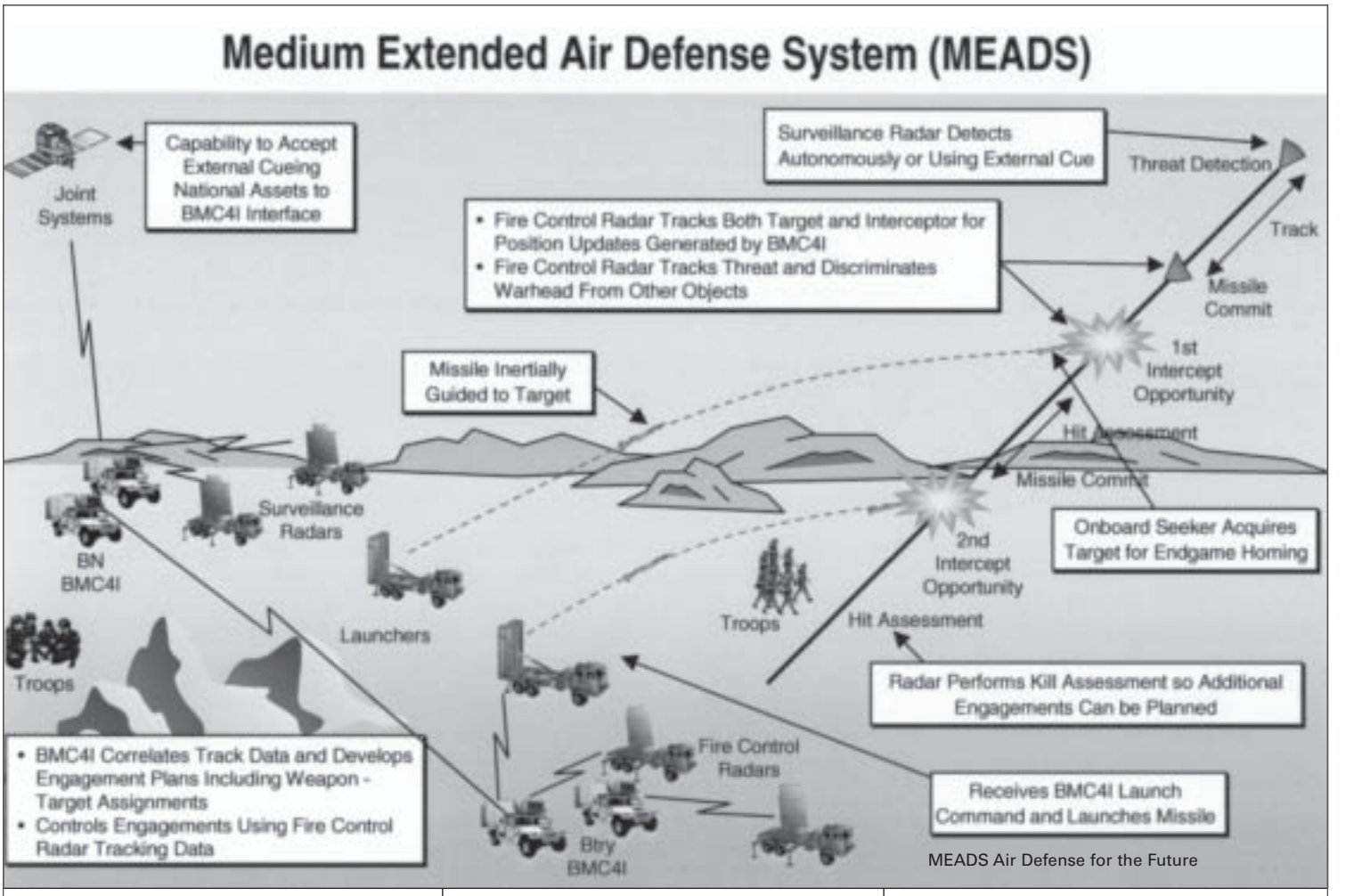
Medium Extended Air Defense System (MEADS) to Provide Strategic and Tactical Mobility to Future Force

MAJ James O. McClinnaham and Dr. Dennis G. Beeler

Designed to replace the Hawk and Patriot missile systems, MEADS is a highly mobile surface-to-air missile (SAM) system with numerous advantages over its predecessors. The system requires less manpower than either the Hawk or Patriot systems and can be rapidly deployed. MEADS' biggest advantage is its "plug and fight" flexibility — an engineered approach that allows the system to move with ground forces and interoperate with allied forces. MEADS is the air defense system for the Future Force.

