# Armored Systems Modernization Program

## —NBC support to the future

*By CPT Richard McKinney*

As the speed of the battlefield action increases, and more and more nations obtain the ability to employ NBC weapons on the battlefields of the world, the need for a truly integrated ground vehicle NBC protection system becomes more important. As the US Army prepares to build the next generation of combat vehicles, the NBC defense team at the US Army Tank Automotive Command (TACOM) is working to make that a reality.

A new family of combat vehicles is being developed under the direction of the Program Executive Office for Armored Systems Modernization (PEO-ASM). The ASM program is seeking to produce six new vehicles, based on two common chassis. The common heavy chassis will be the basis for the next main battle tank, dubbed the Block III Tank, the Future Infantry Fighting Vehicle (FIFV), the Advanced Field Artillery System (AFAS), and the Combat Mobility Vehicle (CMV). A smaller Common Medium chassis will support the Future Armored Resupply Vehicle–Ammunition (FARV-A) and the Line of Sight Anti-Tank System (LOSAT).

The lead system for the ASM family will be the Block III Tank. To support the development of the advanced components of the chassis, a Component Advanced Technology Test Bed (CATTB) will be built, in two phases. The first chassis is presently being built in the TACOM Research, Development, and Engineering Center's Fabrication Shop. Following the demonstration of the components of the CATTB, two common chassis advanced technology transition demonstrators will be built, one by each of the contractors.

If these systems are to operate on a truly integrated battlefield, advanced NBC capabilities need to be planned in from the very start, rather than adding on later. To support the integration of advanced NBC survivability into these systems, the TACOM NBC Team has been working on the ASM project from the very start.

A full suite of state-of-the-art chemical and nuclear detection will be built in to the system. The radiological monitoring will be handled by the AN/VDR-2. The AN/VDR-2 is an auto-ranging beta and gamma meter, capable of providing both dose rate and total dose information. It can be preset for a known shielding factor, thereby eliminating the requirement to send a crew member outside to calculate a correlation factor. Not only is this safer for the crew, but it also supports the fluid style called for by AirLand Battle. Chemical detection will be handled by the XM-22 Advanced Chemical Agent Detector (ACADA). The ACADA is an electronic detector that uses ion mobility spectroscopy to detect nerve, blood, and blister agents. Because anything mounted outside the vehicle may not live long, the ACADA will be inside the vehicle. But knowing if agents are inside the vehicle is not enough. The ASM vehicles will have the ability to sample from the inside or outside of the vehicle by use of a sample transfer system (STS). The STS is being developed by CRDEC as part of the Multi-Purpose Integrated Chemical Agent Detector (MICAD) Program.

An environmental control system (ECS) will protect the crew from heat stress by providing temperature – and humidity–conditioned air to the crew. The air will be delivered to the crew protective masks and to micro-climate cooling vests worn under their uniforms. This approach, already in use on the M1A1 tank, prevents heat stress more effectively than air conditioning the whole crew compartment, and requires much less engine power to drive the ECS. Additional air, not required for the protective masks or micro-climate vests, is bulk discharged into the crew compartment.

In a crew compartment in which the leakage is controlled, the combined

mask, vest, and bulk flows create enough positive pressure inside to keep the agents from seeping into the vehicle. Although this results in a "shirt-sleeve" environment, current doctrine calls for wearing overgarments when in an NBC threat because the crew must be able to exit the vehicle quickly. However, the overpressure system allows the crew to operate without their masks on, unless entry/exit activities bring contamination into the vehicle.

The ECS will be combined with a new advanced chemical filter system, based either on pressure swing absorption (PSA) or on catalytic oxidation (CatOx) technologies. Both technologies offer effectively unlimited filter life, and are unaffected by light gases or possible filter penetrating agents. The current requirement for frequent filter changeout and resupply on the battlefield will be eliminated. Because the future battlefield will require long missions with extended waiting periods, the ASM heavy vehicles will have auxiliary power units (APUs) designed to minimize fuel consumption and vehicle signatures while powering the NBC/ECS and minimum vehicle systems.

The ASM vehicles will also produce their own smoke obscuration for self-defense. The smoke, launched from multiple grenade launchers, will provide 360-degree obscuration. Obscuration overhead is also provided, to protect against munitions attempting to attack the less-heavily armored top of the vehicle. Where the present family of smoke only screens in the visible spectrum, the ASM smoke will also screen in the infrared (thermal sight) and millimeter wave radar bands. Sensors will warn the crew when they are acquired with laser rangefinders, laser designators, and other types of missile guidance systems, so they can activate the smoke and take evasive action. The smoke system can also be set up to automatically activate under these kinds of threats.

To bring all these components and subsystems together is an integrated combat vehicle command and control system. The "brain" of the system is a computer system with terminals at each crew station. The "brain" is linked to all parts by an intelligent nerve system. This nerve system, called the standard Army vehicle electronics architecture (SAVA) is being developed by TACOM and a team of prominent corporations.

The SAVA system provides a two-way communication channel between intelligent systems in the vehicle. As an example, the ACADA tells the "brain" that it identifies an agent. The "brain" checks to see that the collective protection system is on, checks the pressure of the crew compartment, warns the crew, tells the STS to check the vehicle interior to make sure it is clean, asks the navigation system where it is, and formats an NBC1 report. It shows the report to the vehicle commander, asks for additional information, and sends the report to headquarters.

In theory, a battalion could conduct a radiological survey of its area in a matter of seconds. The battalion S3 electronically tells each vehicle to check the dose rate and report an NBC4, all without taking the crew away from their tasks. The navigation system provides line Q, the computer's clock provides line S, and the AN/VDR2 knows the interior dose rate, the correlation factor, and how to convert to an outside reading for line R.

With the "avoid" and "protect" legs of the NBC defense triad covered, we will not overlook the "decon" leg. As the contractors submit their designs, they will be evaluated by the TACOM NBC team on their compliance with contamination sur- vivability guidelines required by AR 70-71. This regulation Cspecifies that the system and its crew must be able to withstand an NBC environment, to include decontamination, without losing the ability to accomplish its mission. To evaluate the meeting of this requirement, we will look at materials and engineering design criteria to survive repeated contamination and decontamination cycles. (Remember that the most destructive agent on the NBC battlefield is DS2.) These criteria must be looked at from the system level, and at the component and subsystem level.

Just as the future battlefields will be fast and lethal, NBC decisionmaking must also be fast and accurate to support the battle. The ASM family NBC survivability systems will provide the information needed to make those decisions. The end product of TACOM's NBC effort will be vehicles that will allow the crew to concentrate on what they are there for—to fight.

***The TACOM NBC Team is lead by Mr. Gil Piesczak, a mechanical engineer, who was involved in the development of the M1A1 tank NBC system, and the procurement of the M93 FOX NBC reconnaissance system. Mr. Ross Case is a mechanical and chemical engineer, and is working on the survivability and smoke systems for the ASM program. Mr. Herb Dobbs is a mechanical and chemical engineer, and is working on integration of the ECU/APU and advanced filtration into ASM. Ms. Pam Waldrop is an electrical engineer, and is working on the ACADA and AN/VDR-2 interfaces, and their reporting through the command and control system. CPT Richard McKinney is a Chemical Corps officer assigned as NBC material management officer. He has experience as battalion and brigade chemical officer, smoke platoon leader, and chemical company commander. He is a graduate of the Chemical Officer Basic and Advanced courses, Combined Arms and Services Staff School, and the Command and General Staff Officer Course.***