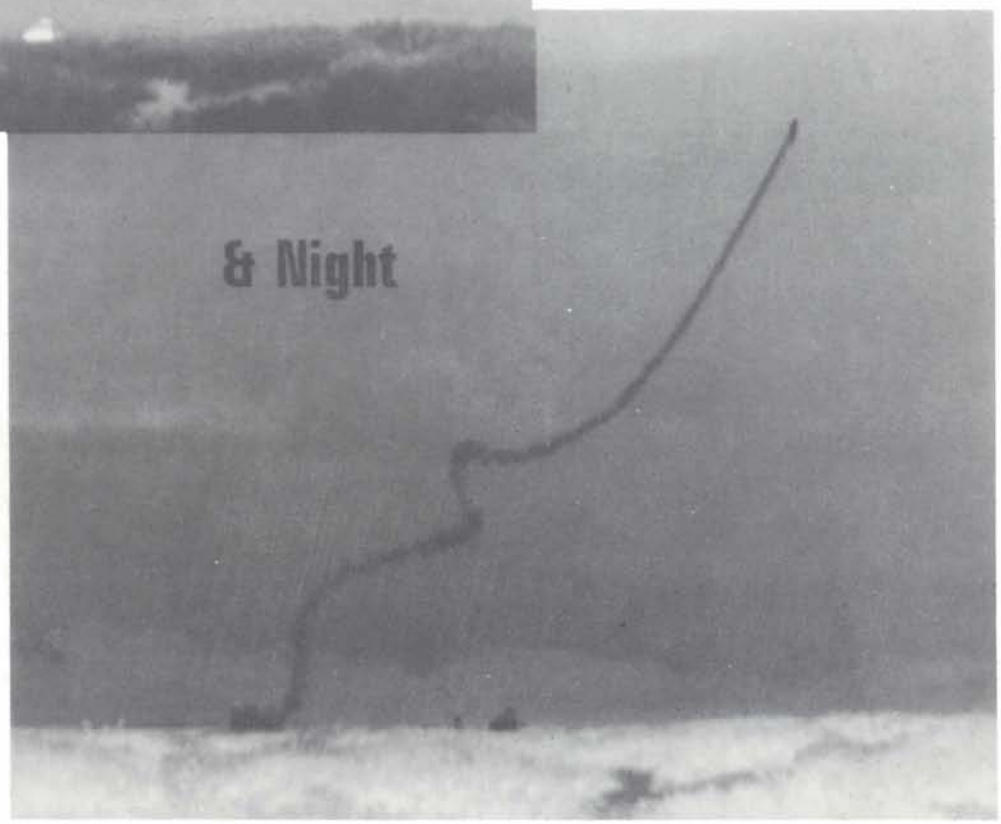
UAVs will be widely proliferated with flexible payloads, and will perform RISTA, jamming, deception and attack missions. They will gather real-time battlefield intelligence data, provide targeting information to enemy attack systems, function as communications relays, provide battle damage assessments, disrupt C^2 operations and destroy radar facilities. UAV trends include improved penetration capabilities (e.g., lower radar cross section [RCS]), improved payloads, the capability to operate at higher altitudes, improved endurance, use of warhead submunitions, real-time threat designation capabilities, improved accuracy and expanded multirole capabilities.

Cruise missiles will perform a variety of deep strike, anti-armor and SEAD missions. They will disrupt entry and deployment operations, destroy logistics bases and assembly areas and attack C^2 and communications facilities. Cruise missile trends include future improvements to increase survivability (e.g., lower RCS); increased standoff ranges; slower attack speeds; improved navigation, terminal guidance and accuracy; and increased lethality.

TASMs will attack air defense radars, C^2 nodes, communications facilities and selected high-value targets. They will employ a variety of guidance schemes and will have very accurate targeting capabilities. TASM trends include increased standoff ranges, and improved guidance accuracy and lethality.

The Solution to Tomorrow's Air Defense Threat is Ready

Recent THAAD flight test demonstrates CSD's advanced energy management technologies



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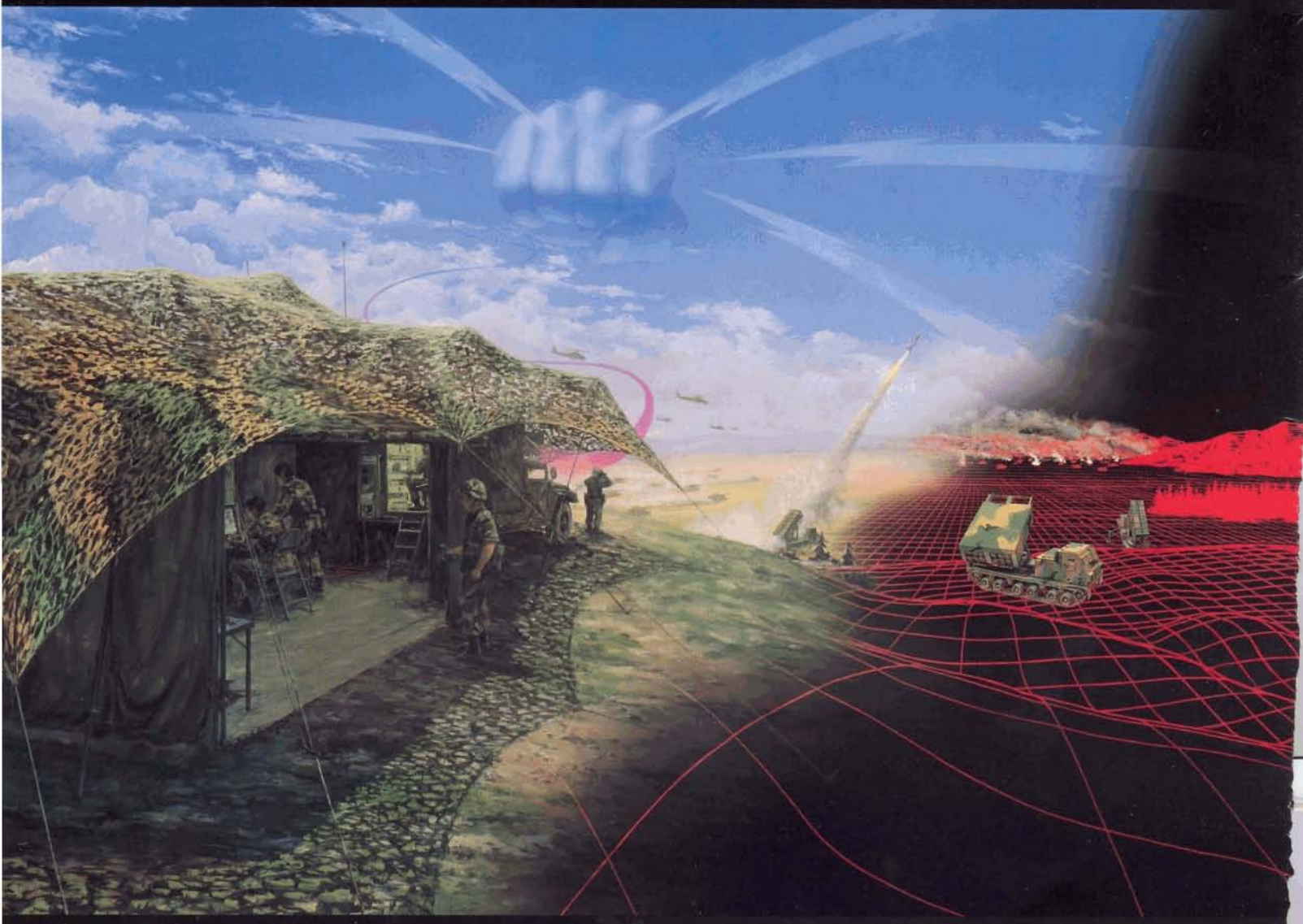

Digitizing Force XXI

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*TBM*s will target population centers, key military and geopolitical assets, ports of debarkation and troop concentrations. TBM trends include future improvements in range, shorter firing sequences, reduced RCS, improved accuracy, specialized payloads (including weapons of mass destruction) and increased use of solid propellants to improve reliability.

Rockets will perform missions similar to those performed by the shorter range TBMs. Rockets will target military assets in the division area of operations (armor and infantry units and troop concentrations). They will disrupt the tempo of operations and inflict casualties on maneuver forces. Rocket trends include longer launch ranges, improved accuracy, higher fire rates, enhanced warhead options (including weapons of mass destruction) and increased lethality.

Surveillance satellites will perform a variety of RISTA missions. They will gather battlefield intelligence data, provide targeting information in real time to enemy attack systems and provide battle damage assessments. Satellite trends include integrated sensor suites that enhance multirole capabilities and improved target detection and real-time target designation capabilities.

The threats described above will target forces and assets located within a theater of operations. Some potential adversaries will also possess longer range TBMs capable of reaching population centers in the continental United States. While intentional use of these missiles against U.S. cities is unlikely, accidental or unauthorized launches could occur, resulting in widespread destruction and mass casualties.

Threat Vulnerabilities

We must identify threat vulnerabilities and then exploit these vulnerabilities through improvements in our doctrine, training, leader development, organization, materiel and soldiers. Some of these vulnerabilities include predictable "hostile origins" and destinations, exploitable signatures (radio frequency, IR and acoustic), predictable velocities, inability to react when engaged, lack of hardening and susceptibility of launch sites and support systems to attack. Analysis of the information presented in the table below leads to the conclusion that there is a potentially high payoff in improving ADA detection and acquisition (sensor) capabilities because they directly exploit threat characteristics. For example, Air Defense Artillery can exploit the first four vulnerabilities by fielding improved ground-based sensors with longer range search sectors and fences, and aerial "over-the-horizon" sensors. These sensors can be netted with other aerial and or space-based sensors, and the entire sensor suite can be selectively controlled to provide wide area coverage for early warning, or narrow coverage of an intelligence preparation of the battlefield-identified azimuth. We can exploit the next two vulnerabilities (inability to react when engaged and lack of hardening) by employing "hit-to-kill" interceptors and directed energy weapons. The last two vulnerabilities can be exploited by incorporating improved launch point prediction algorithms in ADA sensor and command, control, communications, computers and intelligence (C^4I) systems, and establishing seamless communications interfaces with attack operations elements to quickly pass targeting information.

ADA Capabilities

The subjective assessment of the capability of ADA weapons systems against the 21st century threat (see facing page) includes all of the currently fielded weapon systems in the active Army as well as planned future systems. Capability is a function of the threat time frame, and is assessed as adequate (green or G), limited (yellow or Y) or inadequate (red or R). Based on the information presented in this figure, ADA capabilities and limitations in the near (FY96-99), mid (FY 00-07) and far (FY08-15) terms are summarized below.

Near-Term Capabilities and Limitations (FY96-99). This summary assumes that the following systems are fielded: Stinger, Avenger, Bradley Stinger Fighting Vehicle-Enhanced (Linebacker), forward area air defense (FAAD) command, control, communications and intelligence (C^3I), and Patriot Advanced Capabilities-3 (PAC-3). The summary also assumes

THREAT SYSTEMS VULNERABILITIES

	FUNCTION	SRBMs	MRBM	RKT	CM	FW	RW	UAV	SAT
1. PREDICTABLE "HOSTILE ORIGIN"	D	✔	✔			✔	✔		
2. PREDICTABLE DESTINATION	D	✔	✔						
3. EXPLOITABLE SIGNATURE RF/IR/ACOUSTIC	D/T/E/K	✔	✔	✔	✔	✔	✔	✔	✔
4. PREDICTABLE VELOCITY	D/T	✔	✔						
5. FIRE & FORGET PRE-DETERMINED ACTION... NO REACTIVE CAPABILITY	E/K	✔	✔	✔	✔				
6. LITTLE/NO HARDENING OF WPN PLATFORM FOR SURVIVABILTY	K	✔	✔	✔	✔	✔	✔	✔	✔
7. LAUNCH SITE SUSCEPTIBLE TO PRE & POST LAUNCH ATTACK	D	✔	✔	✔		✔	✔		
8. EXPLOITABLE SUPPORT SYSTEM	D/T	✔	✔			✔	✔	✔	

AIR MISSILE DEFENSE FUNCTIONS
D-DETECT/ACQUIRE
T-TRACK
E-ENGAGE/INTERCEPT
K-KILL

INSIGHTS:
• HIGH PAYOFF IN DETECTION (SENSORS) BECAUSE THEY EXPLOIT THREAT CHARACTERISTICS

•UNDERSTANDING THREAT VULNERABILITIES & CHARACTERISTICS HAS BMC3I -- DEFENSE DESIGN AND FIDOC-- IMPLICATIONS

•POTENTIAL COUNTER-MEASURES-CHAFF, ECM, MANEUVER, IRCM-AFFECT INTERCEPT/KILL

•NOTE - CM & UAVs & HAVE FEWEST "VULNERABILITIES" FOR EXPLOITATION

that the Theater High-Altitude Area Defense (THAAD) user operational evaluation system is deployed.

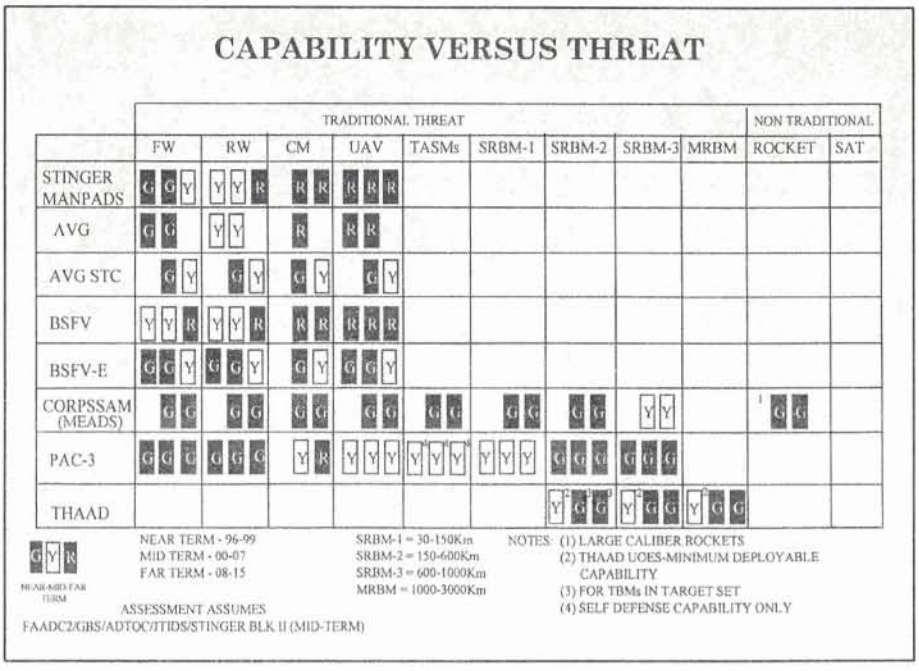
Divisional ADA systems will be capable of countering fixed- and rotary-wing targets, but will not be capable (except for Linebacker) of countering UAVs because of system acquisition limitations. Cruise missiles will not pose a serious threat in the near term because they will not be widely proliferated. Divisional ADA systems will have no capability against rockets.

Corps and echelon above corps (EAC) ADA systems will be capable of countering fixed- and rotary-wing targets, short-range ballistic missiles (SRBMs) and some medium-range ballistic missiles (MRBMs). ADA systems will have some capability against TASMs and UAVs, but no capability against rockets or satellites. Cruise missiles will not pose a serious threat in the near term because they will not be widely proliferated.

Mid-Term Capabilities and Limitations (FY00-07). This summary assumes that Stinger Block II, Avenger slew-to-cue (STC), Linebacker, FAAD C²I, Medium Extended Air Defense System/Corps Surface-to-Air Missile (MEADS/Corps SAM), PAC-3 and THAAD systems are fielded. Avenger STC and Linebacker will be capable of countering the fixed-wing, rotary-wing, cruise missile and UAV threats, but not the rocket threat.

Corps ADA systems will be capable of effectively countering fixed- and rotary-wing aircraft, UAVs, cruise missiles, most SRBMs and some large-caliber rockets. ADA systems at EAC will be capable of countering fixed-wing and rotary-wing targets, most SRBMs and MRBMs, and will have some capability against cruise missiles, TASMs and UAVs. ADA systems will have no capability against surveillance satellites.

Far-Term Capabilities and Limitations (FY08-15). This summary assumes that all of the mid-term systems noted above are still fielded.



FAAD systems will have limited capability against fixed- and rotary-wing aircraft, cruise missiles and UAVs, but no capability against the rocket threat. Capability against fixed-wing targets will be limited because of reduced threat signatures and improved countermeasures. Capability against rotary-wing targets will be limited because of reduced threat signatures, improved threat countermeasures and improved standoff capabilities. FAAD system capability against cruise missiles and UAVs will be limited because of reduced threat signatures. The addition of Corps SAM employed in the division area will mitigate these limitations.

Corps ADA systems will be capable of effectively countering most threats except the longer range SRBMs, MRBMs and some rockets. ADA systems at EAC will be capable of effectively countering fixed- and rotary-wing targets, most SRBMs and MRBMs, and will have some capability against UAVs and cruise missiles. ADA systems will have no capability against surveillance satellites.

ADA Deficiencies

ADA deficiencies in the near, mid and far terms will be the inability to counter rocket and satellite threats.

Near-Term Vision (FY96-99)

The focus in the near-term will be to resolve current "state of the branch" problems, sustain ongoing materiel development efforts and develop operational concepts and DTLOMS requirements for 21st century operations.

Stabilizing the Force. We must stabilize the ADA force by alleviating turbulence. This turbulence includes declining soldier retention rates, a shortage of captains and majors in the active component, an increasing number of Patriot missions and frequent rotational assignments for Patriot soldiers. We can solve these problems through a coordinated campaign to stabilize the force. Elements of this campaign include aggressively promoting the ADA branch by highlighting the challenges of being a part of the ADA force in the 21st century.

A prime example is the modernization efforts in the ADA command and control arena. The roles of the 14J and 140A MOSs have been expanded, making these soldiers an integral part

of the ADA force at all echelons throughout the battlefield. The ADA force will be at the leading edge of C^4I on the 21st century battlefield. Accession goals have been raised for most ADA MOSs, ensuring the recruitment of bright men and women with high potential for promising military careers. The role of women must be expanded and career opportunities clarified. Soldier rotational assignments, particularly in Patriot, must be minimized while continuing to improve the overall quality of life for soldiers and their families.

Finally, the ADA force must move into the high-technology era of the 21st century by enhancing its training devices and battlefield simulation trainers. Training facilities will be improved by leveraging technology, allowing battlefield simulations to enter the classroom. Through video teleconferencing, subject-matter experts from different schools will be able to instruct economically and effectively across the world, providing students the ability to interact with other elements in the military wherever they may be. Future fielding of advanced technology systems, such as the Air Defense Combined Arms Tactical Trainer (ADCATT), will provide the ADA force the opportunity to train efficiently and effectively with other elements of the combined arms team in a realistic, force-on-force, virtual battlefield environment.

Reorganizing the Force. The ADA force must reorganize to improve efficiency and streamline warfighting capabilities. This reorganization will include establishing the new Army Air and Missile Defense Command, phasing Hawk and Chaparral out of the reserve component, inactivating three corps Avenger battalions and establishing a tenth Patriot battalion.

We must establish the Army Air and Missile Defense Command to fully integrate and automate air and missile defense operations for the land component commander, support liaisons with the air component commander, and command and support EAC ADA units. The command will integrate all elements of theater missile defense, synchronize theater missile and theater air defense capabilities, free the EAC brigade to focus on warfighting, streamline passive defense warning and provide the commander in chief an automated operations center to facilitate coordination of air and missile defense operations.

We will phase Hawk and Chaparral battalions out of the force because they are expensive to operate and maintain and are not "total force" weapon systems. Chaparral battalions will be re-missioned to Army National Guard (ARNG) Avenger and Stinger battalions.

We will inactivate three active component corps Avenger battalions and transfer their equipment to the ARNG. This will allow the ARNG to assume a more active warfighting role and will also result in cost savings.

Establishing a tenth Patriot battalion will help reduce the frequency of Patriot rotational assignments.

Standardizing the Force. We must standardize divisional and echelon above division ADA forces to prepare for future operations.

In the division, we must standardize the composition of heavy, light and special battalions to facilitate logistics operations, leader development and training, and task force tailoring. We can accomplish this by standardizing the composition of all heavy battalions in the active and reserve components with the same number of Linebackers and Avengers (24/36), the composition of all light battalions with the same number of Avengers and Stingers (36/24), and the composition of all special battalions with the same number of Avengers and Stingers (48/32).

At echelons above division, we will standardize the composition of all Patriot battalions at five batteries. This will facilitate the formation of the tenth Patriot battalion and will establish a common basis for allocation of Patriot forces.

Sustaining Materiel Development Programs. We must sustain current materiel development programs to ensure adequate ADA capabilities against the threat. These programs include Linebacker, MEADS/Corps SAM, PAC-3, THAAD, the joint tactical ground station, Stinger and the ground-based sensor.

Linebacker is our most important divisional ADA system. It will enable us to fight "mounted" in the forward areas, thus enhancing survivability while protecting the maneuver force. It will also improve the capability to detect and engage helicopters, UAVs and cruise missiles, and will improve night-fighting capability.

MEADS/Corps SAM is our most important ADA system. It is the lynchpin of future ADA operations. It will provide continuous defense of the maneuver forces against TBMs, cruise missiles, UAVs and aircraft from entry through decisive operations and redeployment.

PAC-3, the only near-term TBM defense system, will provide increased battlespace, firepower and lethality against SRBMs and low observables, enhance interoperability with joint forces and improve target classification, identification and discrimination capabilities.

THAAD will protect theater and geopolitical assets from SRBMs and MRBMs and, in conjunction with Patriot or MEADS/Corps SAM, will provide near-leakproof defense of critical assets against TBMs and air-breathing targets.

Stinger improvements will bolster the missile's capabilities against cruise missiles, UAVs and low-flying helicopters.

