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**Autor:** McLeod, Glenn  
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# The Medium Extended Air Defense System (MEADS)

MEADS (Medium Extended Air Defense System) ist ein gemeinsames Projekt von Deutschland, den USA und Italien und soll 2012, in Teilen sogar schon ab 2008 verfügbar sein. Anders als mit Patriot oder einem anderen bereits im Einsatz stehenden System können mit dem mobilen Luftverteidigungssystem MEADS taktische ballistische Lenkwaffen, Marschflugkörper, Drohnen (UAVs), Flugzeuge und weitere Träger von Massenvernichtungswaffen abgefangen und vernichtet werden. MEADS könnte auch für die Schweiz zu einem effizienten und zeitgemässen Abwehrsystem werden.

Heinz R. Jufer/A. St.

Glenn McLeod\*

## The MEADS Program

The Medium Extended Air Defence System (MEADS) program is the first transatlantic joint development of a highly complex weapon system on the basis of cutting-edge technology, and it will be a model joint program for future international cooperation. The program is being financed by the USA, Germany, and Italy. The companies in the individual countries are participating in the program with workshares corresponding to funding shares.

Two Transatlantic Industrial Entities (TAIEs) were formed to pursue the MEADS program in 1995. The TAIEs were Lockheed Martin with DASA-LFK, Siemens and Alenia Marconi as MEADS International; and the same European partners teamed with Raytheon Systems Company to form MEADS Incorporated. In October 1996, two US\$80 million contracts were placed with two TAIEs for the Project Definition/Validation (PD/V) phase by the NATO MEADS Management Agency (NAMEADSMA) located in Huntsville, Alabama. These contracts were completed in January 1999.

In 1999, NAMEADSMA down-selected to MEADS International. MEADS International, which is now composed of Lockheed Martin (USA), MBDA (Italy), and EADS Deutschland GmbH and Lenkflugkörpersysteme (Germany), to develop MEADS. The European companies coordinate their activities via euroMEADS GmbH, which together with Lockheed Martin forms MEADS International Inc.

In November 1999, NAMEADSMA and MEADS International signed a Transition Effort contract to initiate work on the MEADS system.

NAMEADSMA awarded a 32-1/2 month Risk Reduction Effort (RRE) contract to MEADS International in July 2001. Under the \$216 million contract, MEADS International is now investigating measures to reduce cost and development risks for critical elements. These efforts include assessment of technologies identified

in the Participating Countries' evolving air defense concepts, incorporating the hit-to-kill PAC-3 (Patriot Advanced Capability-3) missile into the design, and enhancing the system simulation.

The RRE program is due to culminate with a system demonstration in Rome in early 2004. Design and development is scheduled to begin in early 2004. MEADS is expected to achieve IOC in 2012, with fielding options as early as 2008.

