TECHNICAL REPORT
NATICK/TR-94/022

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FRONT END ANALYSIS OF ARMORED VEHICLE ALTERNATIVES FOR THE CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER

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June 1994

FINAL REPORT
January 1993 - September 1993

Approved for Public Release; Distribution Unlimited

UNITED STATES ARMY NATICK
RESEARCH, DEVELOPMENT AND ENGINEERING CENTER
NATICK, MASSACHUSETTS 01760-5000

ADVANCED SYSTEMS CONCEPTS DIRECTORATE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	June 1994	FINAL Jan 1993 - Sept 1993

4. TITLE AND SUBTITLE
Front End Analysis of Armored Vehicle Alternatives for the Chemically and Biologically Protected Shelter

5. FUNDING NUMBERS
2132040 36T-6T06
P665502 S19129
C DAAK60-93-C-0020

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Natick Research, Development and Engineering Center
Kansas St. ATTN: SATNC-AAC
Natick, MA 01760

8. PERFORMING ORGANIZATION REPORT NUMBER
NATICK/TR-94/022

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

With the increased mobility of the M1 Abrams and M2/M3 Bradley equipped heavy division, the ability of the Chemically and Biologically Protected Shelter (CBPS)--as presently configured--to keep pace with heavy armored divisions is questionable. To resolve this potential problem, an investigation of both tracked and wheeled armored replacement vehicles was conducted All of the moderately priced alternative vehicles will require fairly complex modifications to achieve the desired level of NBC performance. Among the heavy armored tracked vehicles, the BMY Universal Fire Direction Center Vehicle appears to be a viable alternative to the current CBPS vehicle. Likewise, the General Dynamics FOX NBCRS appears to be the most viable light armored wheeled vehicle alternative. One vehicle, the FMC Bradley XM4, is in a class by itself. The Bradley is, and will remain, the Army's primary armored personnel type vehicle well into the next century. Despite its high cost, the FMC Bradley XM4, with its proven NBC protection and ability to keep pace with a heavy division is clearly the best alternative vehicle for the CBPS.

14. SUBJECT TERMS
FRONT END ANALYSIS ARMORED VEHICLES
SHELTERS BATTLEFIELD CONDITIONS BATTALION AID STATION
ESS (ENVIRONMENTAL SUPPORT SYSTEM) CB PROTECTIVE TENT
CBPS (CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTERS)

15. NUMBER OF PAGES
41

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	SAR

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PREFACE

With the increased mobility of the M1 Abrams Tank, and the M2/M3 Bradley equipped heavy division, the ability of the Chemically and Biologically Protected Shelter (CBPS), as presently configured, to keep pace with heavy armored divisions is questionable. This effort was initiated to identify possible armored vehicles for the next generation CBPS. This effort was performed during the period from January 1993 to September 1993 under Project D429, Task 1781.

The authors wish to acknowledge the following companies for their cooperation in furnishing the combat vehicle data, photographs and specifications reproduced in this report: BMY Combat Systems; Cadillac Gage Textron; Diesel Division General Motors of Canada; FMC Corporation, Ground Systems Division; and General Dynamics, Land Systems Division.

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SUMMARY

While all of the vehicles investigated in this effort will require modifications for CBPS use, some will require more work than others. The Commando V150/300, the BISON, the FOX, the XM577A3, the Universal Carrier and the UFDCV all represent moderate cost alternative vehicles for CBPS ($ 500,000 - $ 1,300,000). All of these vehicles claim to have NBC overpressure capability, vehicle air conditioning, and sufficient capacity to handle the added weight of CBPS with suspension modifications. Other modifications required to accommodate the CBPS system include developing a soft shelter/vehicle interface, adapting the ESS if the vehicle system is unable to heat and cool both the vehicle and shelter, and some reconfiguration of the vehicle cargo area. After the required modifications, any of these vehicles could serve as an armored CBPS vehicle.

The huge interior space of the BMY UFDCV separates that vehicle from the other mid-priced candidates for CBPS. The additional space would permit more medical equipment to be in the CBPS package. Chassis commonality with the proven FAASV makes the UFDCV an attractive heavy armored candidate for CBPS. If the UFDCV's NBC protection, environmental control system, and engine meet the manufacturer's claims, the mid-priced UFDCV deserves serious consideration for CBPS use. Among the light armored wheeled vehicles, the FOX deserves serious consideration for CBPS, despite its high price tag, because of its proven NBC capabilities and superior maneuverability in water.

Finally, the FMC Bradley XM4 is in a class by itself. The Bradley is, and will remain, the Army's primary armored personnel type vehicle well into the next century. A faster, lighter, better protected Bradley is now being developed. The Bradley will require the same modifications as the other tracked vehicle CBPS candidates. Unlike the other tracked vehicles, however, the Bradley is the only vehicle capable of keeping pace with an M-1 equipped heavy division. The Bradley is also the most expensive tracked vehicle investigated with an estimated cost of $ 2,000,000 each depending on the equipment and quantity purchased

CHEMICALLY AND BIOLOGICALLY PROTECTED SHELTER

The Chemically and Biologically Protected Shelter (CBPS) will be a direct replacement for the M51 Chemically Protected Shelter System presently used by emergency medical units as a Battalion Aid Station (BAS). The CBPS will eliminate the excessive erection/striking time, insufficient floor space, lack of natural ventilation, outdated equipment, and non-availability of prime movers that make the M51 undesirable for use in the field. When operating as a BAS, the CBPS will be capable of being erected/struck up to three times a day.

The CBPS consists of a Lightweight Multipurpose Shelter (LMS) mounted on a dedicated High Mobility Multipurpose Wheeled Vehicle (HMMWV), Heavy HMMWV Variant (HHV), integrated to a 300 - square-foot air beam supported soft shelter, an environmental support system (ESS), a power support system (PSS), and a High Mobility Trailer. The CBPS provides room for four passengers and their gear, with two passengers located inside the LMS. All medical equipment required to operate the system as a BAS will be stored inside the LMS or on the trailer. The CBPS soft shelter is rolled and mounted on the rear of the LMS during transport. Primary power for CBPS operation is provided by the vehicle engine mounted PSS components and auxiliary power is provided by a standard 10kw military generator set mounted on the trailer.

The design of the CBPS allows deployment in a chemical-biological (CB) environment and enables medical personnel to function effectively under all types of battlefield conditions, i.e. electronic counter-measures, smoke, contaminants (BC including toxins and novel compounds), fallout, and dust. The CBPS is fully operational in a chemically contaminated environment from -25 F (-50 F with kit) to +120 F while maintaining internal temperature of the tent and shelter at 68 F to 80 F. The current CBPS vehicle is shown in Figure 1.

CBPS ENVIRONMENTAL SUPPORT SYSTEM (ESS)

The hydraulic powered ESS operates in two distinct manners depending upon which power source is being employed. The HHV engine is the primary power source or the ESS. The HHV engine is modified by mounting two hydraulic pumps on the engine block and reconfiguring the belt drive system. The vehicle's original 200 amp alternator/generator is relocated to the footwell, just behind the battery box on the passenger side. An electric motor and another hydraulic pump/motor are also mounted in this area, with all three on a belt drive system.

The main hydraulic pump provides all the hydraulic flow required to power the ESS (CB filtration system, A/C system, heating system (oil to air heat exchanger), rib inflation system, recirculation system) while the HMMWV is stationary or on the move. The secondary hydraulic pump, which is mounted on the passenger side of the engine, provides all the hydraulic flow required to power the hydraulic