The joint tactical ground station will provide an in-theater capability to receive, process and disseminate space-based sensor data on TBM launches, and provide timely and re-

liable TBM warning and cueing information to ADA units and the force.

The ground-based sensor and FAAD C^2I improve detection capabilities and provide cueing quality detection information to FAAD weapons so the targets can be effectively engaged.

Operational Concepts and DTLOMS Requirements. To prepare for 21st century operations, we must develop operational concepts and requirements for the Army Air and Missile Defense Command, an advanced short-range air defense (ASRAD) system, an "over-the-horizon" sensor system, a national missile defense system, multirole air defense tactical operations centers (ADTOCs) and automated soldier training.

We need the Army Air and Missile Defense Command to ensure the effective integration of future air and missile defense operations and to adequately protect all designated assets within a theater of operations.

The ASRAD system will provide an economical and highly effective capability against the far-term rocket, fixed- and rotary-wing, cruise missile and UAV threats in the division area of operations. Combat developers envision ASRAD as a follow-on to the present-day FAAD weapons, built upon 21st century technology to counter the 21st century threat.

The "over-the-horizon" sensor system will help the branch detect, track and engage low-flying cruise missiles and other platforms masked from ground-based sensors.

A national missile defense system will protect the United States against a ballistic missile attack.

Multirole ADTOCs will improve ADA C^4I operations. They will possess all of the characteristics essential to Force XXI integrated operations and will have the capability to be configured to fight at any echelon.

Automated soldier training will ensure soldiers are prepared to fight and win on future battlefields. These capabilities will encompass institutional, weapons and C^4I training, allowing soldiers to exercise warfighting activities in a fully integrated virtual battlefield environment.

Mid-Term Vision (FY00-07)

The focus in the mid-term will be to field capabilities and systems that will provide a robust theater missile defense, effective maneuver force protection, "over-the-horizon" detection and engagement capability, improved automated training capabilities and joint operations, and an interim national missile defense capability.

Robust Theater Missile Defense. The fielding of THAAD, PAC-3 and MEADS/Corps SAM will provide a robust mid-term theater missile defense. These systems will be employed in a defense consisting of "upper" and "lower" tiers. THAAD will be the "upper tier" system to counter SRBMs and MRBMs beyond the engagement capabilities of the "lower tier" systems. PAC-3 and or MEADS/Corps SAM will be employed as "lower tier" systems to counter SRBMs, cruise missiles, UAVs, tactical air-to-surface missiles, helicopters and fixed-wing aircraft. Both tiers will be able to engage some of the SRBMs at times, requiring them to share track information and coordinate engagements. Together, the two tiers will provide a near-leakproof protective umbrella over critical assets, denying the threat a preferred attack option.

Effective Maneuver Force Protection. The fielding of MEADS/Corps SAM will ensure that Air Defense Artillery can effectively protect maneuver forces during all stages of force projection operations. MEADS/Corps SAM will possess the strategic deployability, tactical mobility, C^4I, firepower and lethality required to protect corps maneuver forces from SRBMs, cruise missiles, UAVs, helicopters, fixed-wing aircraft and large-caliber rockets. Linebacker, Stinger, FAAD C^2I and GBS will supplement this coverage and protection.

Over-the-Horizon Sensor System. The fielding of an "over-the-horizon" sensor system (e.g., an Aerostat or other elevated sensor platform) will improve Air Defense Artillery's capability to detect, track and engage cruise missiles, UAVs and other stealth platforms. It will interface with ADA, Army and joint architecture to facilitate dissemination of early warning information to the force, and fire control quality tracking information to weapon systems.

Improved Automated Training. Built-in interactive training simulators and netted systems will facilitate soldier training. The interactive simulation capabilities will allow soldiers to conduct stand-alone training (individually or in crews) using actual hardware and software under realistically simulated battlefield conditions. The capability to net systems and integrate their interactive training capabilities will enable units and soldiers to exercise all essential warfighting activities in a fully integrated joint and coalition virtual battlefield environment. Embedded training capabilities will allow commanders to assess the performance of individual soldiers, crews and units, and quickly identify and resolve training shortcomings. The capability to train using prerecorded battle scenarios (actual scenarios as well as those based on expected enemy courses of action [COAs]) will enable soldiers, crews and units to train to the anticipated threat. These advanced training capabilities, along with joint live exercises, command post exercises and field training exercises, will facilitate the seamless integration of today's training and enable soldiers to train exactly as they will fight on the battlefield.

Improved Joint Operations. We will improve joint operations by adopting common doctrine and procedures and employing automated systems that are fully interoperable with those

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of the joint forces. This will include employment of a joint automated airspace management system and joint surveillance network. The airspace management system will rapidly deconflict airspace operations and, thus, reduce fratricide. The joint surveillance network will provide a near-real-time ground, air, sea and space picture to all joint participants. To facilitate distribution of this surveillance information, the branch will field joint tactical information distribution system communication terminals at the ADA brigade TOCs; Patriot, MEADS/Corps SAM and Avenger battalion TOCs; and THAAD battery TOCs. This will result in faster, more reliable distribution of critical situation information.

National Missile Defense. An interim national missile defense capability will protect all 50 states against limited ballistic missile attacks with a treaty-compliant, single site located in the north-central United States.

Far-Term Vision (FY08-15)

The focus in the far-term will be to guide technology development and to field capabilities and systems that can effectively execute the full range of Force XXI operations.

We must guide technological developments in the areas of C^2, computers, communications, sensors and weapons to ensure that future battlefield systems incorporate the following warfighting capabilities.

Command, Control and Computers. C^3 systems must rapidly integrate and fuse information from a variety of ground, aerial and space-based sensors, and must provide full battlefield situational awareness to all elements of the force. This includes providing a relevant ground, air, sea and space picture with common target numbering across the battlefield. TOCs must be able to rapidly plan and design defenses using automated tools, and optimize these defenses through iterative computer simulations of expected enemy COAs. TOCs must be able to quickly reconfigure workstations and communications linkages to meet changing missions and situations, and perform C^2 operations "on the move" as required by tactical situations. They must be able to remotely control weapons platforms and to control and deploy tactical space platforms equipped with sensor or communications packages to support ADA operations. TOCs must be able to process TBM launch detection and warning information from space-based sensors and distribute focused warnings directly to the affected units. TOCs must also have embedded interactive simulation and internetted training capabilities that enable soldiers and units to exercise all essential warfighting activities in a fully integrated virtual battlefield environment.

Communications. Air Defense Artillery must have access to the global information network. This network will extend from strategic stateside locations through the theater of operations to the operational and tactical headquarters, and ultimately to the soldier. It will link deployed ADA units with national, joint and coalition C^4I systems and permit a rapid exchange of critical information, allowing commanders and battle staffs at each echelon to form a common picture of the battlefield and make the decisions necessary to successfully plan and execute operations. Specific capabilities include the following:

- Open architectures and automated systems that are fully integrated with the Army Battle Command architecture and with joint and multinational forces.
- Data and voice communications that are reliable, secure, high capacity, jam resistant and distributed, and that can be transmitted long distances (over the horizon) via aerial platforms and or satellites.
- Broadcast communications that provide intelligence, air and missile warnings and NBC hazard warnings to all recipients simultaneously or selectively via sensor-to-soldier links.

Sensors. Sensor systems required to support future ADA operations will include an integrated, multispectral suite of ground, aerial and space-based sensors capable of detecting the full range of threat target platforms. They must be capable of quickly identifying targets via cooperative or non-cooperative technologies to reduce fratricide, classifying targets to allow preferentially directed fires against the most threatening, and discriminating real from spurious targets to optimize use of weapon system assets. Sensors must be capable of quickly and accurately determining TBM impact points, disseminating warning information and cueing hazard prediction systems. They must also be capable of quickly and accurately determining TBM launch points and cueing attack operations systems.

Weapon Systems. Weapon systems must protect forces and critical assets during all phases of operations. Weapons must be strategically deployable, tactically mobile and survivable, and must have the capability to shoot on the move if required. They must have sufficient firepower to engage large numbers of simultaneously arriving targets, and must be capable of neutralizing weapons of mass destruction. They must also have rapid response times and must intercept targets at extended ranges to allow multiple shot opportunities and minimize collateral damage. Finally, they must be economical in terms of cost per shot.

Specific systems that must be fielded in the far term include ASRAD, national missile defense and multirole ADTOCs.

ASRAD is needed to counter the fixed- and rotary-wing, cruise missile, UAV and rocket threats in the division area of operations. ASRAD is expected to employ advanced weapon system technologies such as directed energy (e.g., Tactical High Energy

Laser [THEL]), hypervelocity radar-guided projectiles (e.g., Depressed Altitude Guided Gun Round [DAGGR]), advanced missiles and EW systems to kill these targets at extended ranges. ASRAD must fight on the move and must have higher firepower and shorter response times than present-day systems.

National missile defense is needed to protect the United States against an accidental or unauthorized limited ballistic missile attack. The system is expected to consist of ground-based interceptors, ground-based radars and associated C^4I systems, and will be cued by space-based sensors. The ground-based interceptors will employ exoatmospheric kill vehicles capable of intercepting ballistic missiles at extended ranges, neutralizing NBC warheads.

Multirole ADTOCS. Multirole ADTOCS will round out 21st century ADA C^2 capabilities over the full range of operations. They will support engagement and force operations at any echelon, and will be fully interoperable with joint and multinational forces; ground, aerial and space-based sensors; and various missile launch platforms. Finally, they will be easily tailorable to any mission or task force.

In addition to these systems, the Army or other services must field a system (or systems) to counter the satellite threat. Such a system will prevent hostile forces from collecting intelligence information on the location, composition and activities of our forces, and using this information to target our forces and assets.

Summary

In the 21st century, Air Defense Artillery will protect forces and key assets from air and missile threats including helicopters, fixed-wing aircraft, cruise missiles, UAVs, TBMs and rockets. To accomplish this mission, the branch must field the systems and capabilities described in the preceding pages. These systems and capabilities, together with improvements in doctrine, training, leader development and organization, will allow our soldiers to execute Force XXI operations and achieve the ADA vision — a stabilized, reorganized, standardized, modernized, modularized and rightsized force — that can fight and win on the Force XXI battlefield.

Maj. Gen. John Costello is the chief of Air Defense Artillery. Col. Michael Vane is the director of DCD. Douglas Agee is DCD's Concepts Branch chief. The authors credit many ADA general officers (active and retired), brigade commanders and directorates at the U.S. Army ADA School for their input.

REINVENTING ADA

by Col. Michael Vane
Director, DCD

Combat developments may be an inexact science, but it is, nevertheless, a science. Centuries of warfare have taught combat developers that future force design starts with an assessment of the threat. So, the collapse of the Soviet Union plunged the world of combat developments into chaos and confusion.

At the moment the Berlin Wall began to crumble, we were rushing newly activated Patriot battalions to Europe to confront a fixed-wing threat of immense proportions. We were also deeply committed to fielding new forward area air defense (FAAD) weapons to counter new generations of Soviet attack helicopters and close combat support aircraft.

The threat we had spent our careers preparing to defeat had suddenly vanished. We gazed out on a profoundly transformed geopolitical landscape. Foreign policy prophets predicted new wars fought for race, religion, creed and culture would replace 20th century wars of ideology, but the emerging air threat was, at first, nebulous and ill-defined. "Could the Cold War ADA architecture, into which we had poured billions of dollars, be modified to address the new threat, or, like Humpty Dumpty, was it broken, never to be put back together again?"

This edition of the *ADA Yearbook* tells the story of ADA combat developers and their efforts to forge a 21st century air defense out of the ashes of the Cold War. The Air Defense Artillery School's Directorate of Combat Developments (DCD) developed the editorial themes from a highly successful series of briefings recently presented to senior Army leaders. I assigned technical advisors to work closely with ADA Officer Advanced Course students, who did the actual writing. I want to thank them for doing a great job of explaining the forces that will shape the Air Defense Artillery of the 21st century.

This *ADA Yearbook* also unveils the "ADA Vision." Maj. Gen. John Costello's energetic leadership and expert guidance during the functional area assessment (FAA) process has equipped the branch with a vision of Air Defense Artillery as a full-fledged Force XXI fighting force. To make the vision a reality, the chief of branch has established a process called vision modules, or VISMODs. A colonel, charged to leverage the expertise of the Air Defense Artillery School, program managers and external agencies, has been assigned to each VISMOD. But the ultimate responsibility for making the ADA vision a reality rests with every ADA soldier.

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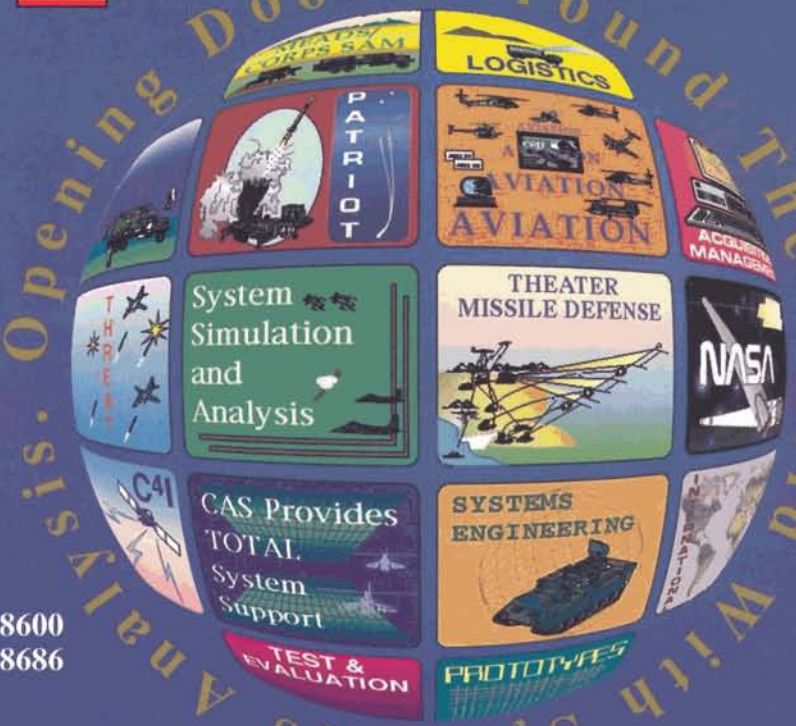

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Functional Area Assessment

Optimizing and maximizing ADA's warfighting capabilities

by Capt. Jeffrey S. Newmann and Lt. Col. Doug Barbee

Easing the burden borne by frequently deployed Patriot soldiers is a primary FAA goal.

Department of the Army (DA) concurrence with nearly all proposals presented during the recently completed Air Defense Functional Area Assessment (FAA) has given Air Defense Artillery a roadmap to follow to Force XXI. The FAA provides answers to many questions about Air Defense Artillery's future and will permit the branch to complete its tour to Force XXI in high gear. The FAA, termed the "most comprehensive in recent history," was designed to optimize and maximize ADA warfighting capabilities within existing manpower and budget restraints. The "green light" from DA gives Air Defense Artillery permission to create the Army Air and Missile Defense Command, form a tenth Patriot battalion and standardize Patriot battalions with five firing batteries. It also anchors air defense battalions in the divisions, and pro-

vides a plan to stabilize and modernize the Army National Guard (ARNG) air defense force.

The branch received its DA tasking to conduct an FAA in August 1995. FAAs focus on the Army's ability to maintain readiness and force capability, and execute force management and modernization in the target restructure years of FY95-FY98 and review years through FY03. They ensure that the Army can fully support all aspects of programmed transitions. The governing FAA goal is to ensure that, as the Army evolves into the restructured force, each branch has a coordinated and cost-effective transition plan. FAAs are conducted as directed by the Army Chief of Staff or Vice Chief of Staff (VCSA). The FAA process culminates with a formal briefing to the VCSA.

The intent of Maj. Gen. John Costello, Chief of Air Defense Artillery, was to present a coherent and comprehensive assessment of the ADA branch. This was achieved by examining the impact of Army restructuring on air defense while maintaining readiness, combat power and force modernization, and ensuring a comprehensive, cost-effective transition to a power-projection force. Brig. Gen. Gregory A. Rountree, Deputy Commanding General, Fort Bliss, Texas, led the FAA effort. He established milestones and an FAA task force to collect, process and analyze the input. In August 1995, the U.S. Army Air Defense Artillery School (USAADASCH), Fort Bliss, tasked ADA commanders in the field to analyze the functional areas of doctrine, training, leader development, organization, materiel and soldiers (DTLOMS) and submit issues and concerns for inclusion in the FAA. For the purpose of the FAA, a concern was defined as a shortfall in capability that requires attention as soon as possible. An issue was defined as a deficiency in capability that restricts operational response and requires immediate attention. ADA unit commanders submitted 105 responses. Twenty-one addressed training, one dealt with leader development, 33 pertained to organizational problems, 25 related to materiel and 10 focused on soldiers.

The FAA Council of Colonels met Oct. 23, 1995, at Fort Bliss to discuss, clarify and analyze the field input. The majority of concerns and issues were resolved at the USAADASCH directorate level in November 1995. Although these concerns and issues were not included in the FAA, they helped USAADASCH directorates provide correct information and focused their efforts on correcting deficiencies and shortcomings that existed in the field. Each command or support element that provided input to the FAA process received a reply.

After a final review, Rountree presented the Chief of Air Defense Artillery with seven issues and four concerns that warranted presentation at the VCSA level. The issues involved Patriot soldiers, divisional air defense, corps Avenger force transition, ARNG stabilization and modernization plans, Patriot force standardization, ADA brigade relocations and ARNG Hawk inactivations. The four concerns identified for presentation were the shortage of ADA majors and captains, the creation of the Army Air and Missile Defense Command, joint air and missile defense doctrine and training shortfalls in simulations and training devices.

Several briefings and meetings were conducted prior to the FAA brief to the VCSA. Brig. Gen.(P) Johnny M. Riggs, Office of the Deputy Chief of Staff for Operations and Planning (ODCSOPS), was briefed Nov. 30, 1995, along with members of the Army's General Officer Steering Committee. On Dec. 1, 1995, the briefing was presented to Gen. John H. Tilelli Jr., Commanding General, U.S. Army Forces Command (FORSCOM), and Lt. Gen. Steven A. Arnold, FORSCOM Deputy Commanding General. Lt. Gen. John E. Miller, Deputy Commanding General, U.S. Army Training and Doctrine Command (TRADOC), was briefed Dec. 8, 1995, and Lt. Gen. Paul E. Blackwell, Deputy Chief of Staff for Operations and Planning, was briefed Feb. 13, 1996. Gen. William W. Hartzog, Commanding General, TRADOC, was briefed Feb. 28, 1996. These briefings afforded commanders and senior DA staff members the opportunity to provide input and help resolve issues and concerns identified at the lowest level.

ADA Vision

Costello personally presented the final FAA briefing to VCSA Gen. Ronald H. Griffith on March 18, 1996. The chief of branch began with the presentation of the "ADA Vision." Several factors influenced this vision. These factors, or "vision imperatives," were the need to stabilize, reorganize, standardize, modernize, modularize and rightsize the force. Stabilizing the force involves improving quality of life, both at home and at work. Reorganizing the force refers to necessary structural changes. Standardizing the force will enhance interoperability from the branch through multinational force levels. Modernizing the force necessitates an improvement in ADA capabilities. Modularizing the force facilitates ADA systems toward force projection and protection requirements. Rightsizing the force involves configuring ADA systems so they provide both affordability and effectiveness. These "izes" affected all portions of the FAA.

Soldiers

Next, Costello addressed Air Defense Artillery's most valuable resource, soldiers. A key issue was that continual deployments and overseas commitments have contributed to a downward spiral in the number of Patriot reenlistments in recent years. Overseas commitments in Europe and Korea; Operation Southern Watch; joint tactical ground station (JTAGS) support requirements; the activation of the Theater High-Altitude Area Defense (THAAD) user operational evaluation system battalion, which syphons off soldiers with Patriot military occupational specialties (MOSs); and support requirements for Patriot Advanced Capabilities-3 (PAC-3) testing have stretched Patriot soldiers to the limit. For example, the Army average for time on station (TOS) is 34 months, but for a Patriot soldier, the average TOS (including Southwest Asia rotations) is 24 months.

Another factor that contributes to the stress placed on Patriot soldiers is that, while 80 percent of Army forces are stationed within the continental United States (CONUS), only 58 percent of the Patriot force is in CONUS. For the short term, reenlistment bonuses for critical Patriot MOSs will help keep qualified Patriot soldiers in key positions, but Costello stressed the need to standardize Patriot battalions, create a tenth Patriot battalion and reduce overseas Patriot requirements to permanently improve Patriot soldiers' quality of life.

During the FAA process, the long-range intent to standardize Patriot battalions and create a tenth Patriot battalion had already been approved as part of Total Army Analysis 2003 (TAA03). Reducing overseas Patriot requirements was the next step, but Costello saved this for the organization portion of the briefing.

The soldier portion of the briefing wasn't composed entirely of concerns and issues. Costello was able to report that Air Defense Artillery is one of the best balanced branches with regard to race and gender equality; i.e., rank and position. A highlight for the branch is the bright outlook for women in air defense. The first women to compete for ADA battalion command were included in last fall's selection board; however, the results have not yet been announced. The THAAD system organization, with a future total of 680 new positions, will open many slots to women. Also, nearly 2,200 non-ADA MOS positions in the headquarters batteries of corps Avenger and divisional ADA battalions will be open to women.

Air Defense Artillery has experienced a significant cut in its active component strength during the Army's build down. In FY87, Air Defense Artillery comprised 2.7 percent of the active duty force, and will build down to 2.2 percent by FY03. In FY96 the total ADA force numbered more than 19,000 soldiers: the ARNG made up 49 percent and the active component force made up 51 percent. One of the challenges as the force structure changes is to maintain a 50/50 ratio of the total force.

Costello also presented an initiative regarding MOS consolidation, the branch's most effective means of dealing with reduced funding and modernization. The branch is reducing 16 MOSs to eight with expanded duties and responsibilities to compensate for reducing troop strengths and modernization efforts.

