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Fact Sheet for the Chairman, Legislation and National Security Subcommittee, Committee on Government Operations, House of Representatives

September 1991

CHEMICAL AND BIOLOGICAL WARFARE

Use of Collective Protection on Vehicles, Aircraft, and Ships

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National Security and
International Affairs Division

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September 5, 1991

The Honorable John Conyers, Jr.
Chairman, Legislation and National
Security Subcommittee
Committee on Government Operations
House of Representatives

Dear Mr. Chairman:

This fact sheet responds to your request for information on the military's efforts to protect personnel in combat vehicles, aircraft, and ships against chemical and biological warfare contamination. Specifically, we identified (1) congressional legislation and the Department of Defense (DOD) and service regulations that address collective protection devices that limit contamination,[1] (2) weapon systems within each service that were equipped with collective protection devices, and (3) where available, costs to equip weapon systems with these devices.

Results in Brief

Collective protection has gained the attention of Congress, DOD, and the services. The Congress twice directed the Army to report on its efforts to protect weapon systems with some form of collective protection. Moreover, the congressional requirement that the Navy develop programs to improve the survivability of combatant ships also led to a focus on collective protection. DOD and all the services have issued regulations requiring consideration of collective protection devices for weapon systems that may perform their missions in a chemical and biological warfare environment.

The Army has equipped 24 of its 40 existing armored systems with some type of collective protection; the Navy has equipped seven ships with various types of collective protection. Both the Army and the Navy plan to equip other systems in the future. The Air Force, however, has not equipped its aircraft with this protection because historically it has emphasized individual rather than collective protection.[2]

[1]Collective protection devices provide filtered air to an enclosed compartment of a weapon system. These devices can include (a) overpressure systems that provide filtered air to the entire crew compartment creating positive air pressure, thus prohibiting the entry of contaminants and enabling the crew to breathe normally without any additional gear; and (b) ventilated face pieces that provide filtered air to the crew through individual air hoses attached to a central filter unit.

[2]Individual protection equipment comprises a mask or hood with an individual or forced air respirator, such as a ventilated face piece, a battle dress overgarment, boots, and gloves.

Cost data for collective protection devices was only available for a limited number of weapon systems. The Army estimated that it costs about $47,000 to protect an Abrams M1A1 tank. Navy officials told us that it would cost about $200,000 to retrofit one section of most types of ships.

Legislation Focused Attention on Chemical and Biological Survivability

On several occasions, the Congress has directed the services to focus attention on their combat systems' chemical and biological survivability. The DOD Authorization Act for fiscal year 1978, Public Law 95-79, required the Secretary of the Army to submit to the House and Senate Armed Services Committees its plan for including collective protection on armored combat vehicles being developed or procured in fiscal year 1981. In response, the Army reviewed eight systems to determine which systems would benefit most from this protection. Of the eight systems, four received some type of protection, two received no protection, and two systems were canceled.

The DOD Authorization Act for fiscal year 1979, Public Law 95-485, required the Navy to develop plans and programs for the construction and deployment of combatant ships with an increased capacity for survivability. The Navy interpreted this requirement to include collective protection.

Most recently, the fiscal year 1991 Conference Report on Appropriations for the Department of Defense (H. R. Conf. Rep. 101-938) required the Army to review the requirements for nuclear, biological, and chemical protection on armored systems and report to the Congress by June 1991 on these requirements. The Army was instructed to provide its plans to meet these requirements. The Army reported that it had developed varying requirements for 53 current and future armored systems. These requirements were primarily based on the battlefield mission of each system. The Army also reported that its approach to meeting these requirements was a trade-off between cost, schedule, and available technology. Although the Army had initiated programs to enhance the nuclear, biological, and chemical protection of its systems, it concluded that its current armored systems were able to fight on a contaminated battlefield. Army officials told us that all armored systems could operate in a contaminated environment because the crew was protected by either collective protection devices or individual protective gear.

DOD and the Services Address Chemical and Biological Warfare

DOD and the services issued regulations that addressed the use of collective protection devices to prevent chemical and biological contamination. For example, to increase the chemical and biological survivability of its ships (in response to the DOD Authorization Act of fiscal year 1979), the Navy (1) issued Navy Instruction 9070.1, which addressed survivability requirements for most types of ships; (2) required collective protection on some new ships; (3) obtained cost estimates from contractors to retrofit some existing ships with collective protection; and (4) researched in-house development of less costly collective protection devices. Regulations were issued that stated that all systems that may perform their mission in a chemical and biological environment would include survivability features so that they could continue operations.[3] These regulations also required that the use of devices to minimize contamination be addressed during weapon systems' design and acquisition.