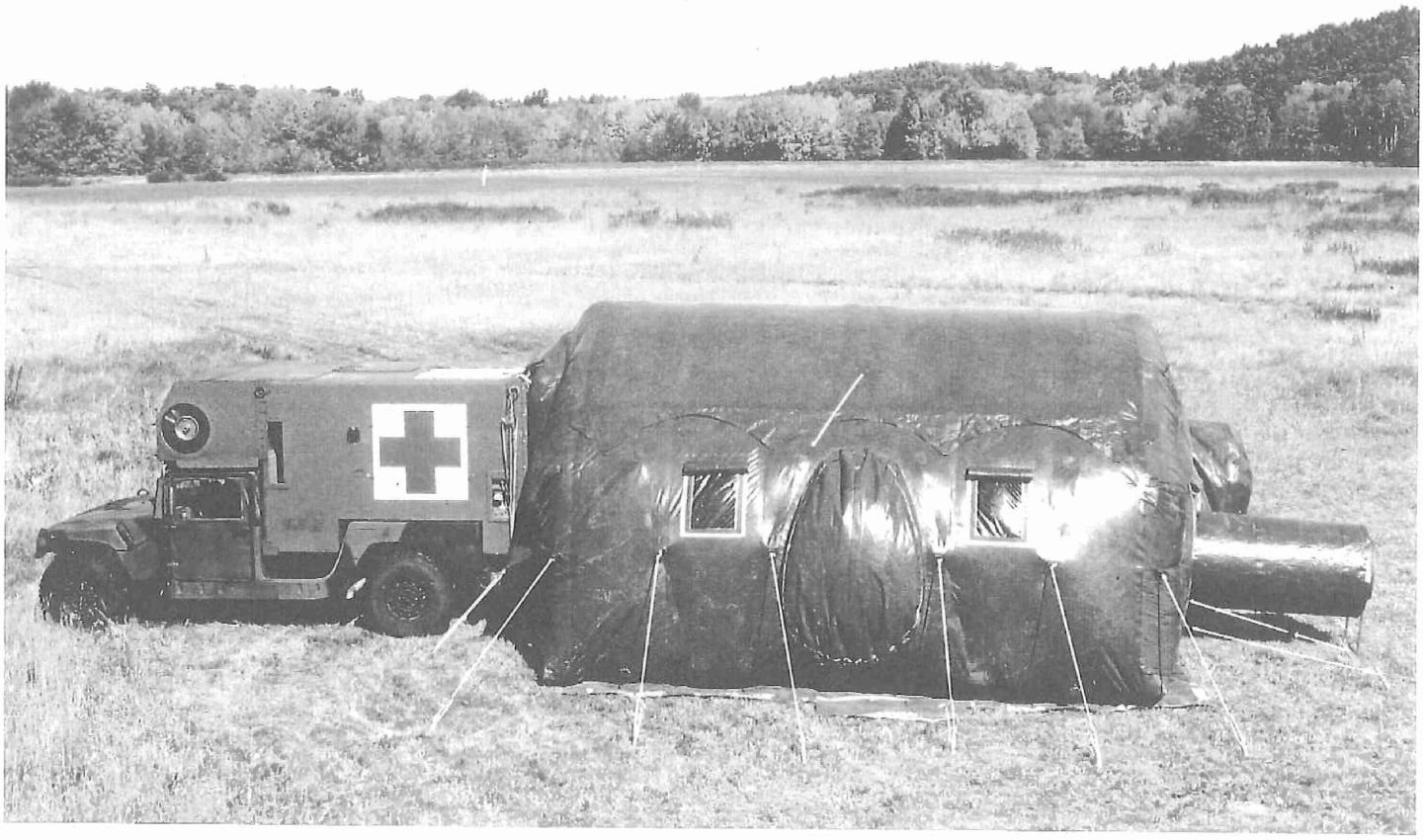


Fig. 1. Current CBPS Vehicle

motor/pump (acts as a motor in this case) located in the footwell. This motor in turn powers the 200 amp alternator/generator which provides the electric power for the system and the electric motor spins freely without producing electricity.

The military generator set is used to power the hydraulic system when the HHV engine is not running. The generator provides electrical power directly to the electric motor mounted in the footwell area, which in turn drives the hydraulic motor/pump (acts as a pump in this case) providing the necessary hydraulic flow to power the ESS. In this mode, the 200 amp alternator/generator is disengaged from the drive system and electricity for the system is provided by the generator. The hydraulic circuitry in this mode of operation differs from engine-based operation in that electric heat strips are employed in lieu of using the oil to air heat exchanger.

VEHICLE REQUIREMENTS

Any potential CBPS replacement vehicle should have most, if not all, of the following performance characteristics. First, the vehicle should be over-pressured for NBC protection. Second, the vehicle should accommodate the ESS hydraulic pumps, or have the capability to heat and cool itself and the CBPS soft shelter. Third, the vehicle ideally would accommodate the entire CBPS system without the need for a trailer. Fourth, the vehicle ideally would have mounting points above or adjacent to a door or hatch for the CBPS soft shelter while stowed. Fifth, the added weight of the CBPS system, approximately 4600 pounds, should not adversely affect vehicle performance. Sixth, the vehicle should be capable of running at idle for extended periods. Seventh, the vehicle should be able to carry at least four passengers in addition to the CBPS system components. Finally, the vehicle should be able to accommodate a 10kw or larger military generator.

POTENTIAL CBPS VEHICLES

Defense budget cuts effectively limit the choice for an alternative CBPS vehicle to tracked or wheeled armored vehicles currently used by US or allied forces. Wheeled vehicles with CBPS potential include the Cadillac Gage Textron Commando V150 and V300, the Diesel Division, General Motors of Canada Limited, BISON and the General Dynamics XM93E1 Fox (FOX). These light armored wheeled vehicles can withstand small arms fire, light mortar fragments, and anti-personnel mines. Tracked vehicles with CBPS potential include the BMY Universal Fire Direction Center Vehicle (UFDCV), and the FMC Bradley XM4, XM577A3, and Universal Carrier. These heavy armored tracked vehicles can withstand small arms fire, mines, mortar bursts and artillery shell fragments within 10 meters. A matrix of alternative vehicle characteristics is included as Table 1.

Table 1. Vehicle Characteristics Matrix

CHARACTERISTIC	WHEELED VEHICLES				TRACKED VEHICLES			
	Cadillac Gage Textron V150	Cadillac Gage Textron V300	Diesel Division GM Canada LAV	General Dynamics NBCRS FOX	BMY Combat Systems UFDCV	FMC Bradley XM4	FMC XM577A3	FMC Universal Carrier
Heavy Armor					O	O	O	O
Light Armor	O	O	O	O				
Tracked Suspension					O	O	O	O
Wheeled Suspension	O	O	O	O				
Over-Pressure Capable			X	O	X	O	X	X
ESS Compatible	O	O	O	O	O	O	O	O
Accomodate CBPS Package	O	O	O	O	O	O	O	O
Shelter Mounting Area	O	O	O	O	O	O	O	O
Extended Engine Idle	O	O	O	O	O	O	O	O
Four Passenger Capacity	O	O	O	O	O	O	O	O
On Board Generator					O	O	O	O
O = VERIFIED CLAIM								
X = UNVERIFIED CLAIM								

LIGHT ARMORED WHEELED VEHICLES

Cadillac Gage Textron Commando V150 and V300

The Cadillac Gage Textron (CGT) Commando V150 is a 4 by 4 wheeled light armored vehicle, while the V300 is a 6 by 6 wheeled light armored vehicle. Both the V150 and the V300 are available in 16 configurations, with the Ambulance Vehicle or armored personnel carrier variant being ideally suited for CBPS. Wherever possible, the V150 and V300 use standard automotive components to minimize both acquisition and operational costs.