The Patriot Advanced Capability-3 (PAC-3) missile is at the center of MEADS, the mobile air defense system replacing the Hawk and Patriot systems. Mounted on a wheeled vehicle, MEADS' modular design offers greater flexibility than the previous systems, enhancing protection for ground troops. (Photo courtesy of Lockheed Martin.)



MEADS Air Defense for the Future

In the late 1980s and early 1990s, the U.S. Army teamed with the U.S. Marine Corps (USMC) to identify a replacement for the aging Hawk air defense system, which had been in service since the early 1960s. In August 1990, the Joint Requirements Oversight Council (JROC) validated the need for a Corps air defense capability. The Defense Acquisition Board (DAB) approved the program to enter the concept definition phase. During this phase, an Operational Requirements Document was jointly developed and approved by the Army and USMC. Concept definition studies were initiated and conducted through contracts with British Aerospace Defense Limited, Hughes Aircraft Co., Lockheed Missile and Space Co., Loral-Vought Corp., Martin Marietta Co. and Raytheon Co. The studies, awarded in July 1992, concluded in February 1993 with each contractor submitting concepts for the Corps SAM system. The Army was designated the final approving authority for the Corps SAM by the JROC in September 1993. Also in 1993, the Secretary of Defense conducted a Bottom-Up Review that led to a program restructure. As a result, the program was delayed until FY98. In addition to approving entry into the concept definition phase, the DAB also required the project office to explore cooperative opportunities with allied countries. The Corps SAM/MEADS program was devoted to implementing a multinational co-development program that would fill the needs of member nations' air and missile defense forces. Eleven countries were contacted regarding the potential for international cooperation on the Corps SAM program.

> MEADS' biggest advantage is its "plug and fight" flexibility — an engineered approach that allows the system to move with ground forces and interoperate with allied forces.

In 1996 the United States, Germany and Italy signed a joint statement of intent and began the MEADS program project definition and validation phase. The program was officially renamed MEADS in 1996. A Memorandum of Understanding (MOU) established the MEADS program as an international co-development program where all three nations established operational requirements for selecting the

prime contractor and developing and producing the system. MEADS International, a trinational company, was selected as the prime contractor for the MEADS program. The MEADS concept was eventually developed as a Patriot replacement and the United States advocated using the Patriot Advanced Capability-3 (PAC-3) missile as a condition of continued participation.

In 2001, MEADS achieved a major milestone with the signing of the Risk Reduction Effort (RRE) phase contract.

> The SoS program calls for transformation to a network-centric capability that integrates all sensors, weapons and battle command.

The RRE objectives were to demonstrate the system concept's validity by:

- Incorporating the PAC-3 missile into the project.
- Reducing the overall technical schedule and cost risk for the MEADS program.
- Assessing critical technology areas.
- Developing an overall program plan for the design and development (D&D) phase.

In 2002, the DAB gave direction that MEADS, in cooperative development with Germany and Italy, would use the PAC-3 missile as its baseline interceptor. In April 2003, the DAB gave approval for the Army to pursue a combined program between Patriot and MEADS. This new plan addressed the evolution from the fielded Patriot Major End Items to a fully integrated MEADS capability. At the same time, the Army began moving toward implementation of the combined Patriot/MEADS program within a broader, system-of-systems (SoS) architecture for integrated air defense.

A successful DAB in 2004 established the funding required and gave approval for the program to enter the D&D phase. The MOU is now in national staffing and it is anticipated

MEADS Architecture on the Battleground

that it will be signed and a letter D&D contract will be awarded by end of FY04.

The SoS program calls for transformation to a network-centric capability that integrates all sensors, weapons and battle command. Implementation of SoS integration in the Future Force will reflect the culmination of ongoing system/component improvements, more effective capabilities and state-of-the-art technologies. They will be modular, more mobile, tailorable and interoperable with Army and Joint, Interagency and Multinational elements. The SoS program will use spiral development to accomplish the migration from stovepiped systems to SoS component-based architecture. Spiral development will involve fielding capabilities incrementally, closely aligned with the user's incremental timelines for required capabilities. The SoS program is designed to allow for work to be accomplished in support of each initial element simultaneously, while ensuring that each increment builds on the previous iteration.