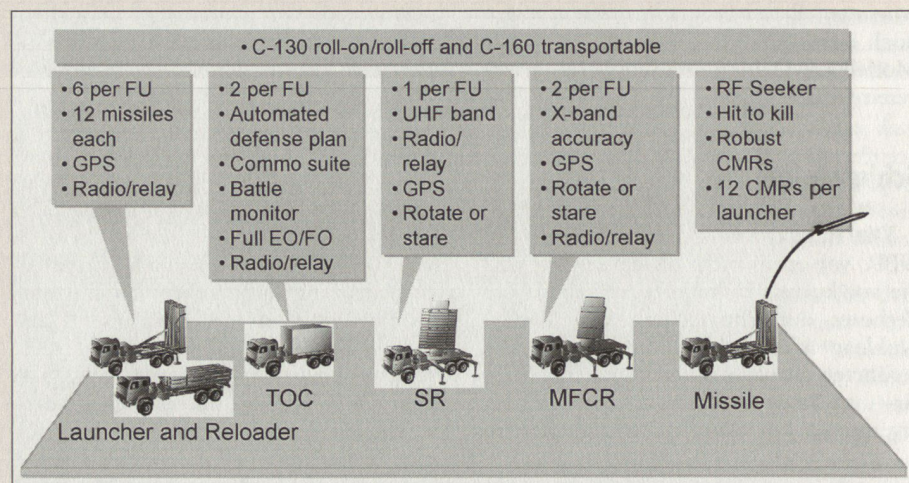
## The MEADS System

MEADS is a mobile air defense system designed to replace Patriot systems in the United States, HAWK systems in Germany and Nike systems in Italy. MEADS incorporates the hit-to-kill PAC-3 missile in a system that includes surveillance and fire control sensors, battle management/communication centers, and high-firepower launchers. The system will combine superior battlefield protection with unprecedented flexibility and mobility, allowing it to perform missions including maneuver force protection and homeland defense against next-generation tactical ballistic missiles, low- and high-altitude cruise missiles, unmanned aerial vehicles, and fixed and rotary wing aircraft.

MEADS will provide capabilities

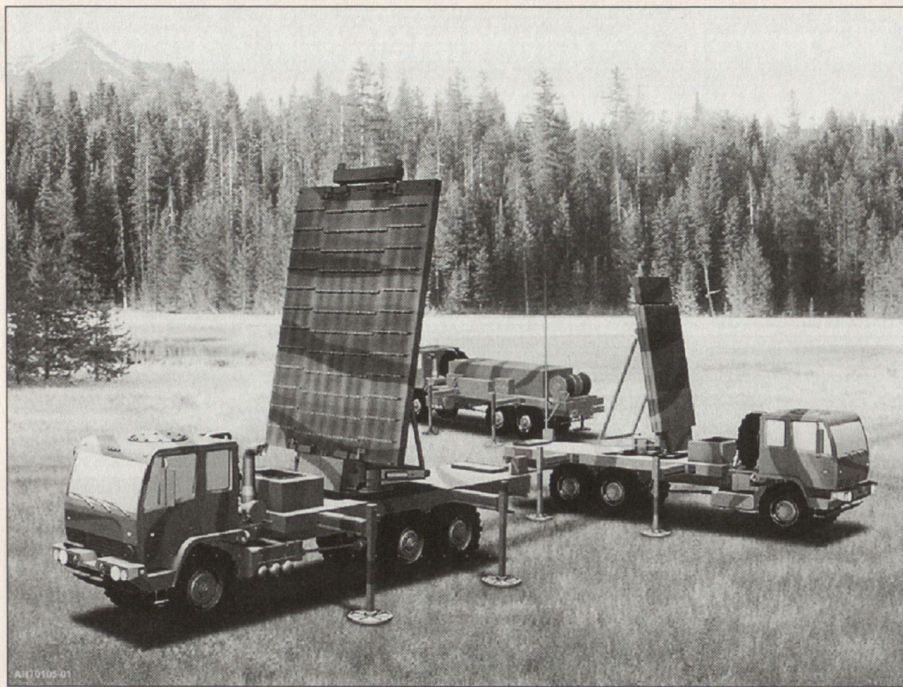
beyond any other fielded or planned air and missile defense system. It is easily deployed to a theater of operations and, once there, will keep pace with fast-moving maneuver forces. Netted and distributed battle management command, control, communications, computers, and intelligence (BM/C4I) will permit battle elements to seamlessly mesh with maneuver forces and higher echelon air component commands. MEADS' state-of-the-art sensor technologies enable total situational awareness and incorporate external sensor data for an integrated picture of the third dimension. Its open system architecture will establish the baseline for 21<sup>st</sup> century air defense systems and permit flexible tailoring of battle elements from early-entry minimum configurations up to multiple-fire-unit battalions for homeland defense or defense of maneuver forces.

The system will be compatible and interoperable with other air defense systems, will interface with joint and allied sensors and BM/C4I networks, or can operate autonomously. In the U.S., a MEADS battalion will consist of three firing batteries and a headquarters battery. Each battery will have six launchers controlled by a battery tactical operations center. Two X-band Multifunctional Fire Control Radars (MFCRs) and one UHF Surveillance Radar are intrinsic to the MEADS standard fire unit. The design approach adopted for MEADS emphasizes maximum performance of the Surveillance Radar to place lower demands on the MFCR. Both types are pulse-Doppler radars employing active phased-array antennas with adaptive digital beam forming. In contrast to the 90-degree sector capability of Patriot, MEADS antennas will rotate and provide 360-degree coverage with the operational capability to stop and "stare" at a specific location or sector as the mission dictates.