Air Defense Artillery, Costello reported, is far ahead of the other branches in MOSs that support digitization of the battlefield. For example, MOS 25L, *AN/TSQ Air Defense Artillery Command and Control System Operator/Maintainer*, and MOS 16J, *Early Warning System Operator*, will merge to create MOS 14J, *Air Defense Artillery Command, Control, Communications, Computers and Intelligence (C^4I) Enhanced Systems Operator*. MOS 14J soldiers will operate and maintain automated data processing equipment in automated division, high- to medium-altitude air defense (HIMAD) and JTAGS tactical operations centers.

Digitization and modernization have affected the warrant officer ranks as well. MOS 140D, *Hawk System Technician*, and MOS 140B, *Short-Range Air Defense System Technician*, will consolidate into MOS 140A, *Command and Control System Integrator*. The plan is to place an MOS 140A warrant officer at every automated ADA battalion, brigade and corps TOC, with the remainder in table of distribution and allowances (TDA) positions. These positions will be created by converting all Bradley Stinger Fighting Vehicle (BSFV) battery-level MOS 917A, *Maneuver Force Air Defense System Technician*, positions and all MOS 140B, *Short-Range Air Defense System Technician*, and MOS 140D, *Hawk System Technician*, positions to the new MOS.

Most soldiers with MOS 14J will be assigned to FAAD and HIMAD units and to light infantry, air assault and heavy divisions, and can look forward to enhanced career progression. MOS 14J will serve as a direct feeder to the newly created warrant officer MOS 140A.

Another MOS initiative is expanding BSFV crew member duties. Currently, the Stinger team in the BSFV is comprised of MOS 14S, *Avenger Crew Member*, soldiers. These positions will convert to MOS 14R, *Line-of-Sight Forward (Heavy) Crew Member*. This will increase the diversity inherent to MOS 14R while making the BSFV crew more self-sufficient. All BSFV crew members will be manportable air defense (MANPAD) system qualified.

Doctrine

In his briefing, Costello covered several doctrine initiatives. Highlighted were the 20 new documents pertaining to Force XXI divisional air defense, which are either complete or in final draft stages. The branch is placing some field manuals (FMs) on the Internet, making limited Internet access to some ADA FMs available. Digitally mastered FMs will be available at a later date. As the threat changes, so must the doctrine; the branch, therefore, is implementing doctrinal revisions in a timely manner. A key concern identified was the existing challenge in joint theater missile defense (TMD) doctrine. Present responsibilities regarding philosophy, mission, organization or functions are not clearly defined. The branch is taking several initiatives regarding this matter. Air Defense Artillery is the TRADOC component for the Army's FM 100-12, *Army Theater Missile Defense Operations*. Additionally, to meet this doctrinal challenge, Air Defense Artillery will design and test the Army Air and Missile Defense Command in Prairie Warrior and Roving Sands '96. FM 100-16, *Army Operational Support*, and FM 100-7, *Decisive Force: The Army in Theater Operations*, support the doctrinal need for the Army Air and Missile Defense Command. Observations since Desert Storm and Army warfighting experiments have validated the need for the command. A proposed organization that would blend active component and ARNG assets is being studied to meet this requirement. The plan is to activate a provisional Army Air and Missile Defense Command in October 1996 for further study and evaluation, and then to field the objective organization in October 1997.

Organization

Force restructuring was the FAA's key topic. TAA03, DSCOPS decisions and TRADOC division reengineering design, along with budget constraints, have produced a host of changes and challenges to current air defense structure. Air Defense Artillery faces many organizational challenges. The branch must improve ARNG mission readiness, achieve a level of standardization throughout the forces, leverage Force XXI technology advantages, preserve and modernize the ARNG structure, complete the relocation of CONUS corps ADA units to Fort Bliss and maintain a modernized ADA battalion in each active component division.

Costello broke the organization portion of the FAA into the following elements: divisional air defense, echelons above division (EAD) FAAD and Hawk battalions, Patriot forces, ADA brigades, and the Army Air and Missile Defense Command. Each area was approached from a total force concept. Costello's "vision imperatives" were critical to the formulation of the organizational concept.

The chief of branch highlighted the need for an air defense battalion in the division. Key points were threat, contributions of air defense to the division's primary mission, and the horizontal and vertical integration provided by divisional air defense battalions. Additionally, Costello pointed out, the Force XXI ADA battalion will feature reduced manpower and increased lethality. TRADOC is analyzing the battalion design as part of its Division XXI study. A proposed composition would include 24 BSFV-Enhanced (Linebackers), 36 Avengers with slew-to-cue (STC) and six ground-based sensors (GBSs). The payoff of restructuring the divisional ADA force is a 140-percent increase in Linebacker kills with a 30-percent increase in crew survivability. The Avenger STC will provide a 55-percent engagement increase and a 66-percent kill increase. This air defense battalion provides an overall 15-percent reduction in manpower requirements. Anchoring air defense in the division, now and in the future, said Costello, is critical.

The branch chief presented the following divisional standardization efforts. First was the standardization of the current six heavy division air defense battalions. The standard design is 24 BSFVs and 36 Avengers, but only the 2nd Infantry Division is currently configured to standard. Five of the six battalions are organized under a structure that gives them 24 BSFVs, 24 Avengers and 40 manportable Stingers.

Analysis, Costello pointed out, supports the standard design for warfighting purposes, and the standard design supports the Force XXI initiatives discussed above. He explained that the inactivation of active component corps Avenger battalions will make standardization even more urgent. A force design approved by DA in 1988 already exists for this structure. The ADA Vision calls for adding 12 Avengers to each heavy division air defense battalion. The additional Avengers will come from active component corps Avenger battalions as they inactivate and, possibly, from active component operational readiness floats.

Costello also discussed standardization of air defense battalions in special and light divisions. Presently, no standardization exists. A review and analysis determined that each battery in special and light division air defense battalions would consist of 12 Avengers and eight manportable Stinger teams. A force design update submitted to the Combined Arms Command in January 1996 supported this standardization.

Division air defense battalion standardization efforts support a standardized, modularized, economized and digitized force, Costello said. He listed the ability to provide

additional Avengers to the heavy divisions as soon as possible as a key challenge.

Costello then presented the EAD FAAD force portion of the FAA. The branch faces a requirement for 16 EAD FAAD battalions (12 corps battalions and four Army battalions), but must overcome several challenges to meet this requirement. TAA03 inactivates the only active component Avenger battalions at corps level and converts them to ARNG battalions. Seven ARNG Chaparral corps battalions are scheduled for inactivation in FY97 (with two battalions already remissioned), and only one ARNG Avenger battalion is presently resourced. As a result, the branch was looking at a corps end-state force of four ARNG Avenger battalions to replace 11 resourced FAAD battalions.

Costello presented to the VCSA a solution that had been carefully coordinated with ARNG Bureau and senior ARNG ADA commanders. The solution is based on the Avenger weapon system, which provides the ARNG a system that is easily maintained, trainable and deployable. Costello recommended that a new force design for EAD FAAD (Avenger/Stinger) battalions, which had been approved by the Combined Arms Command on March 5, 1996, be adapted. The proposed Avenger/Stinger battalion design consists of 36 Avengers and 24 manportable Stinger teams. Upon approval, the five remaining Chaparral battalions and one Avenger battalion would convert to this design. This force could be constructed at little expense, with the Avengers coming from the inactivating active component corps Avenger battalions.

The requirement for the four Army-level FAAD battalions would be achieved by dual-missioning already-established ARNG divisional air defense battalions. This would provide these forces with a higher level mission.

The next challenge examined was the corps Hawk force. The branch was faced with a requirement to maintain one Hawk battalion per corps, a requirement that carried a high dollar cost ($3.8 million Operation Maintenance-Army [OMA] costs per Hawk battalion and a $13.6-million U.S. Army Missile Command annual sustainment bill). Since the Hawk battalions were scheduled for inactivation in FY99, ADA combat developers proposed taking an acceptable risk: speeding up the inactivations and converting the Hawk battalions to another structural design as soon as possible. They recommended converting two of the corps Hawk battalions to Avenger/MANPAD battalions and possibly converting the third Hawk battalion to a Patriot battalion.

The Army would have to purchase 72 Avengers to create the two Avenger/MANPAD battalions. Costello presented the VCSA with several options regarding this purchase. Other considerations were the impact of this early inactivation on foreign military sales and on U.S. Marine Corp Hawk units.

Costello explained that the plan for converting the ARNG Chaparral and Hawk battalions to Avenger/MANPAD battalions structures Air Defense Artillery as a total force. It stabilizes and modernizes the ARNG force and meets a warfighter requirement. Additionally, it contributes to the standardization of the overall force.

Next, the branch chief reviewed the plan to standardize the Patriot force. Five batteries per Patriot battalion capitalizes on the modern combat capabilities of PAC-3 technology and improves the span of control. Several phases of the Patriot transition will be carried out over a period of years. The Patriot force end state will structure active component Patriot battalions at five batteries and give each ADA brigade two Patriot battalions. Key to this plan is the activation of the already-approved tenth Patriot battalion and the return of some Patriot units from overseas locations. The possible creation of a second ARNG Patriot battalion is also being considered, along with the establishment of an ARNG ADA brigade to command the new Patriot battalion and the already activated ARNG Patriot battalion. Overall, the standardization of the Patriot force will support force structure requirements and will improve the quality of life for Patriot soldiers.

Costello also briefed the VCSA on the plan to bring all CONUS ADA brigades to Fort Bliss, creating the "Air Defense Center of Excellence." The 108th ADA Brigade, Fort Polk, La., and the 31st ADA Brigade, Fort Hood, Texas, will relocate to Fort Bliss in FY96. The 35th ADA Brigade, Fort Lewis, Wash., will relocate to Fort Bliss in FY97. Maintaining soldier and family care will be closely considered and monitored during the moves. Maintaining a warfighter link with the corps will be crucial after the moves are complete. The chief of branch also discussed the plan to inactivate three ARNG ADA brigades in FY01 and FY03.

In coordination with the ARNG Bureau, Costello described three future missions: the creation of a national missile defense command, the creation of the Army Air and Missile Defense Command and the assumption of possible future corps requirements. These future missions may provide the opportunity to save some of the ARNG ADA brigade structure.

Materiel and Modernization

Costello briefed the VCSA on a global air threat that has grown in versatility and effectiveness. Emerging technologies offer potential enemies an array of formidable weapon

systems. Unmanned aerial vehicles (UAVs), cruise missiles, helicopters and tactical ballistic missiles (TBMs) are all widely produced and available for purchase. More than 150 countries produce UAVs. Cruise missiles, capable of carrying nuclear and chemical munitions, are ideal weapons of mass destruction. UAV and cruise missile guidance systems are highly accurate, and their low radar cross sections make them highly survivable. Helicopters are gaining increased standoff capabilities and improved fire control systems. Developing countries have discovered the nearly irresistible appeal of TBMs. The threat to Force XXI will increasingly be from TBMs, cruise missiles and UAVs as their technologies become more available to developing countries.

Costello also briefed the VCSA on technologies the Force XXI air defender will harness to counter the emerging threat. The Avenger STC, Linebacker and advanced Stinger are all scheduled for fielding in the next several years. The STC upgrade accepts GBS track data and automatically slews the Avenger turret in azimuth and elevation, placing targets in the gunner's field of view. Avenger STC fielding should be complete by FY06. The GBS and the FAAD command, control, communications and intelligence (C^3I) system are currently being fielded. Superelevation will no longer be required with the improved Stinger Block II missile. Other Stinger Block II characteristics include improved performance against both cruise missiles and UAVs along with full night engagement capabilities. Presently Stinger is the only divisional air defense weapon in the U.S. inventory. Stinger Block II, when employed by the appropriate weapon system, will be capable of countering all classes of air threats.

FAAD C^3I provides all-weather, 24-hour, organic, real-time, digital early warning to the force. Engagement opportunities are expected to increase by 134 percent for divisional air defense systems, resulting in 152 percent more intercepts. Fielding is currently in progress and is expected to be completed by FY00.

Echelons above division are also seeing an array of new and improved weapon systems. The THAAD system will operate in the battlespace beyond Patriot's range and altitude. Working in tandem with Patriot and the Medium Extended Air Defense System/Corps Surface-to-Air Missile (MEADS/Corps SAM), THAAD will form the upper tier of a two-tier, near-leakproof air and missile defense. THAAD system fielding will be completed in FY06. PAC-3 improvements include "hit-to-kill" technology against TBMs and an expanded engagement envelope. Remote launcher capabilities and improved target acquisition are other improvements that PAC-3 offers. Expect PAC-3 to be completely fielded by FY01. The highly deployable, highly mobile MEADS/Corp SAM will provide the maneuver force the protection it needs on the fluid, extended battlefield. It will provide 360-degree coverage and will be able to detect and kill cruise missiles and short-range ballistic missiles (SRBMs). Fielding will be completed by FY10.

Leader Development and Training

Leader development and training was also on the FAA agenda. Costello presented several branch initiatives regarding leader development.

The prototype Force XXI USAADASCH classroom opened in December 1995. It provides a satellite link to other military schools, enabling ADA Officer Basic Course, ADA Officer Advanced Course and ADA Warrant Officer Course students to cross-train with their counterparts in other branches. Paperless classrooms and distance learning are key to the future training of our leaders. Currently, Air Defense Artillery is one of the only branches that practices small group instruction (SGI) in the Officer Basic Course. This training concept always gains praise from the field.

Costello also discussed training concerns regarding the representation of the opposing force (OPFOR) aerial threat at combat training centers (CTCs), 25mm BSFV ammunition and battle simulations. Presently, a viable OPFOR aerial threat at CTCs does not exist; at best, the air threat is marginally represented. The FY96 Standards in Training Commission (STRAC) resources BSFV advanced gunnery table training at the required intensity only once per year. Battle simulations within the Joint Training Federation and corps battle simulations do not properly replicate the third dimension.

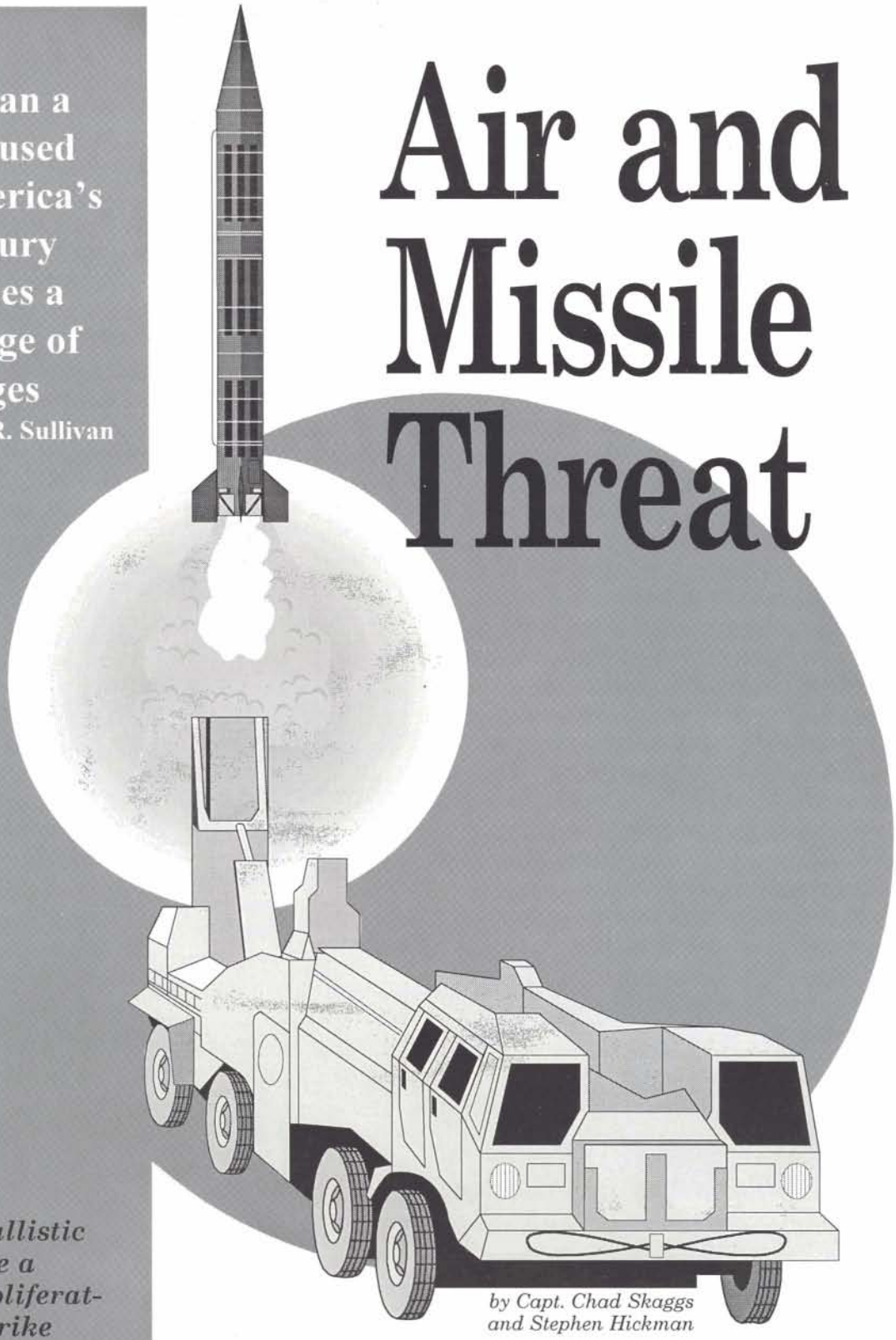
Conclusion

The Air Defense FAA provided senior Air Defense Artillery and Army leaders an in-depth look at the current state of Air Defense Artillery. The branch's future is a promising one, filled with a variety of challenges and opportunities for ADA soldiers. Air Defense Artillery has seen the future, and is ready for it. In Costello's words, "We have a valid road map to the future. I realize there may be a few detours along the way, but the azimuth is now in place."

Capt. Jeffrey S. Newmann is an OAC student at Fort Bliss. His follow-on assignment is with the 108th ADA Brigade, Fort Bliss, Texas. Lt. Col. Doug Barbee, DCD's FAA Division Chief, and Roger Todd, who works with CAS Inc., served as technical advisors.

Rather than a single, focused threat, America's 21st century Army faces a broad range of challenges
— Gen. Gordon R. Sullivan

Air and Missile Threat



Tactical ballistic missiles are a rapidly proliferating deep-strike threat.

by Capt. Chad Skaggs and Stephen Hickman

Countering the air threat enables us to minimize casualties and provide our forces freedom to maneuver. Recognizing and understanding the threat is the first step to countering it.

The worldwide proliferation of advanced military technologies and hardware is rapidly transforming once second-rate forces that may become our future adversaries into formidable opponents. In future conflicts the ground commander and his staff must consider the broad spectrum of potential air and missile threats. Corps and division commanders, in any theater of operations, could face a robust,

global air and missile threat composed of fixed- and rotary-wing aircraft, tactical ballistic missiles (TBMs), cruise missiles and unmanned aerial vehicles (UAVs).

Today, rotary-wing aircraft, TBMs and UAVs have superseded fixed-wing aircraft as top-priority threats, although the fixed-wing threat continues to grow in potency and can hardly be ignored. The need to defend against these newly evolving threat platforms drives ADA doctrine and weapon programs.

Almost every country in the world maintains helicopters to support military requirements. Helicopters give threat ground commanders a versatile, survivable platform that can perform a variety of missions. Whether a single-role attack, transport or armed utility variant, the helicopter can perform numerous missions on the battlefield, including reconnaissance, intelligence, surveillance and target acquisition (RISTA); electronic warfare (EW); troop transport and insertion; ground attack; and command and control (C^2). Low-flying helicopters taking full advantage of terrain masking and moving at speeds up to 180 knots are difficult to acquire and target. These abilities, plus improvements in available missile technology, pose an increased threat.

There is a vast difference in the capabilities of fielded rotary-wing systems. Converted utility helicopters, like the Hughes 500D, with limited or no sophisticated navigation or targeting capability, are in the inventories of numerous possible threat countries. Conversion kits allow nations with limited military budgets to transform the utility helicopter into a multirole helicopter able to deliver gunfire, bombs and rocket fire at a fraction of what it would cost them to purchase "factory-ready" attack helicopters. Utility helicopters can support troop insertion requirements. More advanced platforms like the Mi-35P (Hind F) have sensor pods, an electro-optical sighting pod, night capability, countermeasures and multiple hardpoints capable of carrying air-to-air and air-to-ground missiles, including the laser-beam-riding derivatives of the AT-6 anti-tank missile. Attack helicopters, while more expensive, provide improved combat capabilities that allow for better search, acquisition and engagement of ground and air targets from further ranges.

Helicopters are ideal air assets during early entry and expansion phases because of their versatility and survivability. During entry operations they can conduct RISTA and insertion of special operations forces. Once inserted, these forces are highly motivated and survivable, posing a serious threat to C^2 and other critical rear area assets.

Rotary-wing RISTA will probably be targeted against forward divisions and corps to support threat counter-maneuvering and targeting. During decisive operations, threat helicopters with anti-tank guided missiles can attack armored and mechanized forces at ranges up to five kilometers. They can also block major penetrations or supplement mobile obstacle detachments by laying mines along threatened flanks and gaps. Helicopter assets can attack flanks of U.S. forces, using terrain or smoke to conceal their approach.

Currently, the most dominant potential rotary-wing threat systems are of U.S. and Russian design. The potential for improvement in helicopter combat capability over the next 20 years is huge. The trend will be to develop increased target acquisition, fire control and weapons technologies to provide a longer standoff capability.