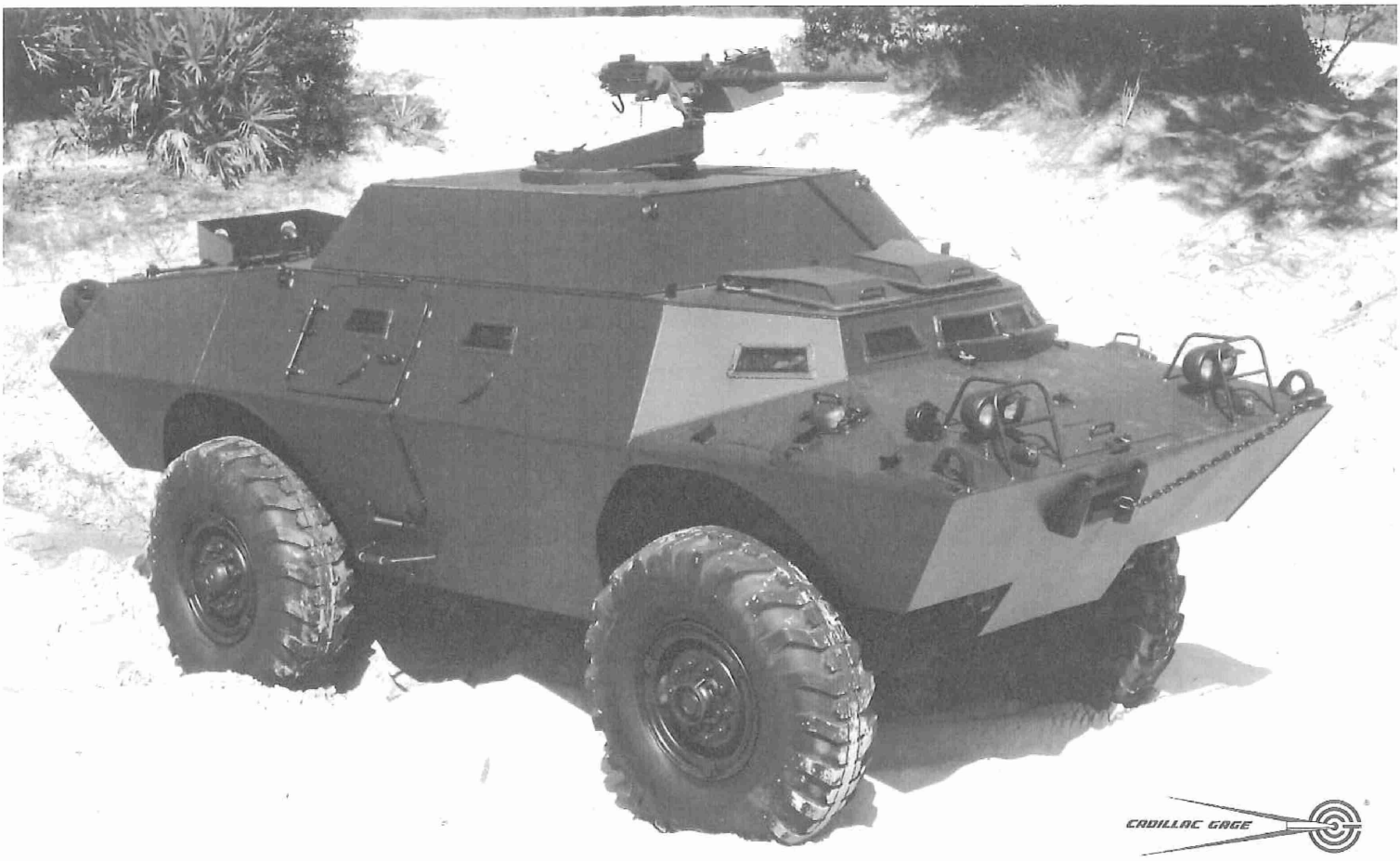


Fig. 2. Cadillac Gage Textron Commando V150

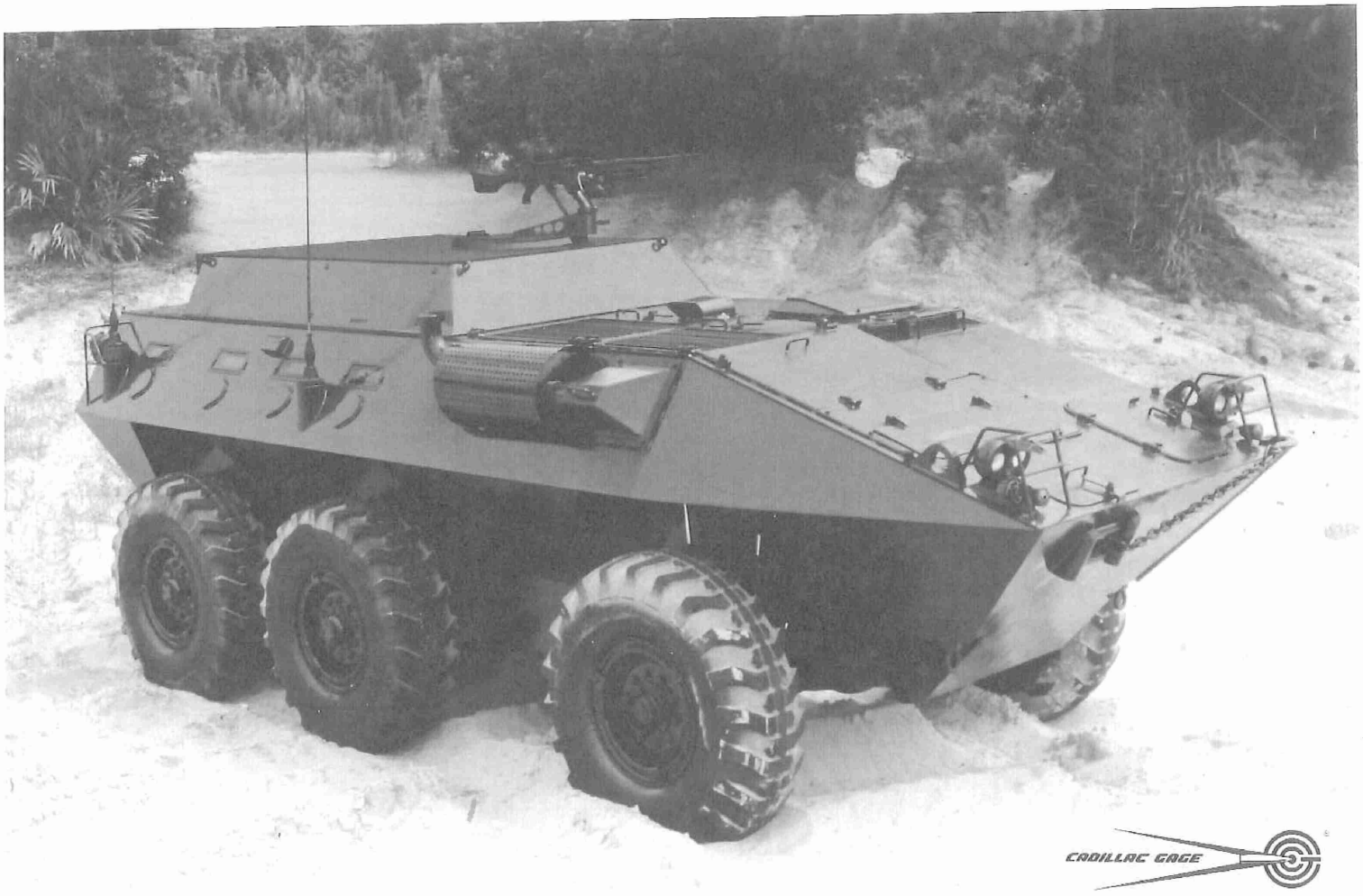


Fig. 3. Cadillac Gage Textron Commando V300

Table 2. Commando V150 Specifications

GENERAL

Gross Vehicle Weight. . . . .10886 kg [24,000 lbs.]
Crew (Maximum). . . . . .12 men
Hull . . . . . Unitized body constructed of special high hardness Cadloy® steel ballistic plate

DIMENSIONS

Height . . . . . .1.98 m. [78 inches]
Width . . . . . .2.26 m. [89 inches]
Length . . . . . .6.27 m. [247 inches]
Wheelbase . . . . . .3.12 m. [123 inches]
Track (Front) . . . . . .1.93 m. [76 inches]
Track (Rear). . . . . .1.96 m. [77 inches]

PERFORMANCE

Maximum speed on land . . . .100 km/hr. [62 mph]
Maximum speed in water (afloat) . . . . . .5 km/hr. [3.0 mph]
Maximum gradient climbable. 60%
Maximum side slope operation 30%
Maximum vertical obstacle . . . .81 cm. [24 inches]
Operating range on primary roads . . . . . .800 km [500 miles]
Operating range cross-country. . . . . .644 km [400 miles]

ENGINE

6CTA 8.3 [turbocharged, aftercooled, in-line 6 cylinder diesel] 186 kW [250 hp] @ 2500 rpm [governed], torque 90 kg-M [650 ft-lbs.] @ 1800 rpm

TRANSMISSION

Automatic 6-speed

TRANSFER

Single speed with spline engagement clutch for front axle drive

SUSPENSION

Solid axles with semi-elliptic multi-leaf springs

AXLES

Double reduction top mounted equipped with silent locking differentials

POWER BRAKES

4 wheel dual-hydraulic
Assist . . . .pump driven, hydraulically boosted with emergency back-up system

STEERING

Variable ratio power

ELECTRICAL

Waterproof 24 volts, radio suppressed

FUEL SYSTEM

Fuel Tanks 2
Capacity . . . . . .302 liters [80 gal.] total

TIRES

Size. . . . . .14R20 radials
Central tire inflation [CTI]. . . . . .optional

ARMAMENT

7.62 mm or .50 caliber machine gun ring mount

1-Meter Turret with twin 7.62 mm or combination 7.62 mm/.50 caliber machine guns

20 mm Turret

25 mm Turret

30 mm Turret

40 mm/.50 Caliber Turret

76 mm Turret

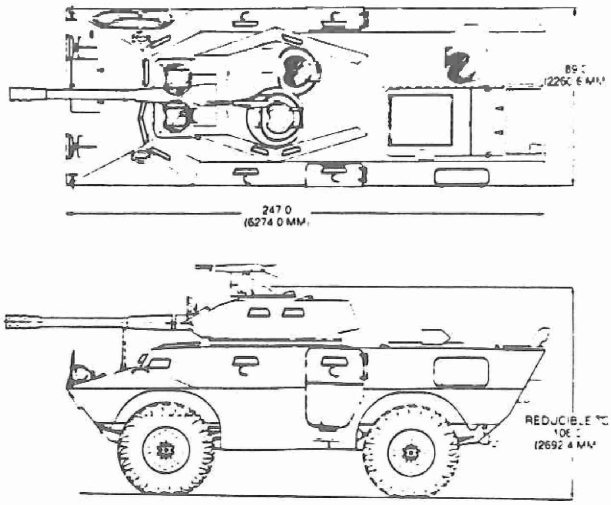
90 mm Turret

81 mm Mortar

TOW Anti-Tank Missile

20 mm Air Defense Turret

Also available in the following configurations: Armored Personnel Carrier [APC], Command, Recovery, Base Security, Logistic and Ambulance.



90 MM TURRET VEHICLE

Specifications subject to change without prior notice.