Easily deployed to the conflict, MEADS is designed to keep pace with fast-moving maneuver forces.





A standard MEADS fire unit incorporates two X-band MFCRs and one UHF Surveillance Radar.

The networked and distributed architecture being adopted for MEADS is fundamentally different from that of its predecessors. A "plug and fight" capability allows individual elements to be inserted as missions and threat dictate. MEADS major end items, Tactical Operations Centers (TOCs), radars, and/or launchers can be added or deleted to optimize the defense with minimal equipment and force structure. MEADS' plug-and-fight capability and comprehensive interoperability requirement will provide MEADS with the capability to command and control all the allied air defenses supporting an operation or theater.

MEADS will use multiple communications paths for robustness against jamming and to assure connectivity while maneuvering or when dispersed over a wide area.

The proven PAC-3 hit-to-kill missile is

the state-of-the-art technology for countering tactical ballistic missiles and is armed with a lethality-enhancing warhead for use against air-breathing targets. The missile combines standard aerodynamic control surfaces and multiple single-shot thrusters to achieve the very agile high-g maneuvers required for precise hit-to-kill. In the terminal phase of flight, the missile acquires and tracks the target with its forward-looking gimbaled active RF seeker and is extremely difficult to jam, even with advanced cooperative mode jamming.

MEADS will be transportable by C-130/A400M (and heavy lift helicopters such as the CH-47 and CH-53), with most of its elements able to drive-on and -off the aircraft without extensive pre-preparation. Each MEADS fire unit has 60 ready missiles – compared with 18 for Improved Hawk, 32 for PAC-2 and 56 with a mixed PAC-2/ PAC-3 battery – yet requires only 50 personnel, including those performing support functions. MEADS will provide greater firepower with less manpower for dramatic savings in operation and support costs.

## Swiss Applications for MEADS

When fielded, MEADS will be the most flexible, interoperable, and capable air defense system in the world, including advanced capabilities which can be tailored to Switzerland's unique air defense needs.

Central among these is the MEADS plug-and-fight capability derived from the netted and distributed BMC4I architecture.

Switzerland currently has air defense sensors, missiles, and gun capabilities and may add to that inventory before the procurement and fielding of an advanced

ground-based air and missile defense system. MEADS' architecture and interfaces will enable integrating these air defense assets into a system that is optimized to satisfy Switzerland's national air and missile defense needs.

The terrain of Switzerland provides unique defense challenges, particularly for an air defense system. MEADS' open architecture and plug-and-fight capabilities allow the air defense force to be tailored to meet these challenges. MEADS does not have to be procured in fire unit sets. Switzerland can procure an optimal number of Tactical Operations Centers (TOCs), radars, and launchers/missiles to accommodate mission needs and incrementally increase components as required. Thus, Switzerland could determine the number of sensors required to provide early warning, the launchers/missiles needed to defend critical areas and assets, and the TOCs needed to command and control the integrated air defense system. MEADS flexible plug-and-fight capability offers tremendous operational and cost advantages over other existing and planned air defense systems.

However, it is hard to envision a scenario in which Switzerland would operate independently of its European neighbors. MEADS is being co-developed with the Europeans, and interoperability is a cornerstone of that development. The system will be produced in the U.S. and in Europe, will be fielded in Germany and Italy initially, and inevitably throughout Europe. MEADS interoperability will provide a netted defense for protecting the homelands of aligned nations and for equipment reconstitution in joint operations.

MEADS is uniquely capable across the entire threat spectrum. MEADS will counter everything from tactical ballistic missiles carrying weapons of mass destruction to the entire suite of air-breathing threats, including cruise missiles.

Additionally, MEADS' lower cost of operations is critical to accommodate a reduced force structure and operating budgets. Enhanced reliability, reduced maintenance costs, and significantly reduced manning requirements are critical design criteria that distinguish this U.S.-European co-developed air defense system.



MEADS incorporates the proven hit-to-kill PAC-3 missile, now in production.

\* Glenn McLeod, Business Development Director, MEADS International, Inc., Orlando, USA.