TBMs, currently produced in 10 countries and imported by a dozen more, are one of the most rapidly proliferating deep-strike assets. TBMs are relatively cheap, all-weather, night-capable weapons. The low cost and availability of TBMs, combined with their ability to hit deep strategic targets, have made them attractive to developing nations whose military budgets cannot afford costly modern aircraft. Nations acquire TBMs to increase their power, prestige and image; to achieve specific military goals; and to compete economically in the global aerospace or weapon systems marketplace.

TBMs can be used for preemptive strikes or fire support, for area denial or as a psychological weapon at ranges up to 5,500 kilometers. These systems pose an increased threat throughout the theater and during all phases of operations. Transporter erector launchers enable the missiles to move from hide positions to launch sites, erect, fire and move again in a short time span. This mobility, combined with little to no advance warning prior to firing, makes detection extremely difficult. Additionally, high terminal velocity speeds and low radar cross sections make detection and reaction extremely difficult.

TBMs will probably be the weapon system of choice during early entry and expansion phases. Their high survivability, range, penetration and warhead options make them ideal for use against political or high-value targets such as seaports, airports and logistics sites. TBMs also give the threat commander the ability to deliver weapons of mass destruction on U.S. and allied forces. During decisive operations, TBMs can interdict chokepoints, disrupt C^2 and inflict heavy casualties in the rear area.

Future TBMs on the battlefield will produce an even more dangerous threat. Improved technology will further reduce the missile radar

cross section and shorten firing sequences, thus improving survivability by making detection harder. The use of improved solid propellants and guidance packages will bring longer ranges and better accuracy. Specialized payloads such as NBC munitions, in addition to various submunitions, will further increase the TBM's effectiveness as a terror weapon.

UAVs are currently produced in 18 countries and imported by at least eight others; however, estimates contend that more than half the nations of the world currently have programs to build or acquire UAVs. UAVs provide countries with an inexpensive means of enhancing their reconnaissance, communications, EW and strike capabilities. Their small size and radar cross section, and their ability to fly low and slow, make them difficult to detect and track.

UAVs perform a wide variety of missions, including RISTA, EW, signal intelligence, communications relay and attack. Mission-dictated flight profiles will increase system survivability and optimize coverage. Most UAVs normally fly at altitudes of 300 to 3,000 meters to take full advantage of terrain; however, some UAVs can reach altitudes of 17 kilometers. Flight times range from 15 minutes to around 29 hours, and speeds range from .15 to .9 mach. Control of UAVs is varied. Flight guidance is controlled by preprogrammed flight paths, radio control with TV monitor guidance, internal navigation system (INS) and global positioning system or a terminal flight profile. Video camera payloads allow the UAV to gather and transmit real-time battlefield information for the ground commander. UAVs give the threat ground commander the ability to see over the next hill with no risk to human life or high-value assets. If the information gathered is linked to a fire control capability, the enemy can use it to conduct deep strikes against friendly forces using long-range artillery and or TBMs.

Currently, several nations are developing and fielding attack UAVs with the primary mission of destroying battlefield emitters such as target acquisition radars. Other UAVs being fielded are infrared attack systems designed to kill tanks or fighting vehicles. We can also expect to see systems that will be able to deliver ordnance similar to that employed by attack aircraft. It is probable that future attack versions will carry laser target designators or submunitions.

UAVs can deceive and destroy enemy radars during entry operations by homing in on and attacking radar sites or by acting as decoys for suppression of enemy air defenses (SEAD) aircraft carrying anti-radiation missiles. They can also gather precision intelligence information such as U.S. order of battle and location of critical assets. Threat use of UAVs conducting RISTA operations, primarily in the forward divisions and corps areas, will probably increase during expansion operations. Threat forces will attempt to determine U.S. intentions, location of assembly areas and lines of communication, then use the information gathered by these sensors to interdict those operations. During decisive operations, threat UAVs can gather real-time battlefield intelligence data for the threat commander to provide target acquisition for field artillery and support countermaneuver. UAVs could also isolate weaknesses in sustainment resources, identify combat resources and follow-on forces and discern maneuver intentions.

Interest in land attack cruise missiles (LACMs) has increased significantly following the success of the U.S. Tomahawk during Desert Storm. LACMs are offensive weapons of varying ranges and capabilities that typically perform deep-strike, air interdiction, anti-armor and SEAD missions. LACMs are cost-effective, lethal and survivable — ideal platforms for weapons of mass destruction and excellent investments for developing nations. Currently, 13 countries produce LACMs, and at least nine other countries are potential buyers.

LACMs are variable launch systems that can be air, ship or ground launched. The vast majority are currently air launched, a few are ship or submarine launched and some are ground launched. LACMs can ingress at altitudes under several kilometers above ground level and at ranges of 30 to 3,000 kilometers. Navigation systems, such as the global positioning system and terrain contour matching system, allow LACMs to fly unpredictable ingress attack routes and strike a target from any direction.

Ideally, LACMs could attack high-value targets during entry operations. Their flexible launch and multiple warhead options make them ideal systems to use against many high-value strategic and tactical targets. During the expansion phase and decisive operations, LACMs might attack assembly areas, corps and division trains, and C^2 centers.

LACMs combine high lethality with high survivability. Numerous warhead options, ranging from nuclear to chemical and biological, are available. The French are developing a new ground attack system called the Apache, with a submunition dispenser, for fielding about 1996. Modern LACMs are getting smaller, and air-launched systems can now be launched from fighter-bomber aircraft. Use of composite materials, radar absorbing materials and stealthy construction techniques have decreased the radar cross section. Low altitude, small ra-

dar cross sections and excellent standoff ranges all contribute to much-improved survivability.

We no longer expect to encounter the massive waves of attacking fixed-wing aircraft envisioned in Cold War scenarios, but the fixed-wing threat has not gone away. Indeed, the fixed-wing threat has grown more lethal and versatile.

Fixed-wing combat aircraft provide flexibility to the enemy by performing a variety of missions in all areas of the battlefield. They can launch strategic nuclear strikes and perform air interdiction (AI), close air support, SEAD, RISTA, troop insertion and EW missions in conjunction with other air threats or in a coordinated pre-emptive strike. Modern technology in newer aircraft, navigation and bombing computers and precision-guided munitions create increased offensive capabilities. All-weather, day and night, precision-strike capabilities, combined with an increased defensive package (including chaff, flares, on-board jammers and radar warning receivers), give threat aircraft increased combat power and survivability.

Today, more than 100 countries have an active fixed-wing component in their military inventories. The former Soviet Union had been the predominant exporter of military aircraft, providing a number of single-mission fighters, fighter-bombers and reconnaissance airframes to numerous countries. With the increased cost of acquisition and maintenance, the trend among potential threat nations is toward purchasing smaller, multirole aircraft (such as the Su-35 Flanker, Mirage F-1 and F/A-18 Hornet) or upgrading older aircraft already in inventory.

The fixed-wing threat is still viable. Multirole, modern aircraft capable of delivering precision-guided munitions to high priority targets gives the threat commander deep strike capability. Their long range, ability to loiter over a target area and ability to perform a number of different missions provide the threat commander with flexibility on the battlefield. Fixed-wing aircraft are the least survivable threat airframes, but advancements in radar cross section reduction and integrated EW suites, coupled with longer standoff ranges in precision-guided munitions, will increase their survivability.

Fixed-wing aircraft can carry out precision strikes with tactical air-to-surface missiles (TASMs). TASMs are air-launched guided weapons delivered by a variety of fighter-bomber aircraft. They have impact velocities of 566 to 1,520 miles per hour and can engage targets out to 150 kilometers. Though delivery depends on aircraft survivability and crew proficiency, they are highly effective. Additionally, their high speed and low radar cross section make TASMs difficult to detect and engage.

At present, most threat TASMs are command guided, requiring the pilot to continually guide the missile by radio link to the target, but this is changing. Modern TASMs are guided by electro-optical systems that provide a TV-like picture to the cockpit. Common types of electro-optical seekers include television and infrared radar. If equipped with infrared, the TASM is provided with day, night and adverse weather attack capabilities. When delivering a TASM equipped with electro-optics, the pilot selects a target, identifies it to the TASM and launches the missile. Once the TASM "locks on" the target, it autonomously guides itself, leaving the pilot free to maneuver.

The anti-radiation missile (ARM) is an extremely deadly TASM. The ARM's guidance system detects radars and the seeker homes in on radar emissions, posing an especially significant threat to air defense radars. These systems, if used effectively in a pre-emptive strike, can shut down air defense radars and make other high-value assets more susceptible to other air and missile strikes.

Fixed-wing threats will probably peak during initial entry phases of the operation, especially if threat forces launch a pre-emptive strike. Their mission will be to disrupt C^2 and conduct deep attacks against known high-value targets using precision munitions, SEAD, RISTA and troop or special operations forces insertion. During the expansion or build-up phase, threat fixed-wing aircraft will restrict maneuver and slow momentum. Targets will include lines of communications, convoys and C^2 centers. Fixed-wing threats will probably suffer significant attrition during the first two phases of deployment; however, remaining assets will attempt to restrict movement, destroy logistics trains and inflict heavy casualties. They will continue to conduct SEAD, RISTA and precision-strike missions.

A properly coordinated and relatively modern air threat has the ability to strike with precision anywhere on the battlefield. Helicopters, UAVs, TBMs, cruise missiles and fixed-wing aircraft can affect operations at every level through attack, RISTA, SEAD, EW, insertion and close air support missions. The United States must develop and maintain the means to counter all possible air threats. A robust, capable air defense must be present at all levels of command to ensure protection of maneuver forces and high-value, critical assets.

Capt. Chad Skaggs is an OAC student at Fort Bliss. His follow-on assignment is at Fort Hood, Texas. Stephen M. Hickman, an intelligence analyst in DCD's Threat Office, served as technical advisor.

"First to Fire" in Force XXI

How to Fight ADA

Automated ADA tactical operations will achieve "information dominance."

by 1st Lt. Gerald R. Scott and Mike Cochrane

On the surface, Air Defense Artillery's role in Force XXI seems no different from its previous role: ADA is still in the business of force protection. The difference may be subtle, but it is also immense.

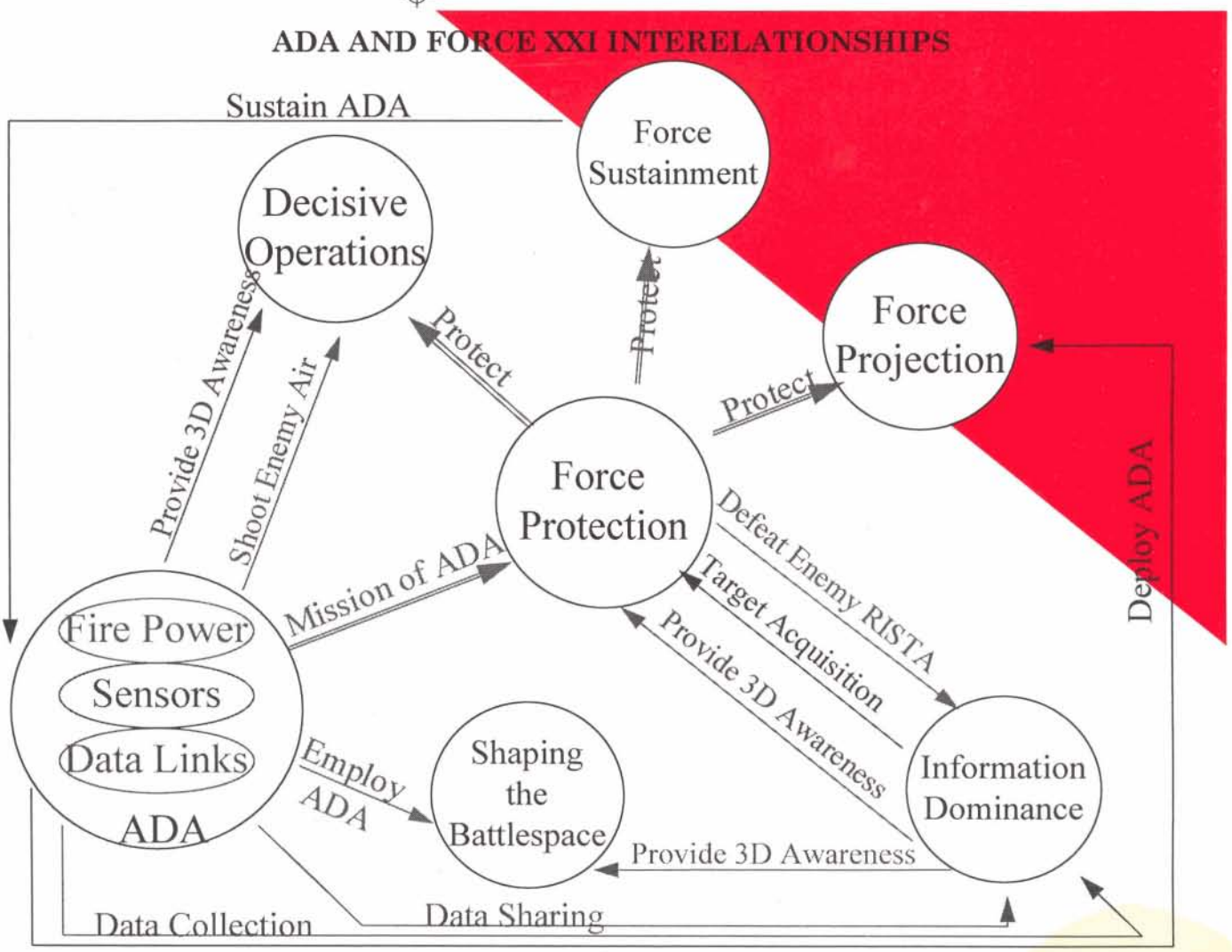
Air Defense Artillery brings to Force XXI three factors that exploit the nature of seamless execution that characterizes Force XXI operational patterns. Integral to Air Defense Artillery are firepower, sensors and data links. ADA firepower consists of surface-to-air missiles capable of engaging a wide range of airborne targets. Sensors include air defense radars as well as passive detection systems, such as the forward-looking infrared sensor. Data links, such as the Patriot data link and forward area air defense (FAAD)

command, control, communications and intelligence (C^3I) system links, bring sensors and firepower together, and can share data with the rest of the force. As the ADA capabilities in these areas increase over the next several years, so will Air Defense Artillery's benefit to Force XXI. The integration of Air Defense Artillery into all Force XXI operational patterns, especially force protection and information dominance, will make Air Defense Artillery a vital part of Force XXI.

The figure below gives an overview of how ADA firepower, sensors and data links interact in the Force XXI operational patterns. Air Defense Artillery's primary mission is force protection, a mission that requires firepower. However, making this firepower effective requires the combined effect of sensors and data links. This allows Air Defense Artillery to provide force protection in support of force projection and force sustainment operations as well as decisive operations. In addition, firepower allows the force commander to further shape his battlespace. Air Defense Artillery's ability to kill reconnaissance, intelligence, surveillance and target acquisition (RISTA) platforms adds to the force commander's level of information dominance by denying information to the enemy. Furthermore, ADA sensors and data links can directly add to the force commander's situational awareness. Air Defense Artillery is dynamically involved in all the operational patterns; however, as the illustration below shows, the primary route of this interaction is through the patterns of force protection and information dominance.

To better understand these interactions, one must understand the Force XXI concept and Force XXI operational patterns. As the Army began its post-Cold War drawdown, we realized that a smaller version of the Cold War Army could not effectively counter the multiple threats it will face in the future. The challenges of the 21st century required Force XXI, a "reconceptualization and redesign of the force at all echelons . . . to meet the needs of a volatile and ever-changing world." In this world, the command

ADA AND FORCE XXI INTERELATIONSHIPS



of information will be as important as the command of firepower, and bytes will be as lethal as bullets.

Force XXI will not face a Cold War-type threat, nor will it face a vastly inferior threat. Force XXI will face a threat that is both smaller and better than those the United States has faced in the past. The Force XXI threat will be more likely to use weapons of mass destruction, will possess a level of technology similar to our own and will be more unpredictable. To face this threat, Force XXI will operate under six concepts, or operational patterns. These concepts will guide Force XXI commanders as they fight smaller, better forces and counter a wide range of threats. They will be used simultaneously and seamlessly by Force XXI; they complement each other and act as force multipliers by increasing the effectiveness of the other operational patterns. As stated earlier, ADA XXI will operate within all of the Force XXI operational patterns, but the primary routes for interaction will be through force protection and information dominance. This is a natural avenue for interaction as these two operational patterns are vital to each other, and Air Defense Artillery is already a leader in each.

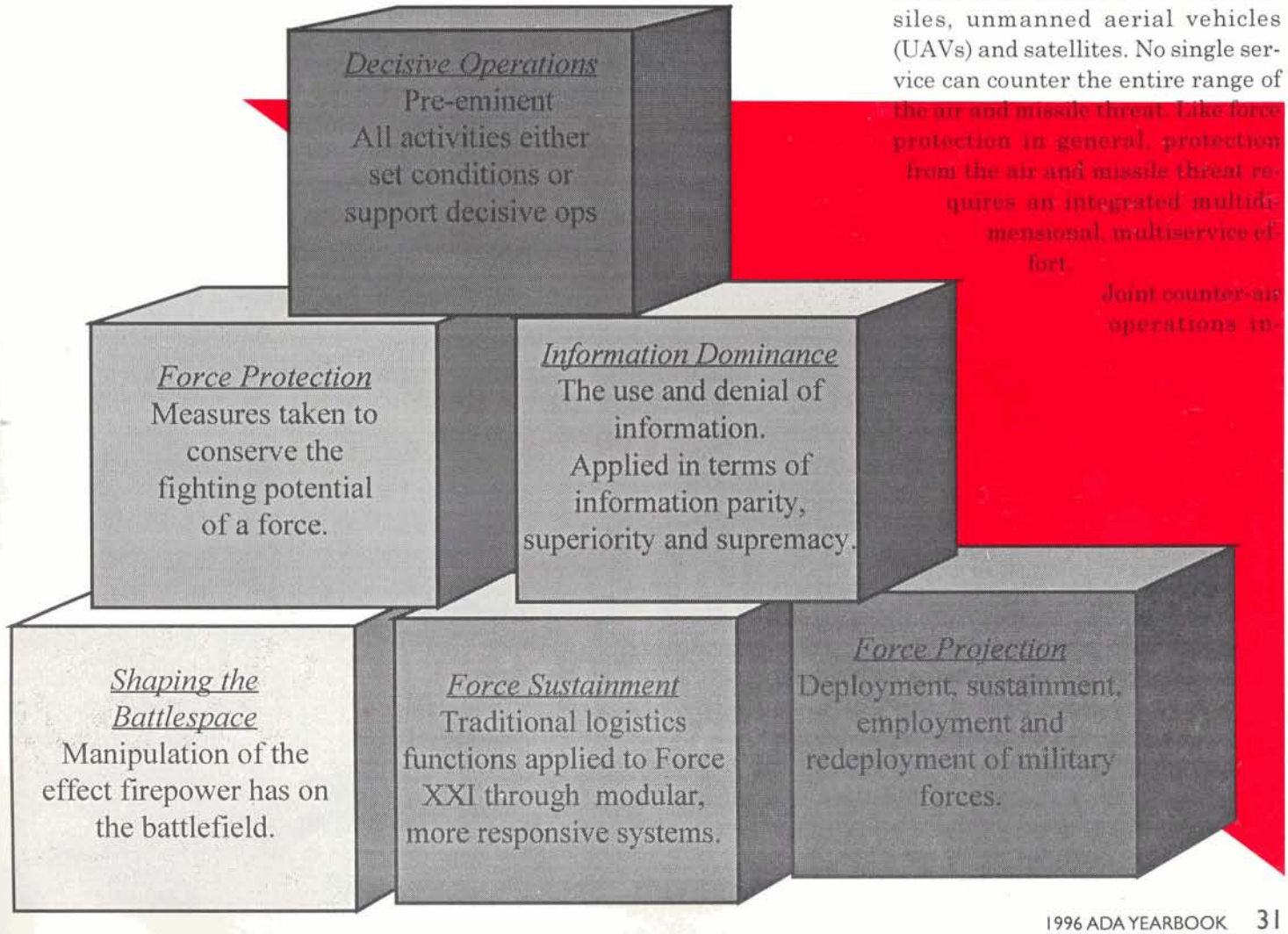
Force Protection

In the Force XXI battlefield, force protection will be a multidimensional and multiservice operation with three goals: protecting friendly forces from enemy action that would disrupt the operational tempo, protecting friendly forces from fratricide, and not hindering the operational tempo through force protection actions. Traditional threats to the operational tempo include weapons of mass destruction, air and missile forces, and the use of special operations forces and ground forces against sustainment operations. Force XXI force protection also consists of denying situational awareness to the enemy, protecting friendly situational awareness and decreasing the probability of fratricide caused by dispersion on a nonlinear battlefield.

The air and missile threats that Force XXI will face will consist of fixed-wing aircraft, helicopters, tactical ballistic missiles (TBMs), cruise missiles, tactical air-to-surface missiles, unmanned aerial vehicles (UAVs) and satellites. No single service can counter the entire range of the air and missile threat. Like force protection in general, protection from the air and missile threat requires an integrated multidimensional, multiservice effort.

Joint counter-air operations in-

FORCE XXI OPERATIONAL PATTERNS



clude offensive counter-air, defensive counter-air and suppression of enemy air defense, with the goal of achieving air superiority or supremacy, thereby providing force protection. A common misconception is that only the U.S. Air Force contributes to air superiority. Army air defense focuses on defensive counter-air, contributing to air superiority and freeing friendly air assets for offensive counter-air and suppression of enemy air defense.

Separate from offensive counter-air is theater missile defense (TMD). Joint Chiefs of Staff Publication 3-01.5 provides the doctrine for TMD operations. TMD operations are a great example of how multiple-service assets will combine in Force XXI to counter a specific threat. To defeat enemy use of a medium- to long-range ballistic missile, the force must combine intelligence gathering, force warning, attack operations and active defense. Ground- and space-based sensors (national assets) will provide information to the TMD system about the location and use of TBMs. This information will be used to warn targeted forces (all services), giving them time to increase their survivability. In addition, the information will be used in attack operations (Air Force offensive counter-air and Army deep strike) against the TBM systems. Finally, the TMD system will use the Army's Theater High-Altitude Area Defense (THAAD) system to actively engage incoming TBMs.