COMMANDO V-300 BASIC VEHICLE SPECIFICATIONS

GENERAL	
Gross Vehicle Weight	14,969 kg (33,000 lbs.)
Crew (Maximum)	12 Men (Armored Personnel Carrier)
Hull	Unitized body constructed of special high hardness steel ballistic plate, Cadloy®, defeats multiple hits of 7.62 mm ball ammunition.
DIMENSIONS	
Height (Hull)	1.98 m, (78 inches)
Width (Hull)	2.54 m, (100 inches)
Length	6.40 m, (252 inches)
Wheelbase	3.73 m, (147 inches)
Track (Front and rear)	2.24 m, (88 inches)
PERFORMANCE	
Maximum speed on land	100 km/hr, (62 mph)
Maximum speed in water (afloat)	4 km/hr, (2.5 mph)
Maximum gradient climbable	60%
Maximum side slope operation	30%
Maximum vertical obstacle	61 cm, (24 inches)
Turning diameter on land (curb to curb)	20.7 cm, (68 ft. maximum)
Operating range	700 km, (435 miles)
Maximum acceleration; 0-32 km/hr, (0-20 mph)	10.0 seconds
Minimum braking distance from 32 km/hr, (20 mph)	12.2 m, (40 ft.)
ENGINE	6CTA 8.3 (turbocharged, aftercooled, in-line 6 cylinder diesel), 205 kW (275 hp) @ 2500 rpm, torque 101 kg-M (730 ft-lbs.) @ 1500 rpm
Fuel	No. 1 or 2 diesel
TRANSMISSION	Automatic 6-speed
TRANSFER	Single-speed with spline engagement clutch for front axle drive
SUSPENSION	Solid front axle, intermediate and rear independent with coil spring
Shock Absorbers	Telescopic — direct acting at each wheel
AXLES	Single reduction hypoid with silent locking differentials
HYDRAULIC WINCH	(except recovery vehicle)
Nominal rated pull (bottom row)	9072 kg. (20,000 lbs.)
Cable	12.7 mm, (1/2 inch) diameter steel core swedged, 45.7 m, (150 ft.) long
BRAKES	
Service Brakes	6-wheel — dual hydraulic
Assist	Power booster with electric pump back-up
Parking Brake	Hand operated disc
STEERING	Hydraulic assisted
ELECTRICAL	Waterproof 24 volts, radio suppressed
Batteries	(2) 100-amp.-Hr. capacity
Alternator	100 amp. waterproof/militarized
Headlights	Double lamp drive, black-out drive, black-out marker, waterproof military
Turn Signals	Front and rear with emergency flashers
FUEL SYSTEM	
Fuel Tanks	1
Capacity	302 liters, (80 gallons)
TIRES	Radial
Size	14.00R20
Central Tire Inflation (CTI)	Optional
ARMAMENT	7.62 mm machine gun ring mount 1-Meter Turret with twin 7.62 mm or combination 7.62 mm/.50 caliber machine guns 20 mm (1-Man) Turret or 20 mm (2-Man) Turret with coax-7.62 mm machine gun 25 mm Turret with coax-7.62 mm machine gun, (stabilization available) 76 mm or 90 mm Turret with coax-7.62 mm machine gun 81 mm Mortar TOW (Tube-launched, Optically-tracked, Wire-guided) Missile System TUA (TOW Under Armor) Multi-launcher Missile System 20 mm or 25 mm Air Defense Turret

Specifications subject to change without prior notice.
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Table 3. Commando V300 Specifications

Optional equipment includes vehicle air-conditioning, various armor and weaponry. CGT also claims that both vehicles can be NBC protected. Since neither the V150 nor the V300 can accommodate the LMS, all CBPS equipment must be mounted inside of or on top of the vehicle. An appropriate interface for attaching the CBPS soft shelter to either the V150 or the V300 would also have to be developed.

Variants of the V150 and V300 are currently fielded by the Marine Corps, Canadian Defense Forces, and the United Nations. Although both the V150 and V300 are capable vehicles, the larger Commando V300 appears to be the better candidate for CBPS. A variant of the V300 is also expected to be a candidate in the US Army Military Police Armored Security Vehicle (ASV) competition later this year. Complete specifications for the CGT Commando V150 and V300 are given in Table 2 and Table 3, respectively. Photographs of the CGT Commando V150 and V300 are included as Figures 2 and 3, respectively.

Diesel Division, General Motors of Canada, Ltd. BISON

The Diesel Division, General Motors of Canada, Limited (DDGM) produces 11 Light Armored Vehicle (LAV) variants. The LAV is an eight-wheel vehicle with full time four-wheel drive and selective eight-wheel drive. The BISON Infantry Section Carrier (BISON) variant appears to be the most viable LAV candidate for CBPS. The BISON accommodates 10 personnel including a driver and vehicle commander and can be air-transported by C-130, C-141, C-5A, and CH-53 aircraft. The BISON also can be equipped with a 40,000 btu capacity hydraulic driven air-conditioning system according to its manufacturer. With a 7,200 pound payload, the BISON may need modifications to accommodate the CBPS package and crew.

The BISON has a large rear ramp inset door that can be equipped with an interface kit for connection to a General Purpose Medium Tent (GP Medium). The ramp door measures approximately 60 inches wide by 57 inches high, while the actual opening is 53 inches wide by 56 inches high. A prototype NBC-protected version of the LAV was developed for the US Army's Nuclear, Biological, Chemical Reconnaissance System (NBCRS) program, but that variant is not currently in production, although the manufacturer claims that the BISON can be overpressured for NBC protection. Estimated cost of the BISON is $ 500,000 to $ 750,000, depending upon the quantity purchased and equipment specified.

Variants of the LAV are used by the USMC in its light divisions, and by the Canadian Defense Forces in substantial numbers. A version of the LAVis also likely to be entered in the ASV competition later this year. The LAV is also likely to be selected to receive the Battlefield Combat Identification System (BCIS) designed to reduce incidents of fratricide in future conflicts. Complete technical specifications for the BISON are given in Table 4. A photograph of the BISON is included as Figure 4.

Table 4. Diesel Division, General Motors of Canada, Ltd.
BISON Specifications

BISON-ISC

MISSION ROLE REQUIREMENTS:

- **mobility equal to supported units**
- **protection and survivability for infantry sections**
- **supportability and affordability**

SIZE/WEIGHT

• Length	6452 mm	254.0 inches
• Width	2500 mm	98.4 inches
• Height	2210 mm	87.0 inches
• Curb Weight	11,072 Kg	24,360 lbs
• Maximum Weight	12,936 Kg	28,460 lbs
• Payload	1,864 Kg	4,100 lbs

PERFORMANCE @ GVW

• Maximum speed	100 Km/h	62 mph
• Swim speed*	9.7 Km/h	6 mph
• Maximum range	665 Km	410 miles
• Minimum turn diameter	15.5 m	51 feet
• Maximum trench crossing	2060 mm	81 inches
• Maximum grade		60%
• Maximum side slope		30%

POWER TRAIN & SUSPENSION

- Engine 202kw (275 hp) Detroit Diesel 6V53T
- Transmission Allison MT653
  (5 speeds forward - 1 reverse)
- Transfer case (1)
- Differentials (4) automotive
  (1) water drive*
- Suspension (8) wheel independent
- Full time 4 wheel drive (rear)
- Selective 8 wheel drive
- Selective water drive
- Water drive* (2) propellers
  (4) rudders
- Power steering
- Power brakes

ON VEHICLE EQUIPMENT

- Provision for tools, camouflage nets, utensils

VISION

- Driver - (3) M-17 periscopes
  - (1) night vision AN/VVS-2(V)4*
- Vehicle commander
  - (5) M-17 periscopes
  - (1) night vision AN/VVS-2(V)4*

DOORS/HATCHES

- (1) large rear ramp door with inset door
- (2) rear roof
- (1) driver
- (1) vehicle commander
- (1) large roof hatch

PERSONNEL (10)

- (1) driver
- (1) vehicle commander
- (8) section personnel

AIR TRANSPORTABILITY

- (1) C-130
- (2) C-141
- (8) C-5A
- (1) CH-53 (helicopter lift)

TOWABILITY

- By similar vehicle (with standard towbar MS-50048)

ELECTRICAL SYSTEM

- 24 volts negative ground
  - water proof
  - radio suppressed system
  - wiring, connectors, breakers, harnesses IAW MIL-STD's
  - MIL-STD 200 amp alternator
  - (4) batteries per MS 52149
  - 500 amp slave receptacle

FIRE SUPPRESSION*

- Halon 1301
  (manual system in crew & engine compartments)

SELF RECOVERY WINCH*

- Hydraulic
  (front mounted 6800 Kg (15,000 lbs) dynamic pull)

NBC SYSTEM*

- M8A1 ventilated face mask system (provision for)

ATGM WIRE CUTTER*

- (1) at driver

AMPHIBIOUS*

- Fully (with 5 minute preparation)

PAINT

- CARC -interior light green
- CARC -exterior camouflage pattern

COMMUNICATION EQUIPMENT

- VIC-1 intercom system
- (2) VHF radios
- (2) antennae

ARMAMENT

- Provision for MG at commanders station
- Provision for ancillary
  - (2) Wegmann smoke grenade launchers
- Ammunition
  - Ready (8) Smoke Grenades

EQUIPMENT

- Provision for all section equipment including crew served weapon

*Recommended optional equipment

Fig. 4. Diesel Division, General Motors of Canada, Ltd. BISON

General Dynamics XM93E1 Fox NBCRS

The General Dynamics XM93E1 Fox NBCRS (FOX) is a 6 by 6 wheeled light armored vehicle designed as a nuclear, biological, chemical, reconnaissance system (NBCRS) vehicle in partnership with Thyssen Henschel, a German firm. The FOX is available in NBCRS, cargo, ambulance, C3, and combat engineering variants. The NBCRS FOX can be over-pressured for NBC protection. In its basic configuration, the FOX has a two person driver/commander compartment forward of the engine compartment, with a cargo area behind the engine. A tunnel along the right side of the vehicle connects the two areas. The compartmented interior allows both clean and dirty areas within the vehicle, if necessary.

The FOX includes an environmental control system that incorporates a dual circuit, engine-driven air-conditioner capable of heating or cooling the crew compartment. The cargo/crew area of the FOX measures approximately 76 inches at its roofline, 112 inches at its midline, and 54 inches at floor level, for an interior of approximately 247 cubic feet.