Army Equipped Most Vehicles With Protection Devices

Most Army combat vehicles have some type of collective protection device. The Army, in its 1978 report to the Congress, stated that on the basis of cost and mission most armored vehicles would benefit more from the ventilated face pieces than from overpressure devices. Consequently, (as appendix I shows) 23 of 40 existing systems are currently equipped with ventilated face pieces, but only two of these systems are equipped with overpressure devices. One additional system, the XM93 Fox Nuclear, Biological and Chemical Reconnaissance Vehicle, is equipped with an overpressure device, but does not have a ventilated face piece system.

When an overpressure system is combined with ventilated face pieces, the combination is called a hybrid system. All M1A1 tanks have a "total collective protection system," which consists of the hybrid system and air conditioning. Appendix II provides a diagram of the collective protection system on the M1A1 tank. Although the Fox vehicles do not have ventilated face pieces, the Army installed air conditioning in the vehicles prior to Operation Desert Storm.

At the time of our review, the Army planned to include overpressure collective protection on the (1) Block III Main Battle Tank, (2) Line of

[3]DOD and each service addressed collective protection in the following regulations: DOD Instruction 4245.13, Design and Acquisition of Nuclear, Biological, and Chemical Contamination Survivable Systems, June 1987; Army Regulation 70-71, Nuclear, Biological, and Chemical Contamination Survivability of Army Materiel, May 1984; Headquarters Air Force Statement of Operational Need 004-85, Sustained Operations in a Chemical/Biological Environment, Dec. 1986; and Office of Naval Operations Instruction S3400.10E, Chemical Warfare and Chemical, Biological, and Radiological Defense Policy, July 1991.

Sight Anti-Tank, (3) Future Infantry Fighting Vehicle, (4) Combat Mobility Vehicle, (5) Future Armored Resupply Vehicle-Ammunition, and (6) Advanced Field Artillery System as part of its armored system modernization program.

Navy Equipped a Few Ships With Protection Devices

The Navy requires that collective protection be included in all new ship designs. At the time of our review, the Navy anticipated that by 1995, 33 ships out of a fleet of about 450 ships would be covered by collective protection: including 15 destroyers, 14 amphibious ships, and 4 auxiliary replenishment ships. Appendix III provides a detailed description of these ships. Of the 33 ships, 6 amphibious ships and 1 destroyer were already in the fleet.

The Navy has three levels of collective protection. Level I protects living spaces for at least 40 percent of the crew and medical facilities; level II adds key operational spaces; and level III provides the maximum coverage that is practical.[4] Most ships have either level I protection or level I plus their combat information centers,[5] because their designs were essentially complete when the decision was made to include collective protection. The DDG-51 destroyer is the first ship to provide level III protection. Appendix IV provides a diagram of the DDG-51's collective protection coverage.

Although relatively few of the Navy's ships have collective protection devices, Navy officials told us that most Navy ships are equipped with features that help minimize contamination in a chemical or biological environment. These features include (1) ventilation fans and fittings (designated as "Circle William"), which can be shut down; (2) "water washdown systems," which cleanse the ships' exterior; and (3) airtight and watertight compartments, with separate ventilation systems on some.

The Navy is developing a collective protection system that would protect selected areas on existing ships. This system would maintain a contaminant-free environment in critical areas of a ship, providing a safe haven or protecting mission-essential spaces. The system is expected to

[4]According to the Navy, it is impractical to protect engine rooms and flight decks with collective protection.

[5]"Combat information center" refers to the section of a ship manned and equipped to collect and collate tactical information.

be fielded in mid-1994 and is a less expensive alternative to protecting an entire ship.

Air Force Did Not Equip Aircraft With Protection Devices

Air Force officials knew of no aircraft with collective protection and told us that no plans existed to include such devices on existing or future aircraft. These officials told us that the crew was protected inside the aircraft with individual protection garments and breathing apparatuses.

Costs to Equip Army and Navy Systems

Only limited information was available on the cost of collective protection devices in weapon systems. Production and installation costs to equip the M1A1 tank with collective protection were about $47,000 each. Navy officials estimated that equipment and installation costs to protect one section of an existing ship would cost about $200,000. Since the Navy anticipates protecting at least two sections per ship, each installation will be at least $400,000.