The single most important element in providing protection from the air and missile threat is the integration and coordination of all counter-air operations. An implied ADA mission task is to provide this integration and coordination for the Army. To do this, Air Defense Artillery integrates operations with both the air and land campaigns. This integration is essential to the effectiveness of ADA firepower, but also allows Air Defense Artillery to give third dimensional situational awareness to the force commander and provide targeting data to Army, joint and combined forces. This increases the effectiveness of all force protection operations.

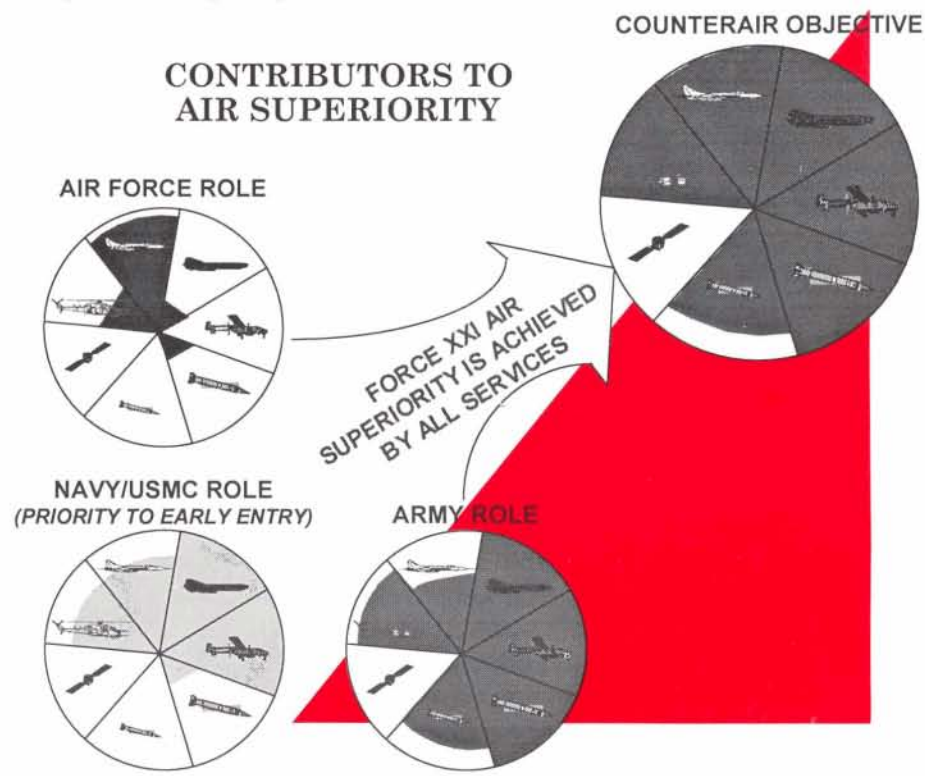
Horizontal and vertical integration and coordination within Army operations is just as important as multiservice integration and coordination. Current technological improvements in ADA sensors and data links will facilitate this coordination. The goal of this integration and coordination is to permit the Force XXI ADA commander at each echelon to act as the counter-air coordinator for that echelon. For example, in addition to commanding his forces and protecting the division from air attack and enemy RISTA operations, the ADA battalion commander in a Force XXI division will integrate his forces with the corps and theater air defense plan, provide the division commander with third-dimension situational awareness, collect data for theater-wide use and provide targeting data to division deep attack assets. This integration and coordination will ensure the effectiveness of force protection efforts at all echelons.

Air Defense Artillery will continue to be a major factor in the prevention of fratricide in Force XXI. Improvements to identification, friend or foe, capabilities and the use of FAAD C^3I will give FAAD gunners greater reliability in target identification.

An additional requirement of force protection is the protection and denial of situational awareness. Air Defense Artillery will contribute to this effort by contributing the third dimension of situational awareness and by targeting enemy RISTA platforms. These functions, which will become critical tasks for Air Defense Artillery in Force XXI, can be better understood through the pattern of information dominance.

Information Dominance

Critical to the improvements Air Defense Artillery brings to force protection is the increase in the amount and use of information. This reliance on information demands that Force



XXI achieve information dominance in future conflicts. Information dominance is comprised of two major tasks: the collection, processing, dissemination, display and protection of information for use by friendly forces, and the denial of the same to the enemy. Air Defense Artillery will contribute to both tasks.

One of the greatest contributions Air Defense Artillery will make to Force XXI is in the arena of three-dimensional situational awareness. The sensor-data link network in place today can provide a real-time or near-real-time air picture of the high- to medium-altitude air defense battlespace, as well as portions of the area of interest. As technology increases, this capability will extend to cover almost the entire area of interest. The sensors associated with FAAD C³I and THAAD systems will add to the current network and provide near-seamless coverage of the third dimension to the force commander. In addition, Air Defense Artillery will continue to protect critical C³I nodes from air and missile attack, thereby protecting information operations.

Information denial will also be a focus of ADA operations in Force XXI. The addition of FAAD C³I and slew-to-cue systems to the Avenger will allow ADA forces to engage UAVs. UAVs are already a major contributor to threat RISTA operations. Their low-cost and effectiveness ensure their use will increase dramatically over the next 10 to 15 years. By adding the capability to engage UAVs and other RISTA platforms in the forward area, Air Defense Artillery will deny the enemy his "eyes and ears," lowering his situational awareness and preventing him from gaining information dominance.

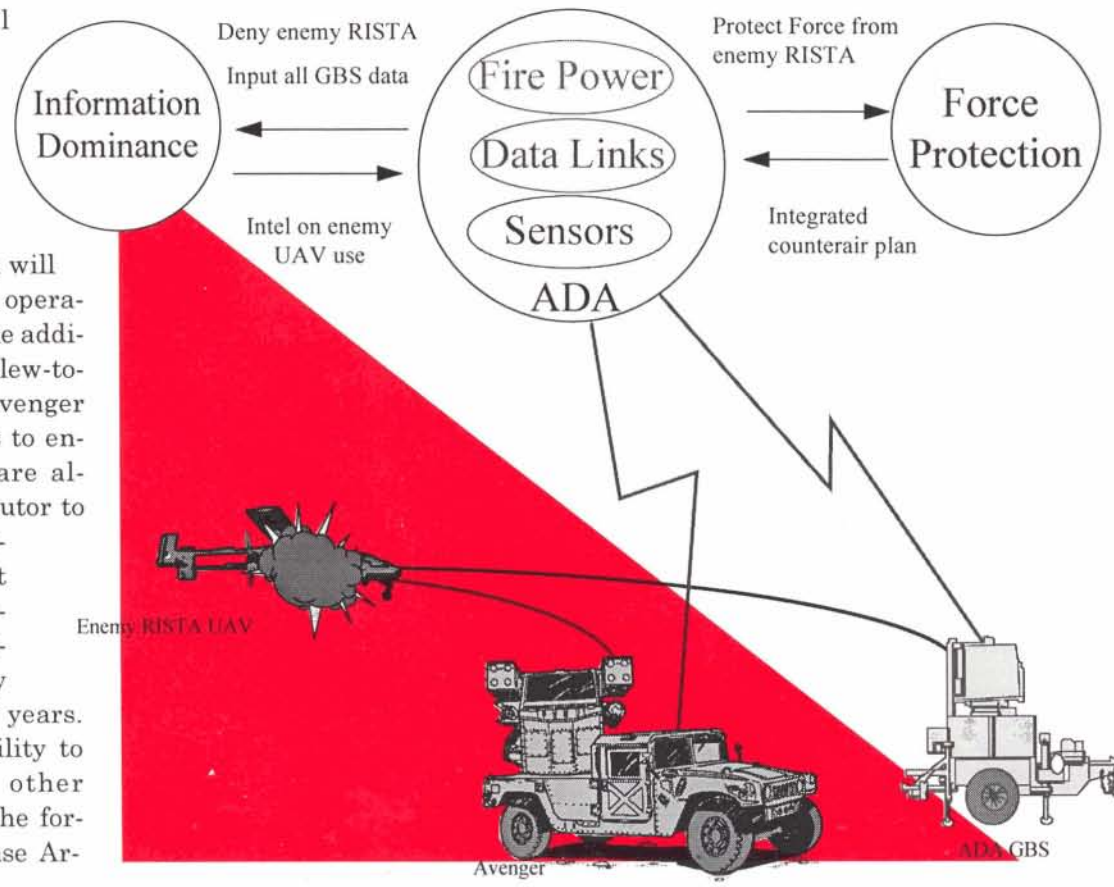
Combined Effect

Force protection and information dominance are closely related operational patterns. Information operations assist force protection efforts by providing early warning and target acquisition and identification, and by establishing a network of information in which force protection systems can operate. Conversely, information operations and networks are incorporated into the force protection plan. Additionally, Air Defense Artillery contributes to, and draws from, both force protection and information dominance. This inter-dependency can be seen clearly in the counter-RISTA fight. From the outset, the engagement of a RISTA UAV adds to both operational patterns: it protects the force from enemy RISTA operations and adds to information dominance by denying the enemy access to information.

However, successfully engaging a RISTA UAV requires the combined effects of ADA sensors, data links and firepower. First, the ground-based sensor detects the incoming UAV; next, the information is passed over the FAAD C³I system to the air battle management operations center; then, the information is passed to a specific Avenger system equipped with a slew-to-cue engagement feature.

This combined effort and the collateral relationships with force protection and information dominance appear below. The Avenger is able to engage the UAV because it is part of an integrated theater counter-air plan. This plan has allocated resources to counter all threats, allowing the

COLLATERAL RELATIONSHIPS



Avenger the time and resources needed to make the engagement. Additionally, the level of information dominance achieved by the force allows the air battle management operations center to receive intelligence about the probable use of UAVs, and early warning from another sensor not under their control.

This combined effect will work throughout the ADA community when it operates under the Force XXI concept. Air Defense Artillery is uniquely positioned to maximize this interaction because it has been operating under similar principles since World War II. However, as with all branches of the Army, full integration with Force XXI will require some changes.

The Road to Force XXI

Air Defense Artillery's transition from a post-Cold War status to Force XXI will require changes in six areas: doctrine, training, leader development, organization, materiel and soldiers.

FM 100-6 will contain the capstone doctrine for information operations. This document emphasizes the importance of information flow "to the point of the spear." It is important that information reach higher echelons if proper decisions are to be made; however, it is just as important that the fighters get the information. This concept is not new; in fact, S.L.A. Marshall stated it almost 50 years ago:

"Information is the soul of morale in combat and the balancing force in successful tactics. . . . We have not found the means to assure an abundant flow. . . . It is true that we have worked marvels in furthering the rearward flow of information to higher headquarters. . . [but cannot get it] to whom the information would be most useful."

The difference between then and now is that Force XXI has the means. FM 100-6 calls for a shift from this hierarchical nature of information flow to a more open system. Capability to interconnect various information systems will make timely information available to those who need it most. FAAD C³I is an example of technological impact on doctrine. With FAAD C³I, the individual FAAD team will have access to a real-time air picture.

Training must change as doctrine changes. Units must train to function within the operational patterns, to fight the information war and to operate at various levels of information dominance. Additionally, multi-service training must become a priority, and ADA units will need to focus training on fighting as part of an integrated theater air defense plan.

ADA leaders can no longer focus only on fighting their part of the air battle, or on leading their troops. The effectiveness of Air Defense Artillery in Force XXI relies on the seamless interaction of air defense at all levels. The focus of leaders must become more broad. Leaders at all levels will need to be expert on all aspects of air defense (firepower, sensors and data links) and must be able to fight their unit as part of a theater-level air and land campaign.

ADA organizations will also change to support Force XXI. The need exists now for the theater-level Army Air and Missile Defense Command for the land component. This command would provide the necessary integration of Army assets required to counter the TBM and RISTA threats. Another shift will be the reliance on reserve components as part of total force organizations. What will not change is the need for organic ADA units at the various echelons. It is critical that the Force XXI division commander "own" the assets he needs to provide force protection.

Materiel changes to make Air Defense Artillery function better in Force XXI are already underway. In the near-term, the fielding of the ground-based sensor and FAAD C³I will give short-range air defense forces more situational awareness and the ability to fully integrate with theater plans. The addition of slew-to-cue will give FAAD systems the ability to engage UAVs, helping Force XXI to gain information dominance. THAAD will soon begin to provide the multi-tiered missile defense necessary for force protection.

Finally, soldiers will have to change for Force XXI. Force XXI will require that ADA soldiers become information experts. They will need to know not only how to fight their systems (already information-intensive) but also how to integrate their systems horizontally and vertically as part of the theater air and missile defense plan. ADA soldiers will be part of the first team of information collection and distribution, and will also be among the most important users of information in Force XXI.

Conclusion

These changes, which will help make Air Defense Artillery part of Force XXI, are not drastic. In fact, Air Defense Artillery has been doing many of the things required for Force XXI for more than 30 years. Since the development of the Hawk system shortly after World War II, Air Defense Artillery has fielded mobile, tactical ADA systems that combine firepower, sensors and data links to provide force protection. Developments since then, in all three areas, have given the "First to Fire" branch an ability unique in the Army in the area of information dominance. These capabilities, combined with planned upgrades to weapons systems and other changes as shown, will ensure that Air Defense Artillery will be "First to Fire" in Force XXI.

1st Lt. Gerald R. Scott is an OAC student at Fort Bliss. His follow-on assignment is Germany. Mike Cochrane, an action officer in DCD's Air Defense Lab, served as technical advisor.

Should We Keep ADA in the Division?

History Supports Only One Decision

by Capt. Roland V. Quidachay and Capt. Torrance J. Porter

Force Protection at Risk

The architects of America's World War II fighting force allocated antiaircraft battalions as Army or corps assets. But when they viewed the carnage that German fighters and bombers wreaked on U.S. divisions in North Africa, they all agreed on one thing: if they had the chance to do things over again, they would have made antiaircraft battalions organic to the division.

The arrival of high-performance jet aircraft in the late 1940s and early 1950s raised the spectre of a Soviet-launched strategic bombing attack against the United States and brought about a resurgence in air defense activity. Light antiaircraft battalions became organic to the divisions when both heavy and light guns were added to the Army inventory.

Today, the continuing onslaught of downsizing compels key leaders to debate the existence of ADA battalions in the divisions. History proves there is only one acceptable decision: keep

Avenger's forward-looking infrared system gives it an adverse weather and night capability.

air defense in the divisions. Removing air defense from the division force structure means sacrificing the protection of our forces, an absolutely intolerable tradeoff. The Battle at Kasserine Pass and the Battle of the Bulge during World War II, as well as the Arab-Israeli War of 1973, all testify to the necessity of divisional air defense in exterminating the air threat.

Current technological advances in air defense weapon systems and support equipment make Air Defense Artillery a highly effective combat multiplier within the division. Air defense capabilities empower the ADA battalion to destroy and eliminate the aerial threat to the division, ensuring our forces retain the freedom to maneuver.

To fully appreciate the role of divisional ADA and understand how vulnerable the division is to third-dimension attack, we must fully understand the capabilities and missions of the current and future aerial threat. The number of countries possessing high-tech weapons and aircraft grows at an alarming rate. Many of these countries show a willingness to use advanced technologies, including weapons of mass destruction, to meet their national objectives. Many countries even view inflicting harm upon civilians as equal in importance to achieving military objectives. Aerial delivery is often a preferred means to accurately employ these munitions. The current aerial threat to the division consists of unmanned aerial vehicles (UAVs), rotary- and fixed-wing aircraft, and cruise missiles.

UAVs currently pose the most significant threat to the division because of their ability to conduct deception, anti-radar, anti-tank, decoy, ground attack, airborne jamming and harassment missions. Low radar cross sections, improved guidance, sophisticated payloads and night capabilities make UAVs a formidable threat. Such characteristics enable UAVs to support targeting and counter-maneuver assets, and disrupt command and control nodes and radar coverage. In the attack mode, UAVs will destroy high-value targets and annihilate troop and armor concentrations. UAVs also perform reconnaissance, intelligence, surveillance and target acquisition (RISTA) missions, and are equipped with cameras that provide real-time video or still photos that aid in reconnaissance and intelligence collection. In the passive mode, UAVs fly high and slow to avoid detection. Not only are UAVs dangerous because of the manner in which they are employed, but also because a large number can target a division at one time. Because UAVs are inexpensive to build and test, they are developed and mass-produced in more than 18 countries. Using ADA assets in the division is a primary way to successfully counter the UAV threat.

The lethality of rotary-wing aircraft is due greatly to their ability to maneuver within restrictive terrain. The reduced radar cross section makes threat rotary-wing aircraft less vulnerable to detection. Most threat rotary-wing aircraft also have improved guidance with night and all-weather capabilities. Similar to UAVs, rotary-wing aircraft have the doctrinal missions of attack, RISTA, air movement and close air support. Rotary-wing aircraft expose the vulnerability of divisional maneuver units by deploying nuclear, biological and chemical munitions, inserting troops and targeting armor concentrations. ADA assets employed with the maneuver units are effective in countering the rotary-wing threat, thus allowing friendly forces to continue their momentum.

While rotary-wing aircraft concentrate primarily on close operations and insertions, the fixed-wing threat is capable of missions covering the entire spectrum of air-to-air and air-to-ground operations. The general objectives of threat fixed-wing aircraft are to destroy armor and troop concentrations and important high-value targets. Fixed-wing aircraft threaten the division in that they are versatile, hard to detect and extremely lethal, and can survive even in extreme conditions. Cruise missiles constitute an evolving threat to the division. They have improved guidance systems and reduced radar cross sections that enable them to fly at low-and-slow or high-and-fast profiles. Cruise missiles attack high value targets and logistical operations centers. Division assets are lucrative targets for cruise missiles, which are extremely destructive and precise delivery weapons. Cruise missiles generally target helicopter assembly areas, multiple launch rocket systems, soldier and equipment concentrations, and command and control centers.

Divisional short-range air defense battalions have the capability and assets to counter and destroy the current air threat with the use of three primary weapon systems: the Bradley Stinger Fighting Vehicle (BSFV), Avenger and the Stinger manportable air defense (MANPAD) system. The BSFV, the enhanced BSFV version known as Linebacker and the Avenger are triple-roled systems. They can effectively shoot and kill in the air and on the ground, and provide a highly capable command and control platform for not only platoon and task force operations, but also during operations short of combat. Formerly called operations other than war, these operations require small teams with self-protect capability, good command and control, and the ability to operate somewhat autonomously.

The BSFV is a highly maneuverable tracked vehicle able to support the armored and mecha-

nized task forces in the close fight. The BSFV is effective against rotary- and fixed-wing aircraft using its dismounted Stinger team and the 25mm chain gun. Future improvements to the BSFV can be seen in the Linebacker, which is currently being tested. The Linebacker will have a shoot-on-the-move capability and an enhanced ability to use an early warning cue from divisional or joint sensors. Once fielded, the Linebacker will be able to shoot down UAVs and cruise missiles using the slew-to-cue method, which allows the mounted Stinger pod to slew to the target for engagement.

The Avenger weapon system is highly mobile and can shoot up to eight Stinger missiles while moving. Its forward-looking infrared system gives Avenger an adverse weather and night capability that makes it critical to the total mix with other divisional ADA weapon systems. Because the Avenger can be inserted by a CH-47 Chinook helicopter, it can be placed along likely enemy air avenues of approach for use against RISTA UAVs and other aerial threats. The Avenger is easily transported in a C-130, enabling rapid deployment to relatively any type of environment. In addition, the Stinger missile on the Avenger can be easily converted to a manportable Stinger should the need arise.

The manportable Stinger is a lethal threat against rotary- and fixed-wing aircraft. Pilots cannot detect Stinger teams while traveling at high rates of speed. Once a Stinger team has identified a target as hostile, it will engage the threat aircraft, automatically locking on to the target and destroying it within seconds. Improvements to the Stinger missile are also underway. The Reprogrammable Microprocessor (RMP) Stinger missile incorporates improved infrared guidance and increased missile speed. This improved fourth-generation Stinger is known as Stinger Block II.

Early warning sensors and command and control systems complement the ADA coverage of the division area of operations. Such sensors provide timely detection of the aerial threat down to the gunner level. The forward area air defense (FAAD) command, control, communications and intelligence (C^3I) system integrates data from a multitude of organic and external sensor platforms to provide responsive, near-real-time track location and data cueing to ADA weapons. The sensors organic to the division are the ground-based sensor (GBS), found in the heavy divisions, and the light and special division interim sensor (LSDIS). In addition to the GBS and LSDIS, FAAD C^3I can integrate the air picture from external sensors, such as airborne warning and control system (AWACS) aircraft and the Patriot radar. By integrating data from these sources, FAAD C^3I enhances the ADA battalion's capability to counter the RISTA UAV, rotary-wing, fixed-wing and cruise missile threats. The FAAD C^3I system is located at the division's Army airspace command and control cell, the ADA battalion air battle management operations center, the ADA battery command post (which is collocated with the supported brigade's tactical operations center) and at the platoon command post.

The GBS and LSDIS, like the old forward area alerting radar, are emplaced based on the battalion reconnaissance and security plan that is approved at division. The GBS has a range in excess of 40 kilometers for search, track identification and classification. Its three-dimensional radar provides azimuth, elevation and range data information to ADA fire units. This excellent detection capability against UAVs, aircraft and cruise missiles enables heavy division commanders to update and verify their fluid battlespace. The LSDIS can detect aircraft to a range of 20 kilometers with 360-degree coverage. The LSDIS also detects small hovering helicopters at eight kilometers. The LSDIS is air-droppable and easily transportable with an M-998 high mobility, multipurpose wheeled vehicle.