In its cargo configuration, the FOX has a side-hinged double rear door approximately 54 inches wide by 49 inches high. The manufacturer believes that the standard FOX engine-driven hydraulic pump can drive the existing CBPS ESS, or can be easily modified to do so. Since the FOX cannot accommodate the LMS, all CBPS equipment must be mounted inside or on top of the vehicle. An interface for attaching the CBPS soft shelter to the FOX also would have to be developed.

Besides its obvious NBC attributes, the FOX possesses an amphibious capability that exceeds those of the other vehicles being considered here. These capabilities, however, place the FOX well into the price range of the heavy armored tracked vehicle competitors. Estimated cost of the FOX is in the $ 750,000 to $ 1,000,000 range depending upon the quantity purchased and equipment specified. With 113 NBCRS versions of the FOX scheduled for fielding by US forces, and 1100 FOX variants already fielded by German forces, the FOX is a viable candidate for CBPS despite its high price tag among the light armored wheeled vehicles. A variation of the FOX is expected to be entered in the ASV competition later this year. The FOX is also expected to receive BCIS to reduce future incidents of fratricide. Complete technical specifications for the General Dynamics XM93E1 FOX NBCRS are given in Table 5, while a photograph of the FOX is shown as Figure 5.

HEAVY ARMORED TRACKED VEHICLES

BMY Universal Fire Direction Center Vehicle

The Universal Fire Direction Center Vehicle (UFDCV) is being developed under BMY's Internal Research and Development Program to serve as a highly

Table 5. General Dynamics FOX Specifications

FOX VEHICLE CHARACTERISTICS

WEIGHT (TONS)

COMBAT LOADED	18.7
W/O CREW & AMMO	16.9
GROUND CLEARANCE	17.1 In

ENGINE

TYPE	V8 DIESEL
OUTPUT	320 HP
TRANSMISSION	6 SPEED (Automatic)

DIMENSIONS (FT)

LENGTH	23.9
WIDTH	9.8
HEIGHT	8.0

RUNNING GEAR

WHEELS DRIVEN	6 X 6
WHEELS STEERED	4
TIRE SIZE	14.00 X 20

FOX PERFORMANCE CHARACTERISTICS

MAX. ROAD SPEED (mph)	65
RANGE ON ROADS (mi)	500
OPERATION TIME W/NBC SYSTEM ON (hrs)	12+
OPERATION TIME W/NBC SYSTEM ON AND LIMITED RESUPPLY (hrs)	48

Fig. 5. General Dynamics FOX

mobile field artillery fire direction center. Like the heavy armored Field Artillery Ammunition Support Vehicle (FAASV) on which it is based, the UFDCV should withstand shell fragments and small arms fire because it shares the same hull and armor configuration. Without the FAASV's automated ammunition delivery system, storage racks and governor-equipped engine, the UFDCVis both lighter and quicker than its predecessor.

According to Tank and Automotive Command (TACOM) representatives, the UFDCV has a lot of advantages for use as an armored vehicle for CBPS. Although the FAASV chassis on which the UFDCV is based, has proven reliable, it is also slow and heavy. Removing the FAASV's artillery resupply mechanism and shell storage racks made the UFDCV much lighter. The UFDCV was made faster by using a non-governed version of the FAASV Detroit Diesel 8V71T engine.

The UFDCV has an interior volume of nearly 750 cubic feet in which to carry personnel and mount CBPS equipment and supplies. Although the vehicle has not been tested, BMY claims that the UFDCV can be NBC protected. The UFDCV also has an on-board generator rated at 15kw and a hydraulic system that could be enhanced to power CBPS equipment. The angular configuration and weight of the UFDCVmay limit its air transportability to C-5 and C-17 aircraft.

The UFDCV is equipped with an environmental control system capable of heating and cooling the vehicle interior. The on-board system may not, however, be capable of heating and cooling and the CBPS shelter. The auxiliary power unit (APU) in the UFDCV powers the vehicle environmental control system (ECS) and should be able to power the CBPS ESS, if necessary. BMY is also investigating a gas turbine APU to power the ECS for the UFDCV. This ECS would use the expansion and compression of ambient air from the gas turbine to create a cooling effect. The UFDCV will be over-pressured to provide NBC protection.

Since the UFDCV cannot accommodate the LMS, all CBPS equipment must be mounted inside or on top of the vehicle. With approximately 750 cubic feet of interior space, however, the UFDCV has plenty of room for all CBPS equipment. Even if all CBPS equipment can be mounted inside the vehicle, the UFDCV would still require an interface for attaching the CBPS soft shelter.

BMY is currently developing a gas turbine engine for the UFDCV to increase vehicle mobility and performance. The UFDCV's commonality with the FAASV chassis systems should contribute to lower operational and life-cycle costs if selected for CBPS use. Estimated cost for the UFDCV in a CBPS configuration would be in the $ 1,000,000 to $ 1,300,000 range depending on quantity purchased and equipment specified. A production UFDCVwill also likely incorporate BCIS to reduce fratricide in future conflicts. Complete specifications for the UFDCV are given in Table 6. A photograph of the UFDCV is included as Figure 6. The BMY UFDCV is still a prototype at this time.

Table 6. BMY Universal Fire Direction Center Vehicle M992/FAASV Specifications

GENERAL AND AUTOMOTIVE

GENERAL

Crew	2
Weight (combat loaded)	58,500 pounds (26535 kg)
Weight (less crew, fuel and storage)	43,490 pounds (19727 kg)
Length	267 inches (6,78m)
Width	124 inches (3,1 m)
Lowest operable height	130.25 inches (3,3 m)
Ground clearance	14.50 inches (36.8 cm)
Shipping volume	2414 cu. ft. (68.4 cu m)

PERFORMANCE

High speed (max)	35 mph (governed) (56,3 kmph)
Low speed (max)	2.5 mph (4,0 kmph)
Reverse speed (max)	7 mph (11,2 kmph)
Maximum grade	60%
Maximum trench	72 inches (1,83 m)
Maximum vertical wall	21 inches (0,53 m)
Turn radius (min)	1 vehicle length
Cruising range	217 miles (349 km)
Fuel capacity	135 gallons (511 l)

ENGINE

Type/Model	Detroit Diesel 8V71T, liquid cooled
Manufacturer	Detroit Diesel Allison Div., GMC
Horsepower (gross) at 2300 rpm	405
Horsepower (net) at 2300 rpm	345
Displacement	567.4 cu. in. (9300 cc)
Torque (max. gross)	980 lb. ft. at 1700 rpm (1323 Nm)
Torque (max. net)	895 lb. ft. at 1600 rpm (1208,3 Nm)
Ignition	Compression

Table 6. BMY Universal Fire Direction Center Vehicle M992/FAASV Specifications (Cont'd)

TRANSMISSION

Model	XTG-411-4
Manufacturer	Detroit Diesel Allison Div., GMC
Overall usable ratio:	5.69:1
First (low range)	3.17:1
Second (low intermediate)	1.58:1
Third (low intermediate)	0.79:1
Fourth (high range)	5.60:1
Low reverse (R-1)	3.79:1
High reverse (R-2)	1.475:1
Steer	Mechanical-applied
Brakes	14 gallons (53 l)
Oil capacity (refill)	21 gallons (79,5 l)
Oil capacity (dry)	

SUSPENSION

Type	Independent torsion bar
Roadwheels	7 sets
Size	24 inches (0,6 m)
Loadings	
1, 2, 5, 6 and 7 positions	4000 lbs (approx) (1814 kg)
Intermediate positions	2600 lbs (approx) (1179 kg)

ELECTRICAL SYSTEM

Voltage (nominal)	24
Batteries (12 volts each, series-parallel connected)	4
Type	6TL
Generator (alternator)	
Manufacturer	Leece-Neville
Type	3 phase
Amperage	100

COMMUNICATIONS

Intercommunication st (model)	AN/VIC-1
Outlets	3
External extension (model)	C-988/U

Fig. 6. BMY Universal Fire Direction Center Vehicle

FMC Bradley Command and Control Vehicle XM4

The Bradley Fighting Vehicle System was originally designed as an armored personnel carrier capable of keeping pace with the M1 Abrams main battle tank. While several variants of the Bradley chassis have been developed, the XM4 Command and Control Vehicle appears to be most suitable for CBPS. The Bradley XM4 gives front line commanders a reliable C^3I chassis with ballistic, NBC, and EMI/EMP protection for both crew and equipment.