The "battle manager" being developed is designed to interface with and control Surface Launched Advanced Medium Range Air-to-Air Missiles, Joint Land Attack Cruise Missile Defense Elevated Netted Sensor and Joint sensors and shooters.

Strategic and Tactical Mobility

MEADS, a highly mobile SAM system, uses a multicanister launcher that is mounted on a wheeled vehicle from the Family of Medium Tactical Vehicles. Advanced radars will provide for 360-degree coverage and operate in highly stressing jamming environments. MEADS is strategically transportable and tactically mobile so it can be quickly uploaded and rapidly transported for deployment to the theater of operations and airlifted via C-130 and A400M aircraft with multiple missiles already loaded on mobile launchers.

A major advantage of deploying MEADS is its distributed architecture and modular components. This architecture will provide for increased survivability and flexibility of employment in a number of operational configurations to complement the unit of action. MEADS provides significantly increased firepower while greatly reducing the manpower and logistics requirements. With these characteristics, MEADS will have the capability to rapidly respond to a variety of crisis situations and satisfy the needs of Joint operational and tactical commanders.

MEADS is strategically transportable and tactically mobile so it can be uploaded quickly and rapidly transported for deployment to the theater of operations and airlifted via C-130 and A400M aircraft with multiple missiles already loaded on mobile launchers.

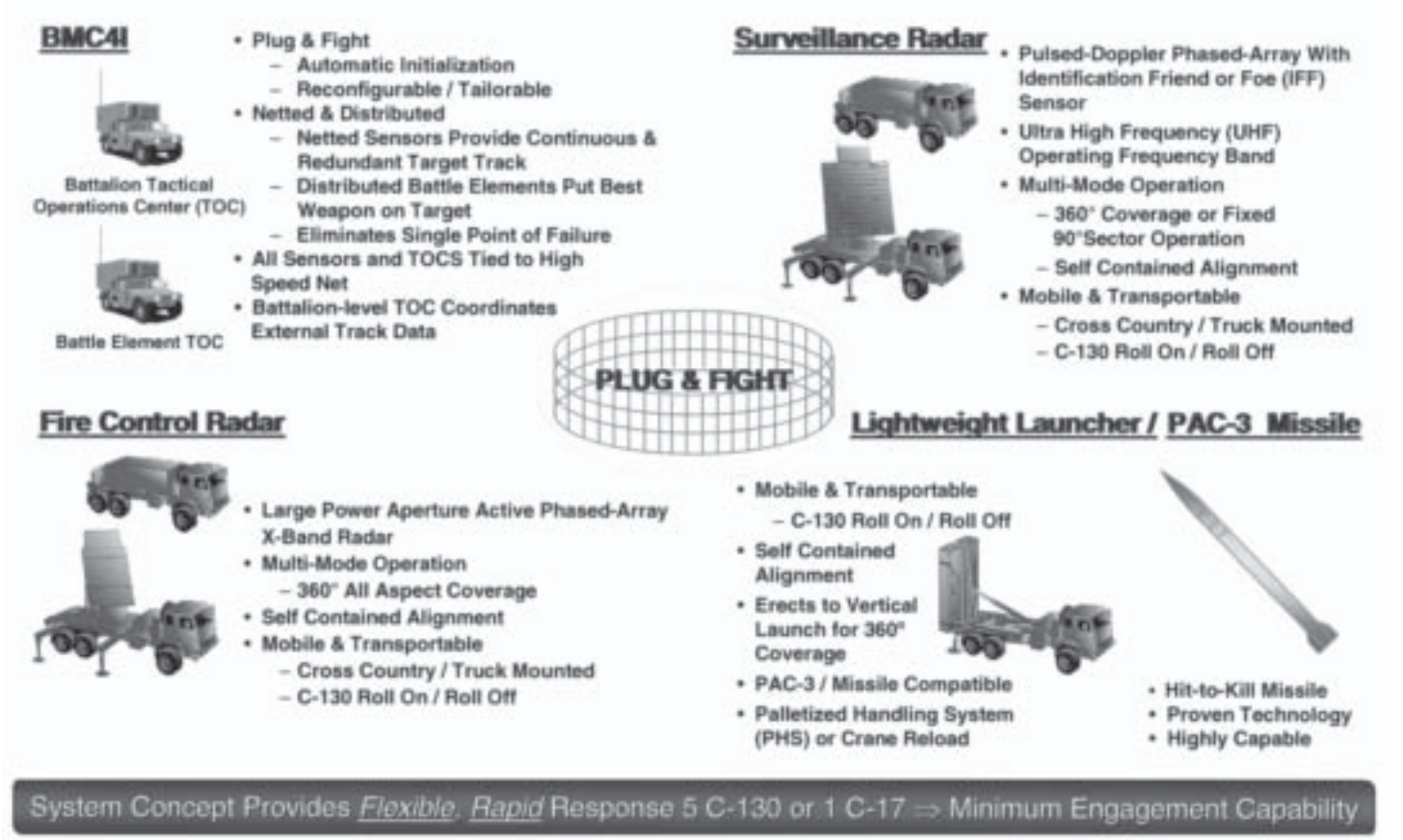
MEADS will be responsible for protecting maneuver forces and fixed installations against attack by current and next-generation tactical ballistic missiles, remotely piloted vehicles, maneuvering fixed-wing and rotary-wing aircraft, as well as low- and high-altitude cruise missiles. Once the system is deployed in the forward area, it will be able to move quickly to keep pace with fast maneuvering forces. MEADS is truly the next generation of air defense to "Support an Army at War."