Army officials provided the following reasons for not being able to give us more definitive cost estimates on their systems. In many cases, the cost estimates for collective protection on combat vehicles were outdated. Regarding the Fox reconnaissance vehicle, the Army cannot differentiate the cost to protect the vehicle from other vehicle costs. Navy officials told us that costs to install collective protection devices on newly constructed ships were so enmeshed with other costs that they were difficult to identify.

Scope and Methodology

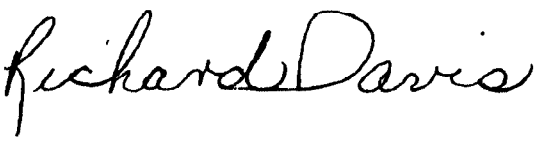
In performing our work, we interviewed officials of DOD's Office of the Assistant to the Secretary of Defense for Atomic Energy; the Army's Space and Special Weapons Office, Nuclear, Biological, and Chemical Division; Chemical Research, Development, and Engineering Center; Tank and Automotive Command; the Office of the Chief of Naval Operations; Naval Sea Systems Command; Office of the Assistant Secretary of the Air Force for Acquisition; and Wright-Patterson Air Force Base. We reviewed congressional legislation, DOD's and the services' regulations, and other documents related to chemical and biological defense and collective protection devices. We limited our review to: (1) Army combat vehicles, (2) aircraft only within the Air Force, and (3) all Navy ships.

We conducted our review between March and August 1991. Although we did not obtain written agency comments, we discussed a draft of the fact sheet with DOD officials and incorporated their comments as appropriate.

Unless you publicly announce its contents earlier, we plan no further distribution of this fact sheet until 7 days from its issue date. At that time, we will send copies to interested congressional committees; the Secretaries of Defense, the Army, the Navy, and the Air Force; and the Director, Office of Management and Budget. Copies will also be made available to others upon request.

Please contact me at (202) 275-4141 if you or your staff have any questions concerning this fact sheet. Appendix V provides a list of major contributors to the fact sheet.