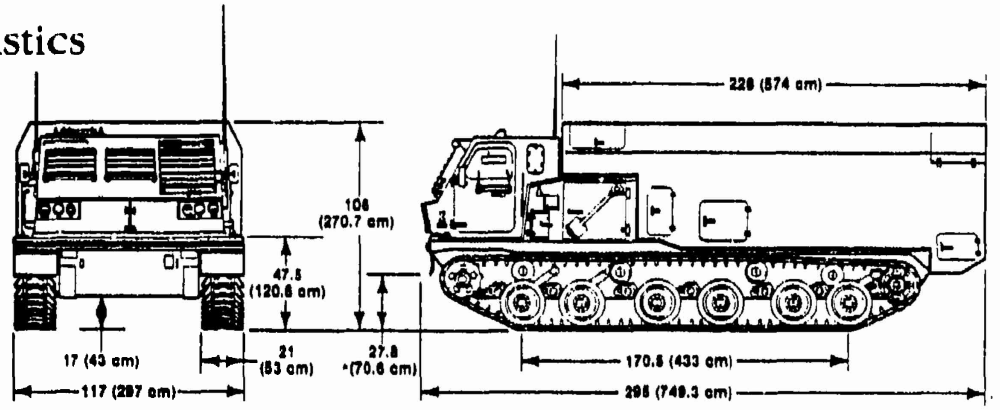
The Bradley XM4 is based on the Fighting Vehicle System (FVS) chassis by FMC. The FVS is a tracked flatbed vehicle designed to carry shelters or weapons systems on its cargo bed. The FVS has a three-man cab and is powered by a Cummins VTA-903T diesel engine rated at 600 hp. FMC claims that the vehicle hydraulic system can be boosted to power CBPS equipment, or that CBPS specific hydraulics can be mounted and driven by the on-board primary power unit . The XM4 can travel at speeds up to 40 miles per hour, and is transportable by C-5 and C-17 aircraft.

A Command and Control Vehicle (C2V) FVS variant is available with an NBC protected armored shelter, and an on-board power system. The Cummins 6BT 5.9 liter diesel engine based primary power unit is rated at 43kw and powers mission oriented equipment and a 12kw DC heater. The NBC system is rated at 1.5 inches H^2O. This level of over-pressure is needed to maintain safe conditions at higher speeds while on the move. The shelter has about 580 cubic feet of interior space with an additional 280 cubic feet of space available by relocating the support system and main radio mast. The M2 and M3 Bradleys were investigated but were found to have insufficient interior space due to the vehicle turret placement. Neither the M2 nor M3 is conducive to either the movement or storage of CBPS medical equipment, or recirculation filters.

In XM4 configuration, the Bradley has approximately 600 cubic feet of interior space in which to mount CBPS equipment and supplies. In addition to offering state of the art armor, the Bradley XM4 provides ballistic and electromagnetic interference/electromagnetic pulse protection for its crew and equipment. An FMC proprietary integral NBC protection system provides the Bradley XM4 with both over-pressure and an air lock entrance to allow continuous operation in an NBC environment. Estimated cost of a Bradley XM4 for CBPS should be in the $ 2,000,000 to $ 2,300,000 range, depending on the quantity purchased and the equipment specified. The XM4, like other Bradley variants, will likely incorporate BCIS to reduce incidents of fratricide in future conflicts. Complete specifications for the Bradley XM4 are given in Table 7. A photograph of the FMC Bradley XM4 is included as Figure 7. All Bradley variants are production ready at this time.

Table 7. FMC Bradley XM4 Specifications

XM4
Characteristics



Dimensions in inches (centimeters)

Engine

Make and model	Cummins VTA-903T
Type	4 cycle diesel
Rated Horsepower	600

Transmission, Automatic

Make and model	GE HMPT 500-3EC
Type	Hydromechanical
Steering	Hydrostatic
Brakes	Multidisc, oil cooled

Performance

Speed (level land)	40 mi/h
Acceleration (0 to 30 mi/h)	20 sec
Stopping (20 to 0 mi/h)	35 ft
Turning radius	Pivot to infinite
Slope	60%
Side Slope	40%
Water fording	40 in.
GVW	56,000-66,000 lbs

Primary Power Unit

Engine	6 BT 5.9 Cummins diesel (enclosure)
Governed Speed	1,800 rpm
Power	AC: 30 kW, 120/208 v 60 Hz, 3 phase, 4 wire, per MIL-STD-704 DC: 28 v, 300 amps, per MIL-STD-1275

Backup Power Unit

Engine	VTA-903T diesel (carrier)
Power	DC: 28 v, 300 amps, per MIL-STD-1275

Antenna Mast

System type	28 v dc powered, mechanically actuated, telescoping vertically, stowed under armor
Height	adjustable to 10 meters
Antenna payload	up to 300 lbs
Time to deploy/retract	30 seconds (max)

Macro Bio-Chem Protection Unit

System Type	28 v dc powered, push through
Filter	M48 based
Capability	100/200 cfm as required
Crew compartment overpressure	1.5 inches H_2O

Environmental Control Unit

System type	60 Hz ac powered, freon 22, modular construction, integrated
Cooling	40,000 btu/hr net
Heating	12 kW, electric

Fuel System

Supply source	Carrier fuel cells

Battlefield Effects Hardening

Ballistic	Small arms, artillery fragments. Modular armor kit optional for advanced threats
Nuclear	Blast, thermal, radiation, EMP

Armored Enclosure Interior Space (cu ft)

Crew compartment	579 ft^3
Mast compartment	36 ft^3
Supporting Systems space	244 ft^3
Enclosure total	859 ft^3

Mission Support Capability

Personnel	Maximum of 9 including driver
Mission equipment	Selection based on mission requirements
Continuous closed operation	Up to 24 hours
Operation on the move	Capability at all times

Fig. 7. FMC Bradley XM4

FMC XM577A3 and Universal Carrier

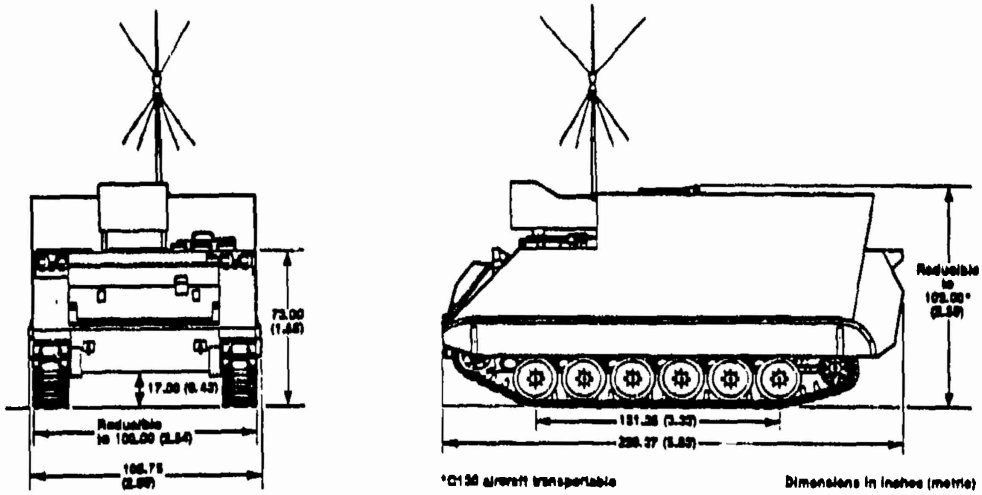
The FMC XM577A3 and Universal Carrier were designed as longer, better protected, and more powerful versions of the M577 and M113 armored personnel vehicles, respectively. Besides more interior space and increased engine power, these vehicles incorporate improved armor protection, NBC protection, and vehicle air conditioning for both crew and equipment according to their manufacturer. The increased engine power increases vehicle agility, mobility, and payload. The XM577A3 has 502 cubic feet of interior space in which to mount CBPS equipment and supplies, while the Universal Carrier has approximately 698 cubic feet of interior space. With a payload of over 5,000 pounds, both vehicles provide the space and capacity of a standard S280 shelter on a proven tracked chassis. The addition of vehicle air conditioning, improved armor and unconfirmed NBC protection represent substantial improvements over earlier M577 and M113 vehicles. Both the XM577A3 and the Universal Carrier are equipped with a 10kw generator and an 48,000 btu capacity environmental control system.

Although the original M577 proved unacceptable in an earlier search for a CBPS vehicle, both the XM577A3 and the similar M113-based Universal Carrier could be viable vehicles for CBPS if manufacturer claims can be verified. FMC claims that its proprietary NBC protection system can be adapted to the XM577A3 to provide recirculation at 200 cfm and 1.5 inches H^2O overpressure. To achieve this level of performance, however, TACOM personnel believe a massive body retrofit would be required because neither the M577 nor the M113 were designed to be sealed for overpressure. Such a retrofit would probably make both the Universal Carrier and the XM577A3 significantly more expensive.

The compatibility of the XM577A3 and the Universal Carrier with the nearly 65,000 M577/M113 variants fielded worldwide is a strong selling point. The increased horsepower, improved armor, claimed NBC protection and S-280 equivalent cargo area make both the XM577A3 and Universal Carrier viable candidates for CBPS. The estimated cost for the either the XM577A3 or Universal Carrier in a CBPS compatible configuration is in the $ 500,000 to $ 750,000 range, depending upon the quantity purchased and the equipment options selected.

The XM577A3 and Universal Carrier both would fit well into the logistics system because of the widespread use of the M577/M113. With the possible availability of lower cost remanufactured versions, the XM577A3 and Universal Carrier deserve serious consideration if their NBC performance claims can be verified. The XM577A3, like the M577/1068 Armored Command Post, will likely incorporate BCIS to reduce incidents of fratricide in future conflicts. Complete technical specifications for the XM577A3 and Universal Carrier are given in Tables 8 and 9, respectively. Photographs of the FMC XM577A3 and the Universal Carrier are included as Figures 8 and 9, respectively. Both vehicles are experimental prototypes at this time.