MEADS' plug and fight flexibility allows the system to move with U.S. ground forces and interoperate with other allied forces. The netted and distributed battle manager will permit battle elements to join in or break off to protect the forces as they move. MEADS is able to command a fleet of distributed missile launchers while simultaneously detecting and tracking hostile enemy targets, and launchers can be located far away from ground radar and battle management units. Doing so reduces the risk of detection by enemy forces. It also permits launcher and missile command and control hand-over to another battle management unit while systems are being moved.

The PAC-3 hit-to-kill missile is being produced by Lockheed Martin Missiles and Fire Control for the Patriot Air Defense System that MEADS is intended to replace. This missile was first deployed during *Operation Iraqi Freedom* in 2003. The missile has a solid propellant rocket motor and uses an inertial guidance unit to direct it to the target area. During the missile's terminal phase of flight, it acquires and tracks the target with its forward-looking gimbaled active radio frequency Ka-band millimeter wave seeker.

Two new radars, a Surveillance Radar and a Multifunction Fire Control Radar, are also being developed for MEADS under a contract with MEADS International by Lockheed Martin Maritime Systems and Sensors, European Aeronautic Defence and Space (EADS) and Matra Bae Dynamics Aerospatiale (MBDA). Both of these new radars will use a common design for selected areas that will facilitate testing/validation and reduce total

MEADS Plug and Fight Flexibility



production costs for the two projects. The radars will also provide full 360-degree coverage capability.

A new lightweight launcher is being developed that comprises a prime mover, a prime mover adaptation kit, a palletized load handling/erection system, launcher electronics power generator, a missile blast deflector and launcher cabling. The launcher can handle either a 4-missile canister pack or individual single canisters. MEADS provides for critical asset protection, maneuver force protection and U.S., Germany and Italy homeland defense. The system provides supportability through the use of electronic technical manuals and kitted prognostics and diagnostics equipment.

MEADS will provide air and missile defense for vital corps and division assets associated with Army and USMC maneuver forces. MEADS will also provide forces with defense against multiple and simultaneous attacks by tactical ballistic missiles, stressing cruise missiles and other air breathing threats. MEADS will transform Army air defense systems and strategy, helping air defenders provide a dynamic, all-inclusive umbrella of protection for U.S. and allied ground forces.

MAJ JAMES O. MCCLINNAHAM is Assistant Program Manager for International Program Operations, U.S. MEADS National Product Office. He has a B.S. in business administration from Winston Salem State University and a master's degree in management from Florida Institute of Technology. He is Level III certified in contracting and Level II certified in program management.

DR. DENNIS G. BEELER is a systems engineer with CAS Inc. He has an A.A.S. degree in electrical technology from Odessa College, a B.A. in business from Columbia College, an M.S. in contract and acquisition management from Florida Institute of Technology and a Ph.D. in business administration from Century University.