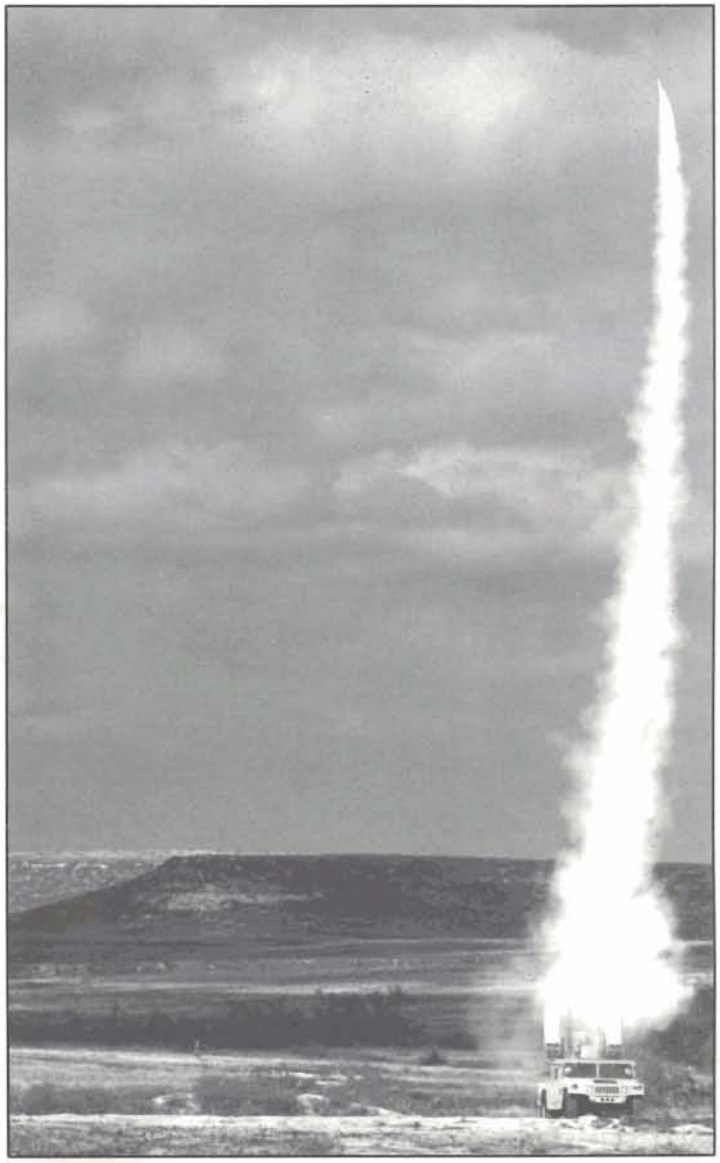
The capability to identify and defeat the threat before it can perform its mission is key to mission accomplishment for ADA battalions. The weapon systems, modern sensors and C^3I systems keep air defenders postured and ready to fight in today's division. Only ADA units can counter the deadly serious threat that today's high-tech, highly lethal aerial platforms pose to the division. The success of the combined arms team is reliant upon the destruction of the aerial threat. The question of why divisional Air Defense Artillery is needed is simply answered by stating the obvious: until other weapon systems can counter or destroy the aerial threat, Air Defense Artillery must remain in the divisions.

Capt. Roland V. Quidachay is an OAC student at Fort Bliss. His follow-on assignment is with 5-5 ADA in Korea. Capt. Torrance J. Porter, an analyst in DCD's Force Development and Analysis Division, served as technical advisor.

Can FAAD Stop Cruise Missiles?

Answer Depends on Funding

by Capt. Brian L. Bowen and Maj. Steve Miller



CMs Deadly Effective

A young Stinger gunner is emplaced in a well-concealed position along a high-speed avenue of approach. The air defense warning is red. An air attack is in progress in 3rd Platoon's Sector, but his platoon (about three kilometers south of 3rd Platoon) has not seen any air activity. In an instant, a cigar-shaped object whirs along the tree line parallel to his position — a complete surprise! Anxious to relay information, but excited by the confusion, he rushes to the radio. "Dynamite! Dynamite! Two fixed-wing . . . . Two fast moving . . . . " then aside, "Sergeant, I didn't see that. What was it?" Before his team chief can answer, a deafening explosion permeates his senses.

The cruise missile that just neutralized a fictitious brigade support area only five kilometers to the rear of the unnamed gunner traversed an entire brigade defensive area. It was not detected, acquired or engaged. This situation was not the result of apathetic soldiers or poor training, nor was it the result of poor tactical emplacement or poor command and control by battery-level officers. Though fabricated for the purpose of my discussion, this scenario represents an absolute and dangerous threat to U.S. air defense design. This threat is the cruise missile.

With ranges of up to 3,000 kilometers, cruise missiles pose quite a threat to assets within all dimensions of the battlefield. High- to medium-altitude air defense (HIMAD) weapon systems can detect and destroy small, stealthy targets, but HIMAD lacks the assets and the mobility to defend the priorities of maneuver commanders below divisional level.

Forward area air defense (FAAD) systems defend those priorities and still maneuver with light infantry, heavy infantry and armored forces. Even with the light and special division interim sensor (LSDIS) to detect targets, existing FAAD command, control, communications and intelligence (C^3I) measures to alert gunners to the target, manportable air defense (MANPAD) teams, Avengers and Bradley Stinger Fighting Vehicles (BSFVs) firing reprogrammable microprocessor (RMP) Stinger missiles, the ADA community falls short of countering this cruise missile threat. With improved systems such as the ground-based sensor (GBS), incorporation of an Avenger slew-to-cue (STC) capability, the new Bradley Stinger Fighting Vehicle-Enhanced (known as Linebacker) and improved RMP Block II Stinger missiles, FAAD will be able to successfully detect, acquire and destroy these effective killers.

Small and stealthy in design, cruise missiles are unmanned, self-propelled, expendable, guided weapons that use propulsion and aerodynamic lift during all or nearly all of their flight. Lethal unmanned aerial vehicles (UAVs) fall into this subset because, like cruise missiles, they can assume the primary mission of destroying a specific target. The performance of these weapons poses a deadly threat to defense design. Cruise missiles can operate day or night, and can fly as low as 50 meters from ground level at up to 250 meters per second. They can pinpoint a target as small as three-by-three meters. UAVs add the ability to navigate with real-time flight data from on-board flight cameras and global positioning devices. They can kill moving or static targets.

These capabilities lead to broad versatility, which in turn leads to unpredictability. UAVs can attack, jam and perform reconnaissance, intelligence, surveillance and target acquisition (RISTA). Air defenders will not know a UAV's direction of approach, whether it is performing a RISTA mission, or if it contains munitions. Some UAVs, like cruise missiles, have an extended flight time and range. With this extended range air defenders cannot be sure if the target is attacking near assets or traveling to another sector. UAVs may appear anywhere on the battlefield, and the growing diversity of potential warheads greatly enhances their versatile lethality.

Potential adversaries have access to these state-of-the-art technologies from an expanding field of sources. The price tag of these technologies is low and will decrease in the future. The term "Poor Man's Air Force" describes a highly probable, highly dangerous, destructive force. For roughly $50 million any adversary could buy two superior fixed-wing fighters, four attack helicopters or 15 tactical ballistic missiles with three launchers. For the same price an adversary could purchase more than 100 UAVs or cruise missile platforms. These platforms are so inexpensive — yet so deadly — that we certainly expect proliferation in the near future.

Slew-to-cue capabilities will enhance Avenger's performance against cruise missiles.

Inexpensive, stealthy, lethal and multipurpose — these are the deadly characteristics of cruise missiles. Some of these characteristics, however, also serve as vulnerabilities. Cruise missiles are light-skinned and fly at low altitudes, making them vulnerable to short-range weapons fire. During Desert Storm approximately six Tomahawks did not reach their targets. The Navy suspects that some, perhaps all, became victims of Iraqi ground fire. The Iraqis may have capitalized on the fact that the Tomahawks used only two ingress routes.

FAAD may be able to predict ingress routes with a good intelligence preparation of the third-dimension battlefield and then pre-position air defense assets accordingly. Once detected and acquired, cruise missiles (which are incapable of reactive, evasive maneuvers) are easier to engage than fixed-wing aircraft.

Lethal UAVs are also light-skinned, but they fly slower and usually higher than cruise missiles and are, therefore, easier to track and engage. Unlike cruise missiles, which are usually pre-programmed with flight data, UAV flight patterns are often visually dependent and can be modified in real time. Adverse weather and nightfall reduce their effectiveness, as do sound passive air defense measures. In many cases, air defense assets may pre-position forward to achieve a timely kill.

It seems that detection of these platforms is the key. Their small size and unpredictable flight patterns make them hard to detect. The human eye, alone or aided by M-22 binoculars, is the detection method most air defense systems use (air defense scouts, BSFVs and MANPAD Stinger teams). During Roving Sands '93, scout teams demonstrated that they relied on hearing a UAV to find it; even then UAV detections were few, close (usually at less than one kilometer) and made during the day (no night detection capability severely limited the scout team's effectiveness).

The LSDIS, coupled with the FAAD C^3I reporting and display system, is a significant improvement over Stinger scout eyeball-dependent detection, but still cannot counter the cruise missile threat. It can detect targets out to about 20 kilometers and digitally report them via the simplified hand-held terminal unit (SHTU) display, but has a limited ability when detecting low observables (targets with a low radar cross section). Thus, the LSDIS can only detect low observables at ranges considerably under 20 kilometers. The LSDIS also has a slow update rate of one update every six seconds, meaning that when displayed on the SHTU in one position, a fast-moving target has actually moved for six seconds and is in a new location. This makes detection more difficult at the weapon system level.

GBS is the key for FAAD detection of cruise missiles. Its range is greater than 40 kilometers, which provides that much-needed acquisition and kill time. It has superior clutter and low-altitude detection capability; an identification, friend or foe (IFF), subsystem; and a faster update rate of nearly one update every two seconds. GBS' three-dimensional radar even has the ability to cue other weapon systems to the target. Once the GBS fielding is complete, and assuming that GBS data is netted and distributed, FAAD will be able to mitigate terrain masking and detect very low-flying cruise missiles at the ranges required to provide the needed alerting and cueing to FAAD weapons.

Before air defense systems can acquire this detected target, they must be cued toward the target. Previously, the only alert came from a voice on the division early warning net forewarning systems about the presence of hostile air. But with the advent of improved sensor systems comes the ability to electronically transfer the track data to the shooters. LSDIS and GBS detect and pass information via the FAAD C^3I system to the SHTU. From the SHTU, digital data must be verbally translated to a gunner, who manually aligns the weapon. Because these digits "fall on the ground," this process is slow and relatively inaccurate and results in missed or late engagements. An automated transfer of three-dimensional data from the GBS directly to a weapon turret would increase detection opportunities and the number and speed of engagements. The new Linebacker will translate this three-dimensional data directly into turret movement (an STC capability being integrated into existing Avenger weapon systems) without losing the digits to the ground. With GBS producing C^3I targeting information and the SHTU slewing the Linebacker and upgraded Avenger, we stand a much greater chance of acquiring and engaging the targets.

The next task becomes target acquisition, the unofficial "Achilles' heel" of BSFV and MANPAD subsystems. The irony is that, even though the BSFV was designed to survive and maneuver with a heavy force, when Stinger teams dismount to acquire a target on offensive operations, neither the BSFV nor the Stinger team can keep up with the moving force. Once they fall behind, they cannot make it to the forward area quickly enough to engage the targets they were designed to kill. Furthermore, the Stinger team is misoriented when they roll out the back of a Bradley. Gunners must attempt to acquire targets with-

out cueing assistance, magnified optics or night capability.

The Avenger is the only system with improved acquisition capabilities. The Avenger team can acquire visually or use the forward-looking infrared (FLIR) with magnification. During a live experiment in July 1995, a cued Avenger acquired 85 percent of the cruise missile surrogates it faced. During a counter-UAV demonstration in February 1994, a cued Avenger acquired a Pioneer UAV at up to eight kilometers. All of these tests were done during daylight. The FLIR makes the Avenger night capable, but its visual identification is poor and humidity causes ill effects. With optical enhancements the Avenger could provide much greater acquisition capabilities.

There is no doubt that increased effectiveness is synonymous with better weapon acquisition. During acquisition testing, a one-kilometer increase in FLIR detection range coupled with a one-kilometer increase in visual identification range increased engagement capabilities by an average of 32 percent. We need that added 32 percent to combat cruise missiles.

The Linebacker provides this much-needed acquisition improvement. Firing Stinger missiles from the turret eliminates the need for the gunner to dismount. The Linebacker meets survivability and maneuverability goals because the gunner can shoot from within the armored turret and continue to move. It also possesses enhanced optics for greater night and day acquisition ranges. As mentioned previously, the Linebacker's new STC capability makes it an all-around tight acquisition package and leaves the kill to the responsibility of the Stinger missile.

Improvements to the RMP Stinger missile will make this package complete. Posed against the cruise missile threat, the present missile has several deficiencies. The RMP missile has a decreased probability of kill when targets are small, hidden in ground clutter or flying at slow speeds — all of which are characteristic of cruise missiles. The solutions are the improvements known as RMP Block I and RMP Block II. Block I adds a new control section that improves the probability of kill against UAVs by 100 percent. A cruise missile flying head-on produces a very small infrared signature. RMP Block II adds a new, more sensitive seeker head and advanced signal processing that will defeat this threat. This cuts through ground clutter to buy back battlespace against low observables. It is the only missile with the capability to process that small infrared signature.

A final, serious deficiency is the missile's shelf life. Current RMP inventories are expiring at an alarming rate. The on-board missile batteries have a shelf life of only 10 years. Although both RMP Block I and II will add new batteries to resolve the shelf life issue, funding is still insufficient to buy the quantity of missiles our forces require.

Inadequate funding for improvements serves as a hindrance to FAAD cruise missile defense in more ways than one. Even though the Linebacker has been approved for the Department of the Army Warfighter Rapid Acquisition Program (WRAP), funding is insufficient to field the force. The Avenger STC upgrade has been nominated as a rapid acquisition candidate, but funding has not been provided. Likewise, funding for the Avenger's enhanced optics does not exist. Preplanned product improvements (P^3I) for the GBS, which will increase detection against evolving low-observable threats, remain unfunded. This lack of funding leaves only Patriot to defend against cruise missiles. With the Patriot's deadspace, the lack of Patriot assets and Patriot's susceptibility to saturation with multiple launches, we leave a large gap in force protection.

Clearly, modest levels of funding will bolster FAAD's tremendous potential to contribute to cruise missile defense. To counter the serious, growing cruise missile threat, FAAD needs these improvements. The GBS with P^3I will be able to detect the future cruise missile threat. The STC upgrade, along with enhanced optics for Avenger, will greatly improve the Avenger's capabilities. The Linebacker's ability to shoot on the move, coupled with its STC ability, will provide a much-needed increase in mobility, survivability and lethality. And while Stinger Block I provides the capability to defeat the near-term UAV threat, Block II is needed to kill in clutter and to buy back battlespace against low observables now and in the near future.

A young Stinger gunner is once again emplaced in a well-concealed position along a high-speed avenue of approach. This time he is sitting in the turret of his Linebacker and is oriented along his tasked primary target line. His Linebacker turret, cued by battalion sensors, slews rapidly to the head-on target. Seconds later he acquires the cruise missile with his enhanced optics, launches a Block II Stinger and destroys it before it flies over his position.

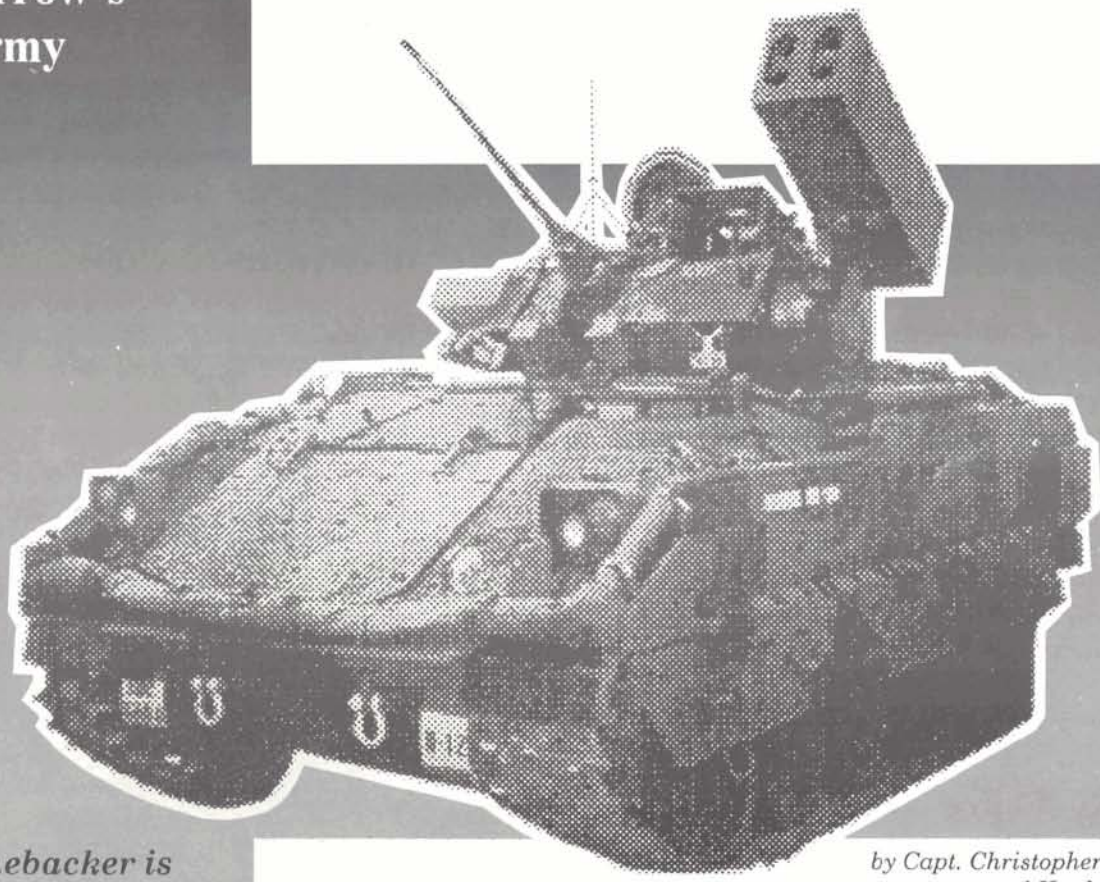
This new standard would make my opening example a faint memory. The choice is one of funding.

Capt. Brian L. Bowen is an OAC student at Fort Bliss. His follow-on assignment is at Fort Stewart, Ga. Maj. Steve Miller, chief of DCD's FAAD Branch, served as technical advisor.

Targets for the 21st Century
ADA
U.S. ARMY
HERLEY VEGA
HERLEY VEGA
HERLEY VEGA
Aim at the Best
Shoot at Tracor's MQM - 107E
TRACOR
HERLEY-VEGA SYSTEMS

CD During Downsizing

Combat developers are the architects of tomorrow's Army



The Linebacker is a product of post-Cold War combat developments.

by Capt. Christopher C. Corbett and Hank Tarkowski

The science of combat developments, which might be defined as the study of combat on future rather than past or present battlefields, is as old as warfare itself. Ancient warriors who turned carts into war chariots, perfected the phalanx or invented catapults to batter down fortress walls were combat developers. The most successful were those who, through intuition or experimentation, could best envision ways new weaponry (such as the English longbow) or organizational innovations (such as the Zulu *impi*) could be turned to military advantage.

Today, combat developers are the architects of tomorrow's Army. The U.S. Army Training and Doctrine Command (TRADOC) has institutionalized combat developments by placing a Directorate of Combat Developments (DCD) within each combat arm school. At Fort Bliss, Texas, the U.S. Army Air Defense Artillery School's DCD generates perfor-

mance requirements for the air defense weapons and command, control, communications and intelligence systems that will fight the air and missile defense battle on 21st century battlefields. The directorate is the Chief of Air Defense Artillery's "think tank." All current ADA concepts of how to fight, weapons, command and control and organizations originated in DCD within the last 20 years.

The TRADOC commander charters TRADOC System Managers (TSMs) where needed to field new equipment and represent user interests. These TSMs are full partners with DCDs in the combat developments business. The two air defense TSMs (Theater Missile Defense and Forward Area Air Defense) focus on user representation and total system integration. They ensure that new systems completely fulfill requirements that DCD develops and documents. One way to picture the DCD-TSM relationship is to view DCD as the planner and the TSMs as the executors of the plan. Continuous coordination between DCD and the TSMs is essential to ensure effective system fielding.

DCD's mission and function statement is oriented to Air Defense Artillery's future: "Develop and serve as proponent for ADA concepts, requirements and organizations. Support the Battle Laboratories Program. Operate the ADA Warfighting Center." This article explains how Air Defense Artillery's DCD works, examines its contribution to the forging of Force XXI and projects the future of air defense combat developments.

The recent collapse of the Soviet Union plunged the world of combat developments into temporary chaos and confusion. Most of us started out as Cold War soldiers who literally grew up with "the threat." Everyone knew who the threat was; it was the Soviets. We had spent most of our careers preparing to defeat the Red Army on the battlefield. As combat developers, our task was to ensure that our capabilities continued to match evolving Soviet capabilities. We were on intimate terms with the threat; we knew its strong points and its weak points.

Then suddenly, the threat we had grown accustomed to was gone. Our challenge was to analyze and redefine the threat and then redesign the force to counter it. This was a task that had to be accomplished in the midst of draconian budget cuts and a drawdown of historic proportions.

DCD changed significantly as a result of post-Cold War adjustments. Budget cuts and force reductions forced us to change the way we do business. Today, we rely on experiments, rather than extensive testing and evaluations, to determine general requirements across the domain of doctrine, training, leader development, organization, materiel and soldiers. The good news is that the new approach has significantly improved the "up front" portion of system development and made it less expensive; the bad news is that it has not reduced the cost of major materiel acquisition programs.