Table 8. FMC XM577A3 Specifications



*C130 aircraft transportable

Dimensions in inches (metric)

General

Weight, combat loaded	31,800 lb
Curb weight	28,430
Personnel capacity, transporting (includes driver)	8
Fuel capacity	95 gal (360 liters)
Ground pressure, (combat loaded)	8.1 psi (.57 kg/cm²)

Armor

Basic hull	5083 aluminum
Bolt-on armor (Top, Side, Belly)	Passive
Spall suppressant (crew compartment)	Composite panel

Mast, Telescoping

Uses antenna head in std. kits	RC-292 OE-254/GRC
Power	Pneumatic
Extended head height	30 feet
Extend time	35 seconds
Power source	Electric pump w/remote
Back-up power	Hand pump

Performance

Speed (level land)	40 mi./h (64.37 km/h)
Cruising range (25 mph, level land)	300 mi (483 km)
Turning radius	Axis to infinite
Slope	60%
Side slope	30%
Vertical wall	24 in. (61 cm)
Trench	86 in. (218 cm)
Braking	40 ft. from 20 mph

Capable of going to 34,000 lbs with 4.308:1 final drive (M548)

Engine

Make and model	Detroit Diesel 6V53T
Displacement	318 cu in. (5.2 liter)
Type	Two stroke cycle
Fuel	Diesel (DF2)
Rated horsepower	275
Gross horsepower-to-weight ratio @ 31,800 lbs	17.3 hp/ton (19.3 hp/metric ton)

Transmission, Automatic

Make and model	Allison X200-4
Type	Hydrokinetic
Steering	Hydrostatic
Brake type	Multiple wet plate

Final Drive

Type	Spur gear
Gear ratio	3.93:1 (M113)

Running Gear

Suspension type	Torsion bar
Number of wheels	Six pair each side
Wheel size	24 in. (61 cm)
Track type	Steel, single pin with detachable rubber pads
Number of shoes	72 left side 73 right side
Track pitch	6 in. (15.2 cm)
Track width	15 in. (38 cm)
Shock absorbers	3 per side
Wheel travel	9.0 in. (22.9 cm)

Electrical System

Alternator	200 amperes
Voltage rating	28 vdc
Batteries	12 volt (4)

Fire Extinguisher

Fixed	CO^2 in engine compartment
Portable	CO^2 in crew compartment

FMC Corporation
Ground Systems Division
801 Martin Ave., Box 58123
Santa Clara, California 95052
(408) 289-4009

Table 9. FMC Universal Carrier Specifications

		M577A2	M577 Stretch (6 R.W. EFT) 350 hp	Universal Carrier 350 hp
Vehicle Weight		25,813 lbs	28,794 lbs	29,664 lbs
Curb Weight		24,142 lbs	26,073 lbs	26,875 lbs
Current Payload		1,671 lbs	2,721 lbs	2,789 lbs
Max GVW		28,000 lbs	36,000 lbs	36,000 lbs
Max Payload Capacity		3,858 lbs	9,927 lbs	9,125 lbs
Top Speed		37 mph	41 mph	41 mph
Cruising Range		370 mi	300 mi	300 mi
Engine HP		212 HP	350 HP	350 HP
HP/TON		16.4	24.3	23.6
Final Drive Ratio		3.929	3.929	3.929
Trench Crossing		66 in	88 in	88 in
Slope		60 %	60 %	60 %
Side Slope		40 %	40 %	40 %
Ground Pressure		6.2 psi	6.9 psi	7.1 psi
Stretch Length		N/A	34.25	34.25
L/T Ratio		1.24	1.64	1.64
Max Output Torque		16,997 ft-lb	27,238 ft-lb	27,238 ft-lb
Braking (20-0 mph)		40 ft	28 ft	28 ft
Acceleration (0-20 mph)		11.0 sec	7.5 sec	7.5 sec
Acceleration (0-35 mph)		92.0 sec	29.0 sec	29.0 sec
Gross Payload Volume		394 ft^3	594 ft^3	698 ft^3
Net Payload Volume		370 ft^3	568 ft^3	635 ft^3
ECU rated capacity		N/A	48,000 Btu/hr	48,000 Btu/hr
ECU volume		N/A	13 ft^3	13 ft^3
Thermal Insulation volume		N/A	16 ft^3	16 ft^3
Overpressure NBC volume		N/A	10 ft^3	10 ft^3
PPU rating		4.2 kW	10.0 kW	10.0 kW
PPU volume		12 ft^3	16 ft^3	23 ft^3
Air Transport	C5/C17	Yes	Yes	Yes
	C141	Yes	Yes	Yes
	C130	Yes	Yes	Yes

Notes:

1. Development work needed to exceed 36,000 lbs GVW
2. Computer Analysis will be necessary to confirm drive-on/drive-off capability on C130
3. Net payload volume = Gross payload volume - volume of: APU, ECU, overpressure NBC, batteries, inverter/power supply, and fuel.
4. ECU and overpressure NBC performance values are preliminary minimums.
5. Thermal insulation is .5" thick
6. Depending on main engine alternator used, power generation capacity is either 15.6 or 18.4 kW with main engine running.
7. Primary Power unit on the XM1068A3E1 is mounted externally.
8. Performance data for the stretch M577 and Universal Carrier is at Max GVW.