Sincerely yours,

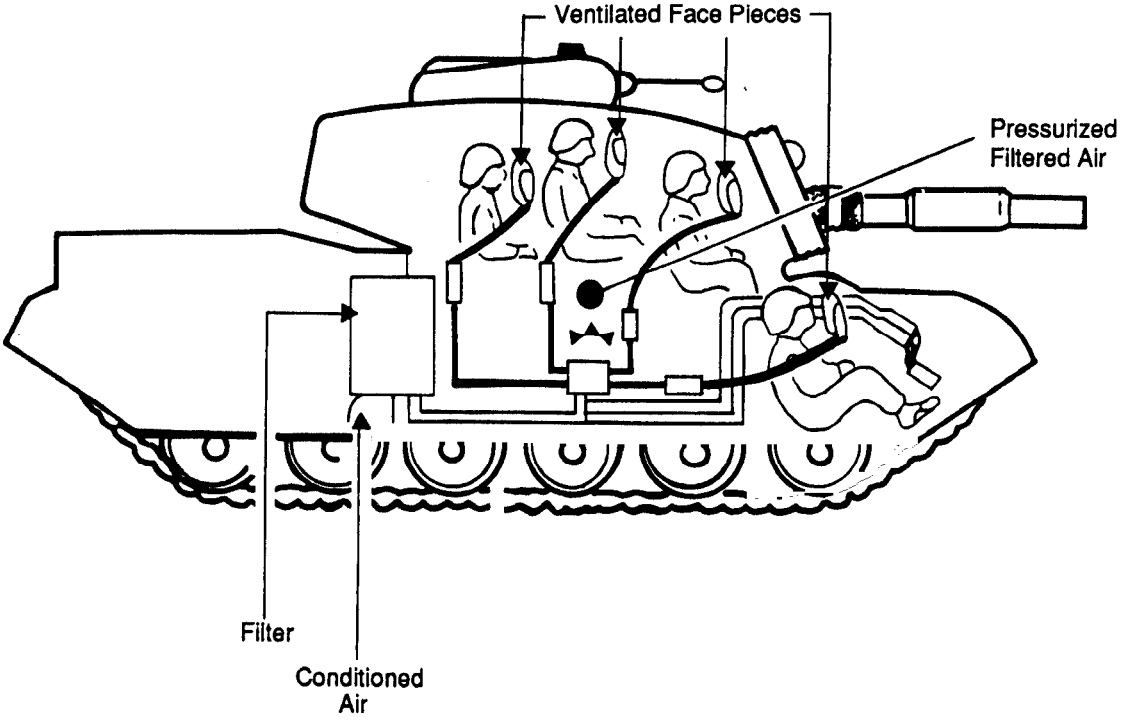


Richard Davis
Director, Army Issues

Army Combat Vehicles: Status of Collective Protection Devices

Vehicle		Ventilated face piece	Overpressure device	None
XM93	Fox Nuclear, Biological and Chemical Reconnaisance Vehicle		X	
M1	Abrams Tank	X		
M1P1	Abrams Tank	X		
M1A1	Abrams Tank	X	X	
M2	Bradley Fighting Vehicle			X
M3	Bradley Fighting Vehicle			X
M2A1	Bradley Fighting Vehicle	X		
M3A1	Bradley Fighting Vehicle	X		
M2A2	Bradley Fighting Vehicle	X		
M3A2	Bradley Fighting Vehicle	X		
M9	Armored Combat Earthmover	X		
M60A1	Armored Vehicle Launcher Bridge	X		
M60A1	Combat Tank	X		
M60A3	Combat Tank	X		
M88A1	Recovery Vehicle	X		
M106A1	107mm Mortar Carrier			X
M106A2	107mm Mortar Carrier			X
M109A2	Self-Propelled 155mm Howitzer			X
M109A3	Self-Propelled 155mm Howitzer			X
M109A4	Self-Propelled 155mm Howitzer	X		
M109A5	Self-Propelled 155mm Howitzer	X		
M110A2	Self-Propelled 8 inch Howitzer			X
M113A2	Armored Personnel Carrier			X
M113A3	Armored Personnel Carrier			X
M270	Multiple Launch Rocket System Launcher	X	X	
M548A1	Cargo Carrier			X
M551A1	Armored Reconnaisance Airborne Assault Vehicle	X		
M577A1	Command Post Carrier			X
M577A2	Command Post Carrier			X
M578	Light Recovery Vehicle	X		
M728	Combat Engineer Vehicle	X		
M730A1	Chapparal Missile Carrier	X		
M730A2	Chapparal Missile Carrier	X		
M741A1	Vulcan 20mm Carrier			X
M901A1	Improved Tube-launched, Optically-tracked, Wire-guided Missile Vehicle			X
M981	Fire Support Team Vehicle Combat Carrier	X		
M992	Field Artillery Ammunition Support Vehicle - 155mm	X		
M993	Multiple Launch Rocket System Carrier	X		
M1015A1	Electronic Shelter Carrier			X
M1059	Smoke Generator Carrier			X

Total Collective Protection System[1] for the M1A1 Abrams Tank



[1]This system includes ventilated face pieces, an overpressure system, and conditioned air.

Navy Ships Constructed With Collective Protection Systems (CPS)

Ship type	Status	Year to be delivered	CPS level[a]	Number of zones[d]
Amphibious Ships:				
LHA-3/USS Belleau Wood	in fleet	•	[b]	2
LHD-1/USS Wasp	in fleet	•	I	2
LHD-2/Essex	in construction	1992	I	2
LHD-3/Kearsage	in construction	1993	I	2
LHD-4/Boxer	in construction	1994	I	2
LSD-44/USS Gunston Hall	in fleet	•	I + CIC[c]	1
LSD-45/USS Comstock	in fleet	•	I + CIC	1
LSD-46/USS Tortuga	in fleet	•	I + CIC	1
LSD-47/USS Rushmore	in fleet	•	I + CIC	1
LSD-48/Ashland	in construction	1992	I + CIC	1
LSD-49/Harpers Ferry	in construction	1993	I + CIC	1
LSD-50	planned	1994	I + CIC	1
LSD-51	planned	1994	I + CIC	1
LSD-52	planned	1995	I + CIC	1
Destroyers:				
DDG-51/USS Arleigh Burke	in fleet	•	III	4
DDG-52/John Barry	in construction	1992	III	4
DDG-53/John Paul Jones	in construction	1992	III	4
DDG-54/Curtis Wilbur	in construction	1993	III	4
DDG-55/Stout	in construction	1993	III	4
DDG-56/John S. McCain	in construction	1993	III	4
DDG-57/Mitscher	in construction	1994	III	4
DDG-58/Laboon	in construction	1994	III	4
DDG-59/60/61	planned	1994	III	4
DDG-62/63/64/65	planned	1995	III	4
Auxiliary Replenishment Ships:				
AOE-6/Supply	in construction	1992	III	4
AOE-7/Paul Hamilton	in construction	1993	III	4
AOE-8	planned	1993	III	4
AOE-9	planned	1994	III	4