DCD has been very successful in working within the Army's battle lab program to the benefit of Air Defense Artillery, the Army and joint forces. As a result, the "First to Fire" branch is well represented within the Army's concept for future operations. DCD has developed and is now staffing an overarching operational concept that reflects all four pillars of theater missile defense (active, passive, attack and command, control, communications, computers and intelligence).The requirements for Patriot Advanced Capabilities-3, the Theater High-Altitude Area Defense (THAAD) system and the joint tactical ground station (JTAGS) have been documented, successfully defended and approved. The requirements for the Corp Surface-to-Air Missile (Corps SAM)/Medium Extended Air Defense System (MEADS), national missile defense, Stinger improvements and the air defense tactical operations center are on track and eventually will be approved.

Combat developments also successfully defended key elements of the ADA force structure in the Total Army Analysis 2003 process, which is how the Army determines its future force structure. It also obtained resources for the joint tactical ground station detachment, the first THAAD battalion and a tenth Patriot battalion. The directorate has also validated a requirement for the U.S. Army Air and Missile Defense Command. Additionally, DCD established the Fort Bliss Warfighting Center, which has many successes to its credit. The center has supported advanced warfighting experiments, joint wargames, requirements analyses, cost and operational effectiveness analyses and battle staff training.

The downside is that we continue to operate under a distinct handicap. Direct resources from TRADOC for Fort Bliss' DCD have decreased 60 percent in manpower and 80 percent in dollars since the mid-80s. These reductions were the direct result of changing the resourcing system for combat developments. The former system of funding recognized workloads associated with core functions and unique workloads for modernization. The current method of funding attempts to spread TRADOC combat developments resources more evenly among the multitude of DCDs. However, this is done without regard to the size and scope of modernization programs and their associated workload.

Air Defense Artillery, which is rapidly modernizing in every area,

is at a disadvantage. In short, some DCDs now have more money to do the same amount of work, while the Fort Bliss DCD is forced to adjust to having less money and the same amount of work. As a result, the ADA DCD has sought out other sources of funding to keep critical projects on track and to eliminate lower priority and/or resource-intensive projects in an effort to balance workload to resources.

Thanks to funding from the Ballistic Missile Defense Organization, DCD has been able to accomplish most of its critical tasks. Without this supplemental funding, Fort Bliss' DCD would have defaulted on its obligations several years ago, and many of the successes mentioned above and elsewhere in this yearbook would have been pipe dreams.

You ask, "What are the specifics? How does this combat developments resource problem currently impact Air Defense Artillery? How is it expected to impact ADA's future?" Read on.

TRADOC covers the "new way of doing business" extensively in its black book, *Requirements Determination*. This third-in-a-series TRADOC pamphlet informs senior leaders in government, the armed forces, industry and academia about TRADOC and the Army, and provides a reference for all soldiers and civilians about determining warfighting requirements.

As previously mentioned, "the new way of doing business" has extensively changed and improved the up-front portion of combat developments (that is, events prior to Milestone Zero, or new system start in the materiel acquisition process). However, the new way of doing business has not significantly helped the combat developer in support of major programs in the research, development and acquisition process, particularly after Milestone I. Those responsibilities are driven by Department of Defense 5000-series regulations. Current revisions of those regulations retain the requirement for products traditionally produced by the combat developer.

In Air Defense Artillery's case, several major programs are in various stages, from Milestone Zero to near fielding. DCD must compete intensely for resources to support or lead experiments associated with this new way of doing business. This includes the up-front portion of the combat developments process and its responsibilities for materiel acquisition. This competition for resources has been, and continues to be, a major challenge to the ADA community. To date, we have met this challenge for scarce resources.

How have we met this challenge? The short answer is "with extreme difficulty" and a helping hand from the Ballistic Missile Defense Organization, program executive officers, program managers and other agencies. To understand the basic challenge, one has to comprehend the magnitude of the resource decrements relative to workload.

Manpower and direct dollars continue to decrease at an alarming rate. The workload has dropped slightly since DCD moved out of the tactical software testing business and decreased its level of effort in strategic defense and technology. However, the workload climbed back up again after Desert Storm, when the nation increased its priority for missile defense.

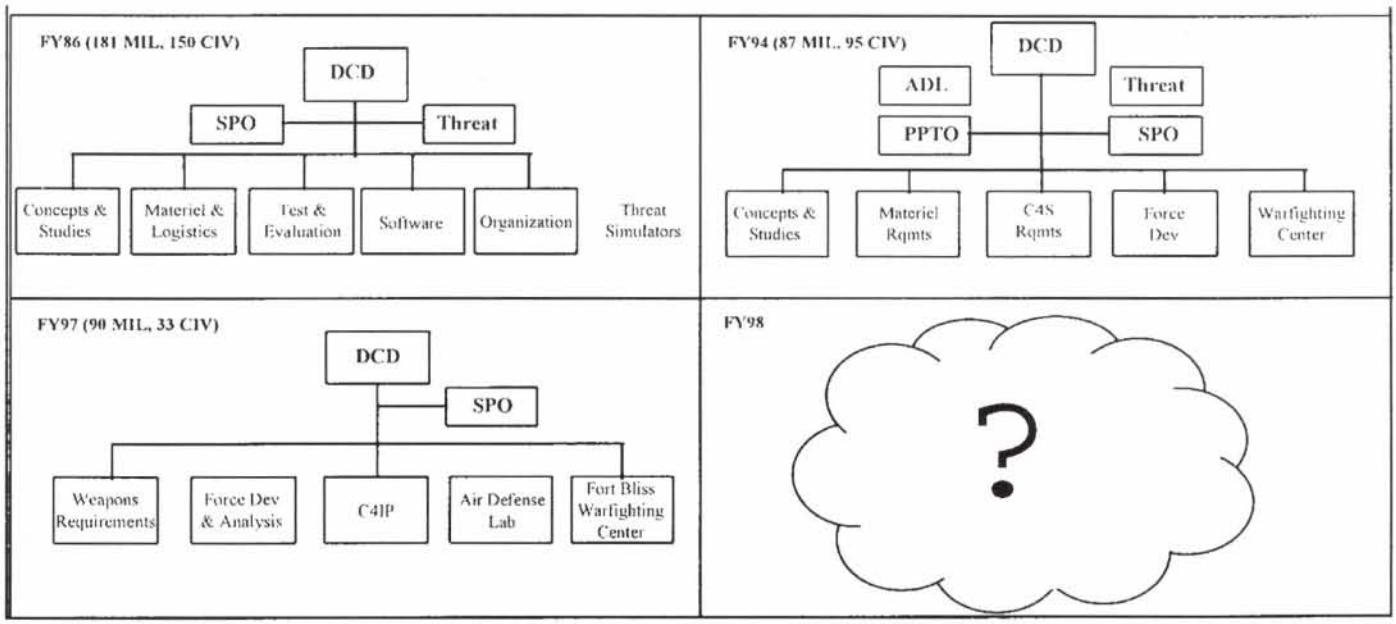
The first step in meeting the challenge was to generalize, deemphasize or eliminate all lower-priority projects and take risks. This meant getting back to basics and ensuring that limited resources were strictly focused on core requirements (in essence, putting first things first). Back in its "heyday," when DCD had three times as many people on board as it does today, DCD did a lot of work outside its official responsibilities in direct support of the "field," as well as work officially assigned to other agencies "for the good of ADA." These areas were among the first targeted for deemphasizing or elimination. Gone are the days when DCD gave full support to table of organization and equipment units for such actions as developing modified tables of organization and equipment, resolving unit issues or conducting deployment analyses.

DCD is now much more selective in its participation in joint studies, tests and experiments. The requisite numbers of skilled and experienced personnel in DCD simply do not exist to ensure proper representation of the branch in those efforts. Sometimes, these decisions are high risk, particularly when the other services inflate their capabilities and deflate the Army's capabilities to provide air and missile defense.

The second step, somewhat a parallel with the first, was to put the bite on other agencies for resources required for successfully meeting acquisition milestones but not directly resourced by TRADOC or the Department of the Army to Fort Bliss. Recent combat development success stories, such as the Fort Bliss Warfighting Center and Patriot Advanced Capabilities-3 cost and operational effectiveness analysis, would not have been possible without resources from other agencies.

Another step taken (again, something of a parallel) was to adjust the DCD organization to live within the manpower reductions over time (see illustration, facing page).

Some of the key functions dropped or reduced in scope over the past 10 years are reflected in the organizational changes. The Threat Office has been reduced from a major division to a small cell within the Force Development and Analysis (FDA) Division. DCD is no longer re-



sponsible for major studies, yet it retains a small analysis cell in FDA. Work in logistics went from a 40+ person branch and several million dollars a year in contract support to now residing on a "will not do" list.

DCD currently retains a small Evaluation Branch in lieu of the previous Test and Evaluation Division. Back in the mid-80s, DCD devoted more manpower and dollars to tactical software than the entire DCD is expected to have in FY97. Without the tactical software expertise we had available at that time, the "Scudbusters" of Desert Storm would not have been a reality. The Software Division is now history. Only a few people work tactical software part-time, along with other duties, in our Weapons Requirements Division. The former Organization Division has been replaced by a small cell in FDA. The Air Defense Lab, a new organization created "out of hide," focuses on the up-front portion of combat developments associated with the battle laboratory process.

The Fort Bliss Warfighting Center is a restructure of previous organizations' modeling, simulation and simulator cells. DCD's viability (now and in FY97) depends on other people's money, particularly to maintain on-board civilian expertise. Combat developers, asked to "do more with less," have done exactly that. However, the viability of the FY98 organization is highly questionable due to a lack of commitments, as of this writing, to retain the infrastructure required to accomplish the current mission.

The resulting organization was developed with a desire on the part of both the commanding general and DCD leadership to streamline the organization, foster a more creative and efficient environment and empower personnel. The process DCD has gone through to capitalize on the downsizing has included the establishment of a shared vision within DCD. We established a review and analysis process to ensure all employees are oriented to a common set of goals. This process continually assesses our progress on meeting those goals and synchronizing our efforts and schedules.

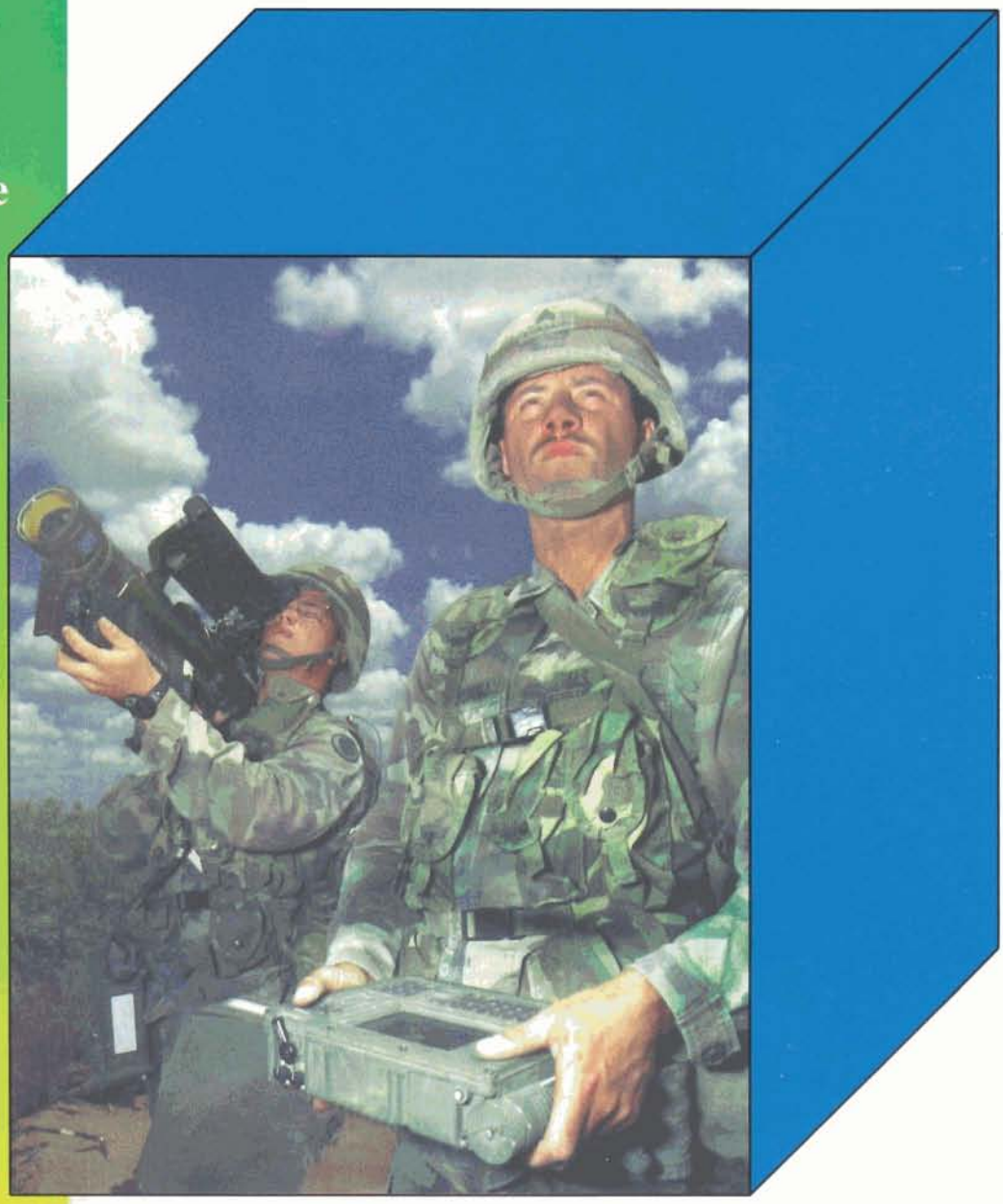
The uncertain future of combat developments for air and missile defense is in the hands of Army leadership at echelons above Fort Bliss. The one thing that is certain is that most, if not all, combat developments functions currently performed at Fort Bliss in support of modernization are absolutely essential to meet the national priorities and challenge for air and missile defense. Commandants agree that combat developments must be resourced adequately, or the proponent commandant will lose his ability to carry out his mission.

Costello has taken the initiative to bring the resource and workload issue to the attention of the Army leadership and has offered a number of options for issue resolution. Decisions made this calendar year will undoubtedly impact the future of combat developments and, in turn, the future of the Army's air and missile defense capability.

Capt. Christopher C. Corbett is an OAC student at Fort Bliss. His follow-on assignment is 108th ADA Brigade, Fort Bliss. Hank Tarkowski, DCD's Deputy Director, served as technical advisor.

The Master Plan

Air Defense Artillery draws a blueprint for air and missile defense

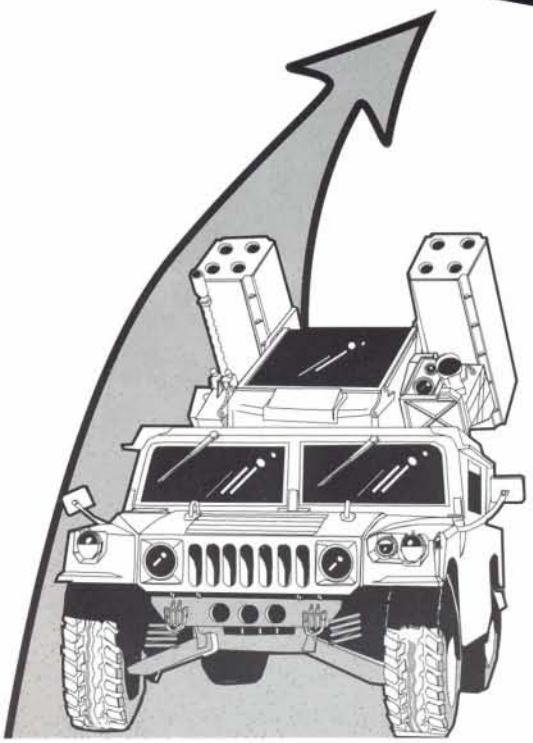


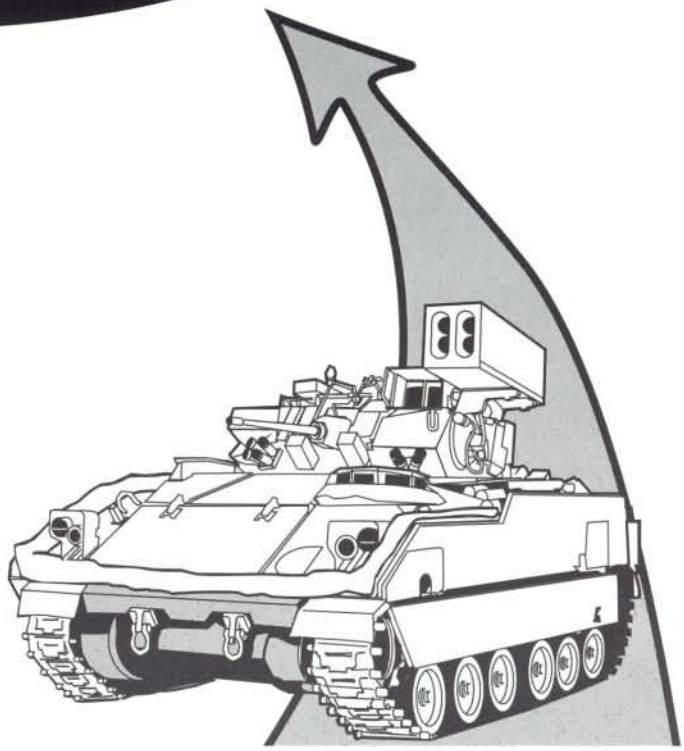
Stinger missile improvements will help air defenders overmatch the 21st century air threat

by Capt. David M. Partridge and Dan Silva

The Air and Missile Defense Master Plan focuses air and missile defense modernization and the air and missile defense strategy to overmatch evolving, worldwide aerial threats. In the scope of this discussion of the Master Plan it is important to understand why we, as air defenders, require a master plan. Force modernization is driven by current and projected threat forces. This holds true in the ADA perspective of aerial threats. Current and required ADA capabilities to overmatch the threat

Short Range Air Defense for the 21st Century





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of the future drive modernization requirements. The Master Plan will focus Army science and technology, battle labs, future weapons development, the Department of the Army and the U.S. Army Training and Doctrine Command (TRADOC) to ensure the branch vision becomes a reality.

In the early 1990s, the U.S. Army Air Defense Artillery School (USAADASCH), Fort Bliss, Texas, in conjunction with the Program Executive Officer Air Defense and Headquarters, Department of the Army, produced an Air Defense Modernization Plan that, along with the other branch plans, defined the overall Army Modernization Plan. However, the Army Modernization Plan presents the overall view of material modernization and does not contain enough detail to provide guidance to the air defense acquisition community.

At the initiative of the school's Directorate of Combat Developments, meetings in 1995 with Maj. Gen. John Costello, Chief of Air Defense Artillery; Brig. Gen. Richard A. Black, Program Executive Officer Missile Defense; and George G. Williams, Program Executive Officer Tactical Missiles; generated the decision to establish the Air and Missile Defense Master Plan.

The Master Plan process provides a forum for coordination among the key ADA planners to modernization. The written plan, scheduled for publication on Sept. 20, 1996, will harmonize the various combat and materiel development efforts. It will tie together Costello's vision, Army modernization planning, battle lab efforts and the Army Science and Technology Master Plan from an air and missile defense perspective. The end result of the process is to produce a Master Plan that serves as the solitary authoritative source document for ADA modernization. This document will present to the Department of the Army, ADA leaders, government agencies and Department of Defense contractors the long-range air and missile defense modernization strategy as voiced by the ADA community.

Management of the Master Plan resides with three committees: the Working Group, the Executive Committee and the General Officers Steering Committee. The Working Group drafts and coordinates the document and implements changes. The Executive Committee (colonel level) guides and makes recommendations to the Working Group. The General Officer Steering Committee provides direction and approves the Master Plan. The final content of the Master Plan will address every facet of ADA modernization.

The "Executive Summary" will provide the reader an overview of the Master Plan. It will contain the purpose, methodology, conclusions and recommendations.

The "Threat" chapter will lay out the air threat to current and future forward ground forces and rear assets by threat type and proliferation. This chapter draws the reader a vivid picture of the current and future air threat to the force.

The "Warfighting Concept" chapter will discuss how Air Defense Artillery will fight under the Force XXI concept and explain the capabilities it will need to accomplish the Force XXI mission. Force protection and information dominance will be Air Defense Artillery's principle missions.

"Army/Air and Missile Defense Initiatives" will show the work ADA battle labs have done in terms of initiatives and required technology to modernize the ADA force. Other initiatives, such as the functional area assessment, Mountaintop and Aerostat experiments and doctrine, will appear here.

"Research, Development and Acquisition Modernization Strategy" will present a system-by-system direction of current modernization programs, giving commanders and users a clear picture of future capabilities and modifications. System modernization will be related to operational requirements as defined in the warfighting concept.

The "Capabilities Assessment" will show the current assessment of required capabilities for countering each of the threats as defined in the Warfighting Concept portion of the Master Plan. The "red, amber, green" methodology will show the systems' ability to counter the threat. This chapter will also identify prioritized deficiencies for future modernization.

The "Conclusion" will summarize what the branch can and cannot do based on capabilities, thereby providing a prioritized recommendation for modernization of the air defense force.

The final Master Plan will address the full threat spectrum based on current intelligence, warfighting doctrine as defined in Force XXI and the way Air Defense Artillery will modernize to maintain an advantage over the evolving threat. Currently fielded air and missile defense systems provide a significant force protection capability; however, additional system capabilities are required to satisfy ADA vision requirements.

Capt. David M. Partridge is an OAC student at Fort Bliss. His follow-on assignment is Augsberg, Germany. Dan Silva, DCD's acting Priorities Branch chief, served as technical advisor.