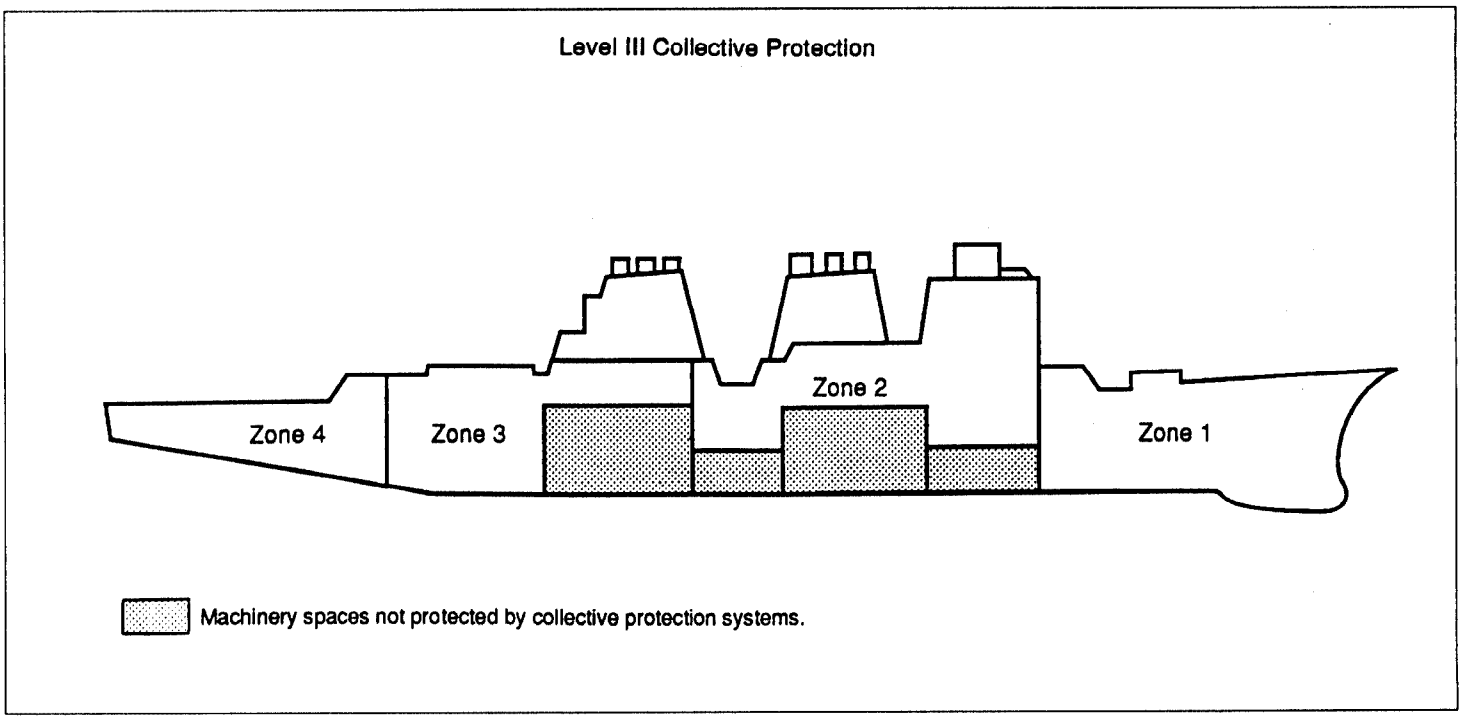
[a]Level I protects living spaces for at least 40 percent of the crew and provides medical facilities; level II adds key operational spaces; and level III provides the maximum coverage that is practical.

[b]The LHA-3's CPS does not fit any established CPS level.

[c]CIC - Combat Information Center

[d]"Number of zones" refers to protected sections of ships.

Pressure Zones Created by Collective Protection Systems Aboard the DDG-51 Arleigh Burke Class Destroyer



Note: Level III collective protection refers to the maximum coverage that is practical.

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