MASTER PLAN BREAKDOWN

Chapter 1:	Executive Summary
Chapter 2:	Threat
Chapter 3:	Warfighting Concept
Chapter 4:	Army/AMD Initiatives
Chapter 5:	RDA Modernization Strategy
Chapter 6:	Capabilities Assessment
Chapter 7:	Conclusion

How Urgent is TMD?

National Commitment Remains Strong

by Capt. Frank Saffen and Maj. Dave Yancey

A Recurrent Nightmare

What if the Scud missiles that hit the U.S. Army barracks near Dhahran or fell on Tel Aviv in 1991 had carried chemical or biological warheads?

The answer is that the worst nightmare of Operation Desert Storm planners would have come true. This sums up the effectiveness of tactical ballistic missiles (TBMs). Even with conventional warheads, the psychological effect of the Scuds fired at Israel and into Saudi Arabia was explicitly evident. The technology and expertise to field a near-leakproof theater missile defense (TMD) system are at hand. The greatest danger is that the post-Gulf War urgency currently assigned to TMD programs will wane as the wail of Scud alerts still resounding from Riyadh, Dhahran and Tel Aviv fades away.

The joint TMD operational concept bases the defense against theater missiles on four mutually supporting pillars: passive defense, active defense, attack operations and command, control, communications,

computers and intelligence. Active defense operations provide protection by destroying TBMs in flight. Passive defense operations include multi-tiered defense in depth via multiple engagements using air, land and sea assets. The U.S. Army, led by the Air Defense Artillery branch, is working quickly toward making this requirement a reality.

Prior to the Gulf War the TBM threat received insufficient attention, largely because Cold War threat analysts suggested that Warsaw Pact TBMs were inaccurate and of little military significance. During the Gulf War, the United States found itself on the ragged edge of TBM defense capabilities. The United States was not comfortable with the Patriot Advanced Capabilities-2 (PAC-2) missiles rushed to the theater to counter the Iraqi threat. Patriot was not designed to defend broad areas against TBMs or to defeat unconventional warheads.

What is the situation today? Iraq let the TBM genie out of the bottle. They effectively illustrated the use of TBMs as a "poor man's air force" and the ability of a third-world nation to upgrade the capability of first-generation missiles. While still too inaccurate to have significant operational or tactical significance, TBMs targeted at geopolitical targets (population centers) and the threat of chemical warheads pose a significant psychological threat and promise to be a threat to U.S. and coalition forces involved in future conflicts.

The Missile Defense Act published in 1991 ordered the aggressive development and deployment of advanced TMD systems by the mid-1990s. These systems must be able to rapidly relocate and cover forward-deployed and expeditionary elements of the armed forces. This prompted the Department of Defense to issue a joint mission need statement to the TMD community: "The mission is to protect U.S. forces, U.S. allies, other important countries and areas of vital interest to the United States from theater missile attacks."

The requirement to protect the force and vital assets during entry operations is of key importance. Force projection doctrine states that forces are most vulnerable during entry operations into the lodgment area, and protecting the force will be critical to success. This vulnerability is even more acute when the projected threat environment includes weapons of mass destruction. Therefore, the need exists to have adequate protection over the entire lodgment area (air and sea ports of debarkation, command and control facilities, logistics bases and population centers) and as far forward as the maneuver units. Most vital assets, such as ports and critical airfields, must receive near-leakproof protection.

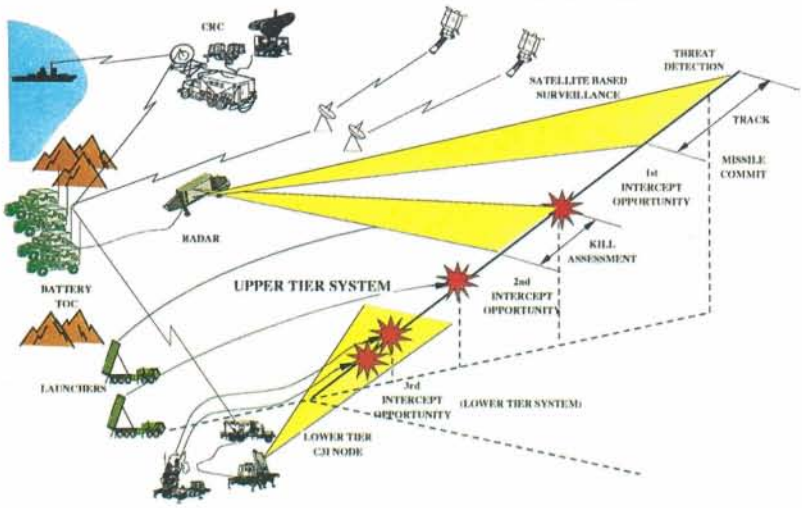
A wide variety of TBMs reside in the inventory of more than two dozen countries, half of which are known to export their missiles for profit. The weapons vary in ranges from about 70 to nearly 3,000 kilometers. All of them can carry chemical, biological or even nuclear warheads. The trend for the future is increasing numbers of the longer range missiles in the developing nations. Not only does this give the threat country a wider range of targets, but the longer range TBMs are harder to intercept due to greater velocities. Accuracy will also improve with time. Improved command and control will allow synchronization for mass TBM attacks immediately preceding fighter aircraft interdiction.

Given the mission to defeat this threat as the driving factor for developmental consideration, the joint requirements operational ca-

The Army activated B/1-6 ADA, the first THAAD user operational evaluation system battery, on June 6, 1995, at Fort Bliss, Texas. A second THAAD UOES battery, A/1-6 ADA, was activated Feb. 23 of this year, also at Fort Bliss.

pability states that " . . . to negate potential warhead effects . . . active defenses must consist of several layers of TMD systems. A layered defense will provide multiple opportunities to negate the theater missiles with differing technology, increasing the probability of kill and prohibiting the enemy from being able to counter the defensive system with a single technique. . . ." The possibility that a TBM might deliver a weapon of mass destruction led to a desire for near-leakproof defense. The need for a near-term improvement promoted the strategy to build on Patriot as the cornerstone of TMD capability.

TMD OPERATIONAL CONCEPT



PAC-3 buys back lost battlespace against targets with a low radar cross section and increases the ground area a single fire unit can protect from a TBM attack. Recent improvements have taken the Patriot system close to its cost-effective limit — further advances would virtually rebuild the whole system. Within anticipated technology, PAC-3 is "all Patriot can be," but this improved, greatly enhanced version will still only cover the lower tier of the TMD battlespace. The PAC-3's lethal battlespace upper limit is defined by the physical ability of the missile to maneuver in thin air and its lower limit is derived by the desire to keep out weapons of mass destruction. TBMs will remain in this region from three to 10 seconds — enough time to get a two-shot salvo on most of the target set. We need more shots to achieve the desired high probability of kill. Faster targets and weapons of mass destruction demand additional battlespace. Extended battlespace requires new sensors to see farther and a new missile to reach higher. Greater improvements in both would not be cost-effective for Patriot. Therefore, a second system is necessary.

The Theater High-Altitude Area Defense (THAAD) system will defend the upper tier of the TMD battlespace. It will integrate with joint theater architecture and complement the lower tier systems to provide near-leakproof, wide area defense of strategic-, theater- and corps-level assets. THAAD complements Patriot. Without two systems, near-leakproof protection will be too costly. A single-shot system with that kind of capability would cost a tremendous amount to develop and produce. The two-system trade-off builds off the Patriot investment and provides near-leakproof protection at reasonable cost. It affords THAAD the opportunity for multiple shots and evaluation in the upper battlespace, then hands off the target to Patriot for an additional salvo if THAAD fails. Finally, it provides operational flexibility against the entire threat set. The union of the two systems covers the full spectrum of the threat inventory of TBMs. PAC-3 covers the lower 80 percent while THAAD defends against all the longer range weapons, up to the definition of medium-range ballistic missiles as defined by international treaty. The overlap in capability covers more than 75 percent of all the threat inventory.

The two-tier concept calls for two THAAD battalions to stand up and integrate with the current echelon above corps Patriot battalions. Two battalions will sufficiently support two simultaneous major regional conflicts. The THAAD battalion will consist of four firing batteries. Each firing battery has one battery tactical operations center, a radar and nine launchers. THAAD fights as a battery and will have a TBM coverage of approximately 100 kilometers.

The theater commander will have an effective air and missile defense task force (AMD-TF) at his disposal. The AMD-TF is made up of an upper tier (THAAD) battery and a lower tier (PAC-3) battalion. With this AMD-TF the theater commander can cover all his assets with the single THAAD battery, providing broad area TBM coverage with incidental coverage of surrounding population areas. Under the THAAD umbrella, the Patriot batteries will provide near-leakproof defense of critical assets from TBMs and or threat aircraft.

Desert Storm opened our eyes to the threat potential of theater missiles. Air Defense Artillery has used the national urgency placed on TMD to leverage the two-system solution of air defense to provide the needed degree of protection for Force XXI. Whether in the lodgment area during entry operations or for force protection in a mature theater, Air Defense Artillery will be there first, and once again, be First to Fire!

Capt. Frank R. Saffen is an OAC student at Fort Bliss. His follow-on assignment is with the 35th ADA Brigade at Fort Lewis, Wash. Capt. Dave Yancey, DCD's Theater Missile Defense Branch Chief, served as technical advisor.

The

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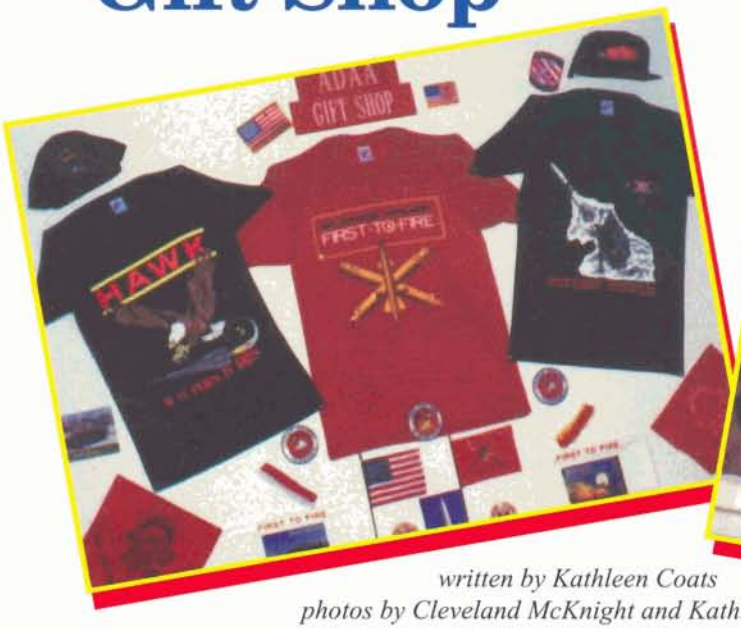
Air Defense Artillery Association Gift Shop



written by Kathleen Coats
photos by Cleveland McKnight and Kathleen Coats

Did you ever need a going-away gift in a hurry — one with real meaning for the recipient? Have you ever wanted to advertise that you're a member of the ADA team — by wearing the colors proudly? How about finding a way to promote esprit de corps within your unit?

Well, you can, and thanks to the Air Defense Artillery Association, it's easier than you think. The association provides air defenders with their own company store — the ADA Association Gift Shop. Unselfishly supported by many volunteers and excellently managed by Mrs. Rusty Frazier, the gift shop is loaded with specially designed logo items ranging from ADA branch insignia to specific ADA weapon systems. Items depicting and documenting ADA's history and evolution are also available.

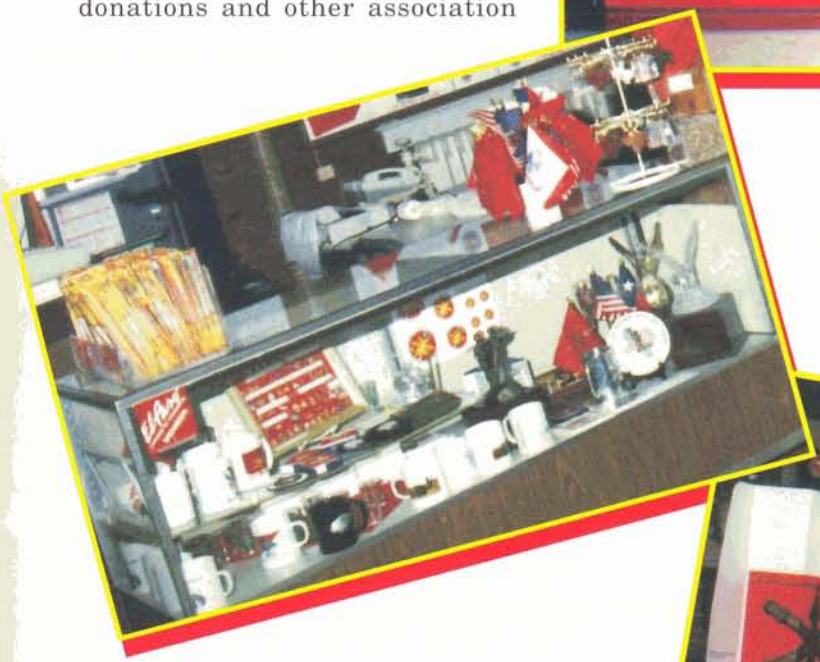
The inventory includes items that could outfit a ball team — such as T-shirts, sweatshirts, baseball caps and patches — or decorate an office with statues, plaques, pen sets, letter openers, bookmarks, paperweights and posters. However, your show of pride need not be left in the office. Many items may be displayed and used in the home, such as limited edition prints, brass door knockers, pewter beer mugs, coffee mugs, spoons and playing cards. You can complete your wardrobe with the ever-popular ADA belt buckle, tie, suspenders and a hat pin, or snooze to your heart's content in a "First To Fire" nightshirt. Display your pride from coast to coast with an ADA

sunshade, complete with bumper sticker, or purchase an ADA license plate holder.

Located in the ADA Museum building at Fort Bliss, Texas, the store hours are from 10 a.m. to 4 p.m., seven days a week. For more information, call (915) 564-4331 or write to: ADA Association Gift Shop, Building 5000, Pleasanton Road, Fort Bliss, Texas 79906.

Association membership, ADA Museum Capital Campaign donations and other association business should be directed to Mrs. Edith Fanning at (915) 568-2711.

The company store is just one of the advantages the ADA Association provides. So shop, support the association and show the world you're proud to be an air defender.



(3) Gift shop manager Rusty Frazier and volunteer Col. (Ret) John S. Rushing. (6) Gift shop assistant manager Dixie Oxley. (7) ADA Association secretary Edith Fanning. All items pictured on these two pages may be purchased at the ADA Association Gift Shop.

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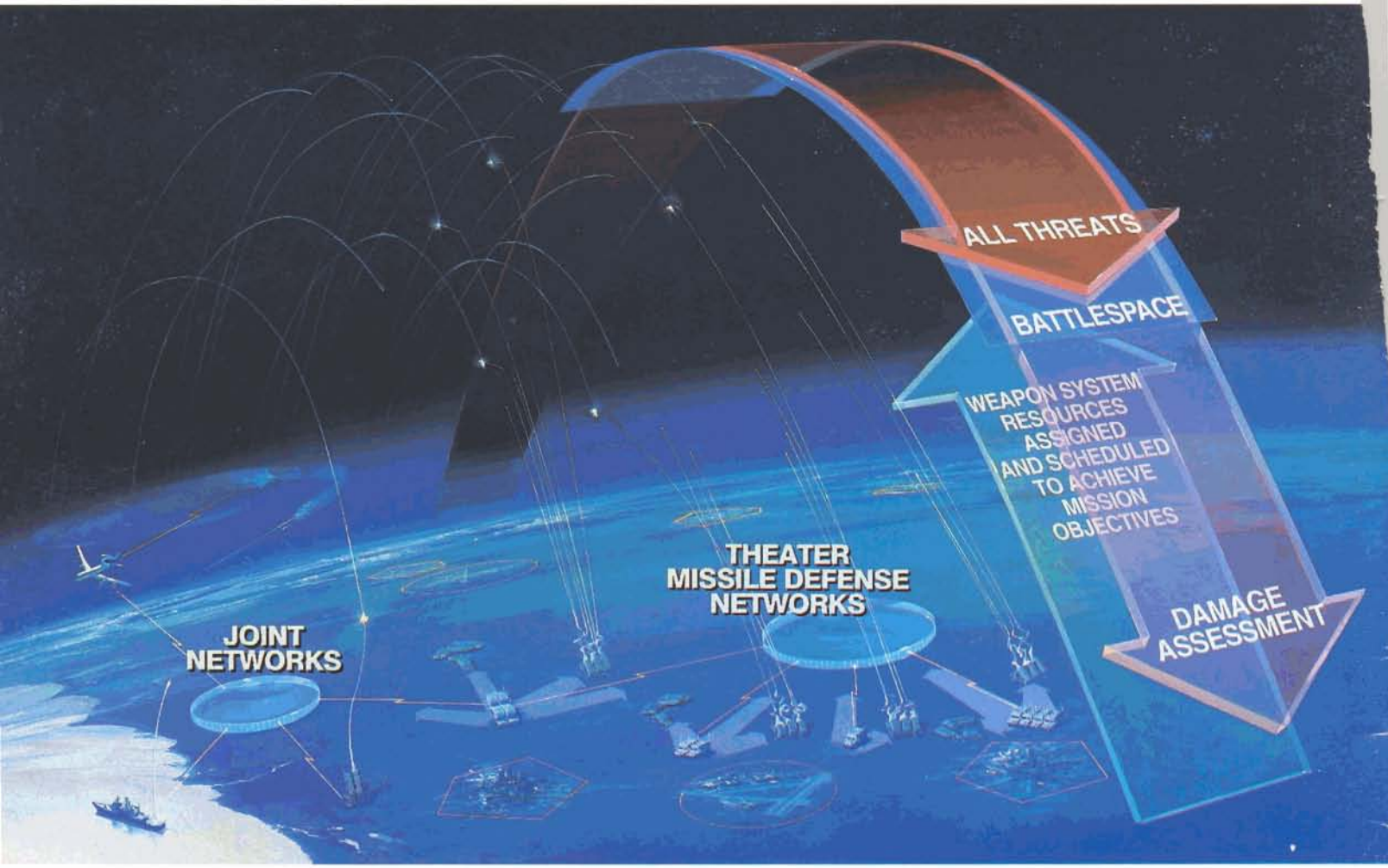

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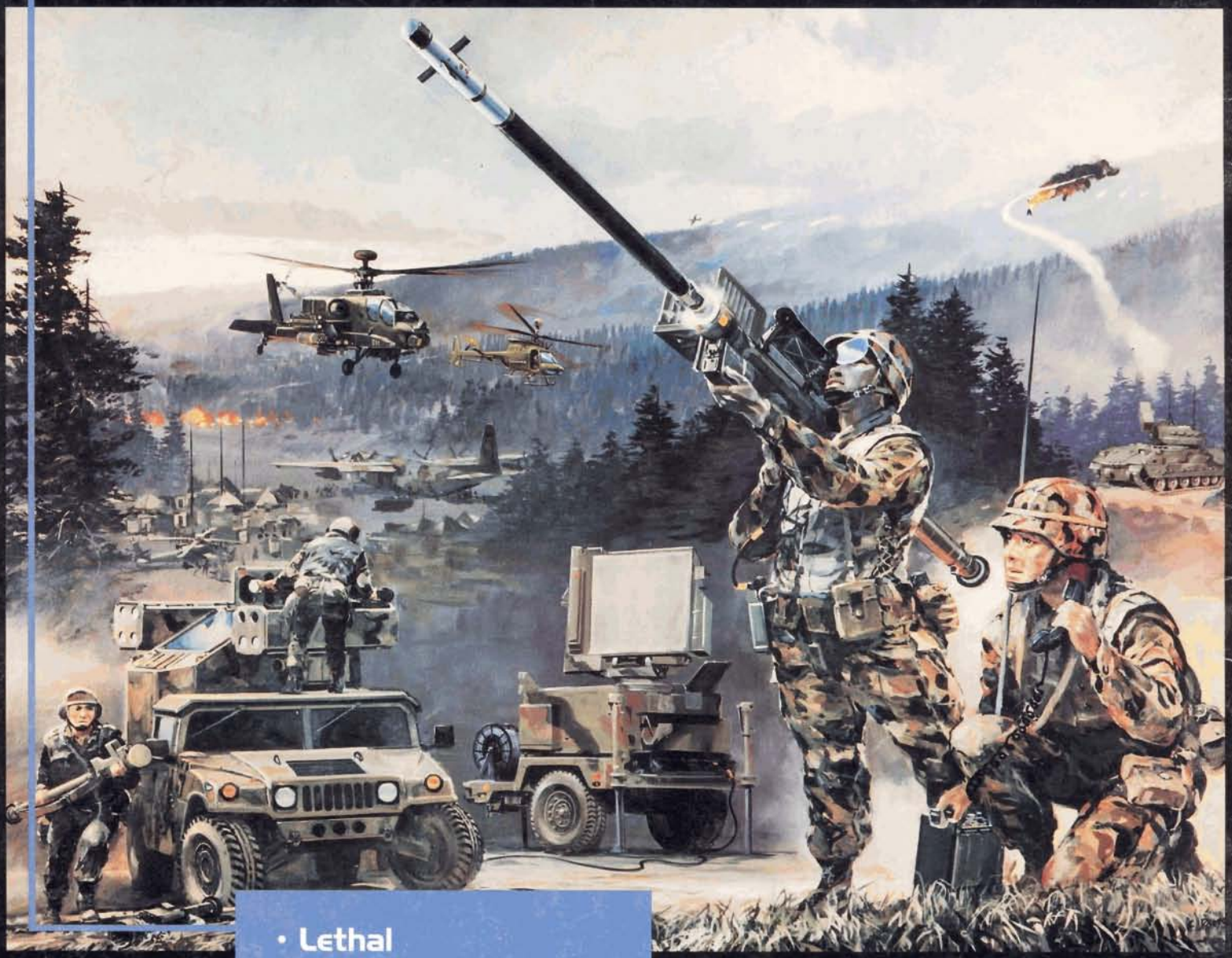

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