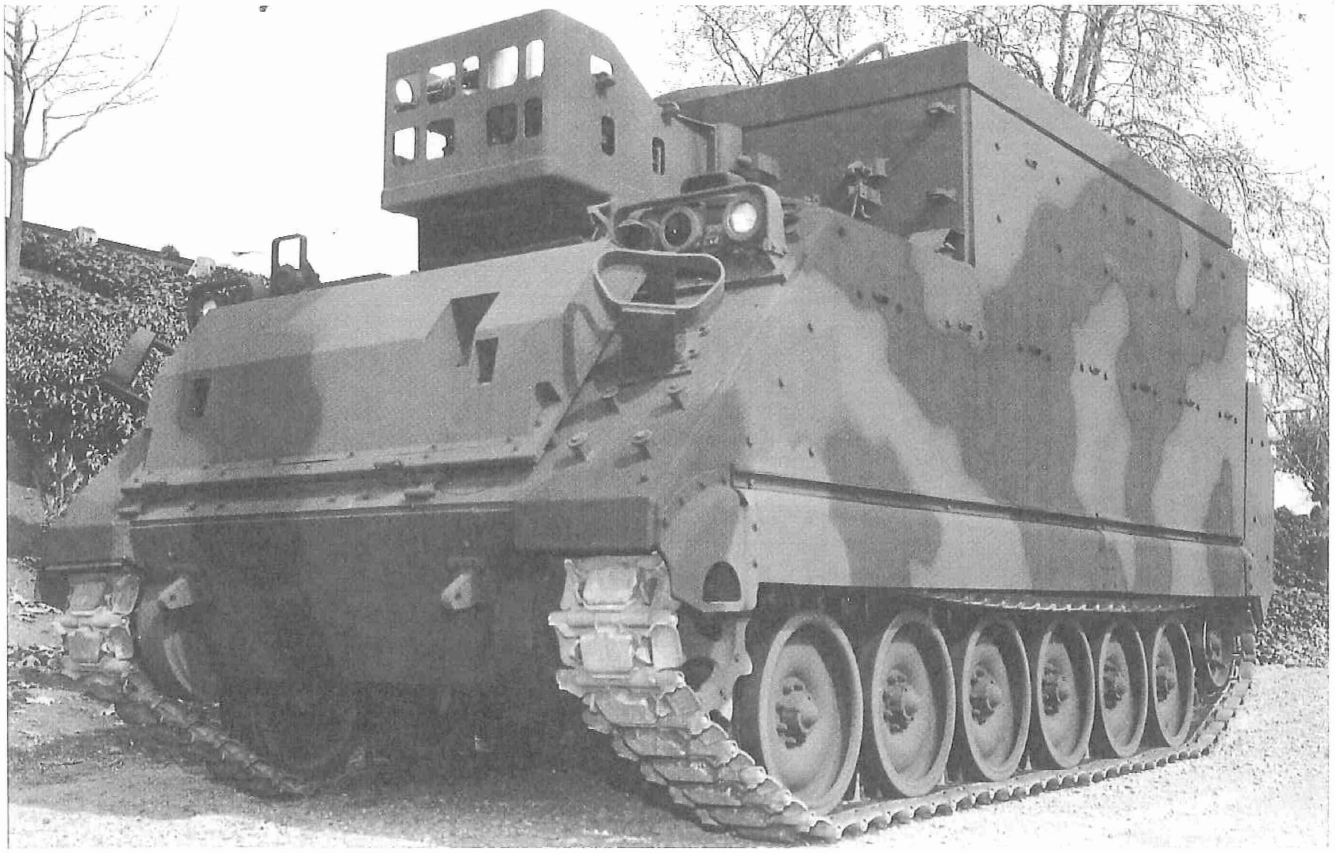


Fig. 8. FMC XM577A3 Armored Tactical Command and Control System

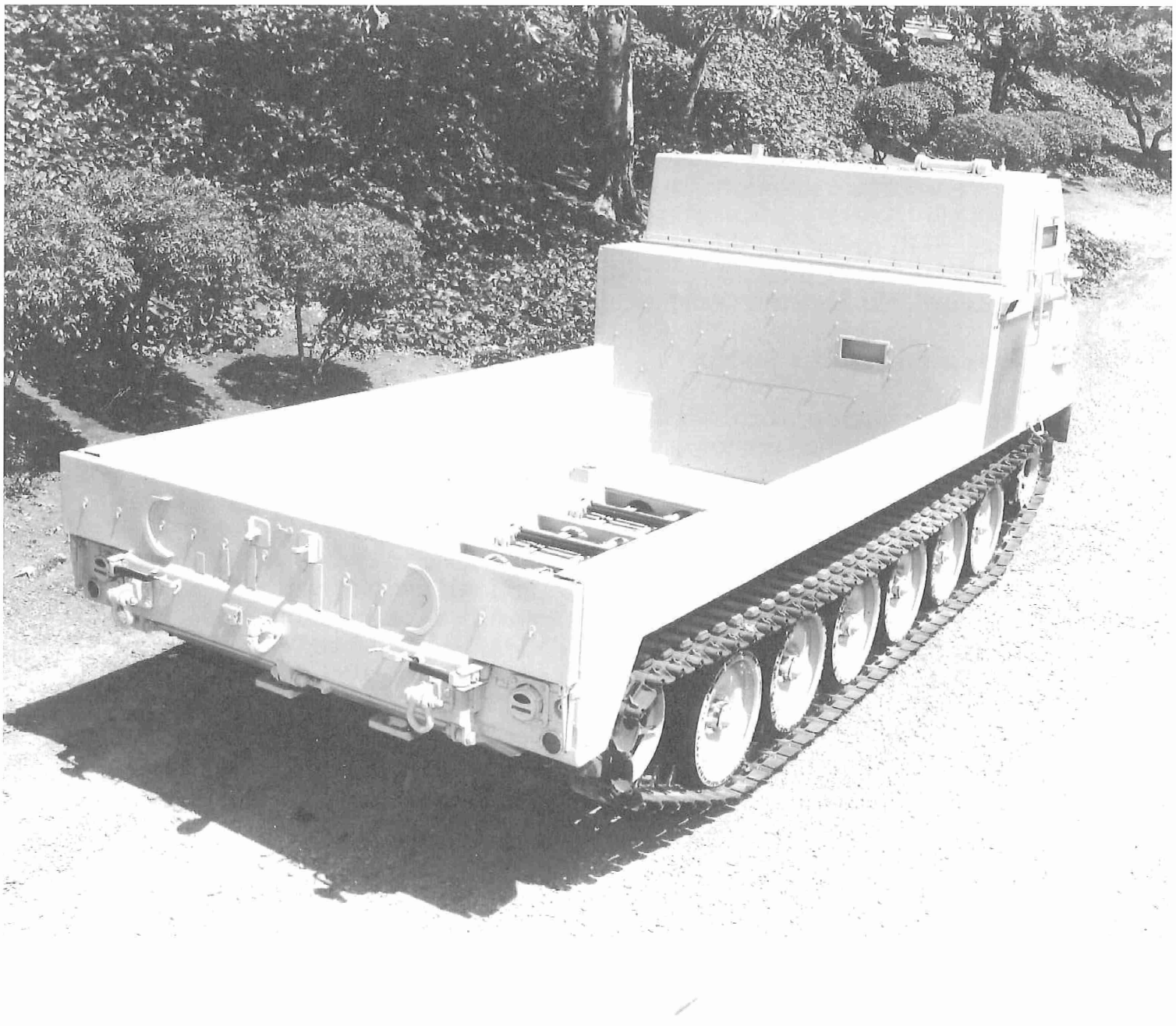


Fig. 9. FMC Universal Carrier

VEHICLE CHARACTERISTICS SUMMARY

Over-pressure Capability

Of the four-wheeled, light armored vehicles identified as possible alternative vehicles for CBPS, only the General Dynamics FOX has been proven to be over-pressure ready. According to the manufacturer, the NBCRS version of the DDGM Canada LAV can be over-pressured, although actual test results are not available. Similarly, Cadillac Gage Textron claims that its V150 and V300 Commando can be overpressured, but no data are available to substantiate such claims.

Of the four heavy armored tracked vehicles identified as alternative vehicles for CBPS, only the FMC Bradley has been verified as having over-pressure capability. However, FMC uses a proprietary system to provide NBC protection for the Bradley XM4. A detailed description of the FMC system is beyond the scope of this effort. FMC claims that this system can also be fitted to the XM577A3 to give that vehicle NBC over-pressure capability. BMY claims that the UFDCV can be over-pressured, although test results are not available.

Environmental Support System

All four of the light armored wheeled vehicles investigated should be able to accommodate a modified version of the ESS. Any retrofit of the ESS will require the relocation of existing engine components in all of the light armored vehicles.

If manufacturer claims can be confirmed, the on-board air conditioning in the FOX and the LAV may be able to cool both the vehicle and shelter in some environments. Similarly, all four of the heavy armored tracked vehicles investigated should be able to accommodate a modified version of the ESS. Vehicle air conditioning in the FMC Bradley XM4, XM577A3 and Universal Carrier may be able to cool both the vehicle and the shelter. FMC is willing to provide a more definite answer on the heating and cooling capability if more information on the CBPS shelter is released. Until an actual retrofit of ESS components can be attempted, however, none of the vehicle manufacturers were willing to go on record that the system could be accommodated without major modifications to their respective vehicles.

CBPS Equipment Package Accommodation

With suspension modifications, all four of the light armored wheeled vehicles investigated should be able to accommodate the CBPS equipment package without the need for a trailer and without adversely affecting vehicle mobility. All of the heavy armored tracked vehicles investigated should be able to accommodate the CBPS equipment package without a trailer and without adversely affecting vehicle performance without modification. Because most of the vehicle interiors are

irregularly shaped, however, no conclusive statement about the need for an equipment trailer can be made until an actual attempt to pack the complete CBPS package into each vehicle is made, or a computer load simulation can be run.

Shelter Mounting Area

All four of the light armored wheeled vehicles investigated appear to have an area above the rear door suitable for stowage of the CBPS soft shelter. Likewise, all four of the heavy armored tracked vehicles investigated appear to have an area above the rear door suitable for stowage of the CBPS soft shelter. Once an area suitable for mounting the shelter is identified, Natick engineers can determine whether an appropriate interface can be developed for each alternative vehicle.

Extended Engine Idle

According to the vehicle manufacturers, all four of the light armored wheeled vehicles and heavy armored tracked vehicles can idle for several hours without modifications. Depending upon ambient temperatures, however, all of the vehicles could experience over-heating conditions if forced to idle for longer periods of time. The employment of on-board air conditioning systems and high ambient temperatures would affect vehicle idle limits and hasten the onset of over-heating. Extended engine idle claims should be confirmed before an alternative vehicle for CBPS is selected.

Four-Passenger Capability

All of the light armored wheeled and heavy armored tracked vehicle candidates for CBPS can accommodate four or more passengers. The CGT Commando V150 and V300, the DDGM LAV, and the FOX can accommodate 6-8 passengers plus a driver and vehicle commander depending upon equipment placement and interior configuration. Likewise, the BMY UFDCV, and the FMC Bradley, XM577A3 and Universal Carrier can accommodate 6-8 personnel, plus a driver and vehicle commander, depending upon equipment placement and interior configuration. Personnel capacities can be expected to decrease by 25% to 50% once the CBPS equipment package is placed within the vehicle due to weight limitations.

On-Board Generator Set

All of the heavy armored tracked and light armored wheeled vehicles identified as alternative vehicles for CBPS have room to accommodate a 10kw generator. The problem with both the tracked and wheeled vehicles, however, becomes one of space management and weight limitations. The added weight and intrusion of a generator compartment along with the entire CBPS equipment package will make even the largest interior seem small and approach vehicle weignt limitations.

Vehicle Specifications

For reporting convenience, vehicle specifications were compared and examined in two data sets. A set of physical specifications was defined to include the weight, height, width, length and track of the vehicle. A set of performance specifications was defined to include turning radius, top speed, fuel capacity, and cruising range. Physical specifications for wheeled and tracked vehicles are given in Table 10, and Table 11, respectively. Performance specifications for wheeled and tracked vehicles are given in Table 12 and Table 13, respectively.

Table 10 - Wheeled Vehicle Physical Specifications

VEHICLE	WEIGHT	HEIGHT	WIDTH	LENGTH	TRACK
Cadillac Gage Textron V150	24,000 lbs.	78 "	89 "	247 "	76 "
Cadillac Gage Textron V300	33,000 lbs.	78 "	100 "	252 "	88 "
DDGM Canada LAV	21,000 lbs.	87 "	99 "	254 "	86 "
General Dynamics FOX	44,400 lbs.	95 "	117 "	287 "	101 "

Table 11 - Tracked Vehicle Physical Specifications

VEHICLE	WEIGHT	HEIGHT	WIDTH	LENGTH	TRACK
BMY UFDCV	43,490 lbs.	130 "	124 "	267 "	101 "
FMC Bradley XM4	60,000 lbs.	117 "	142 "	258 "	117 "
FMC XM577A3	31,800 lbs.	102 "	106 "	229 "	100 "
FMC Universal Carrier	29,664 lbs.	102 "	102 "	254 "	102 "

Table 12 - Wheeled Vehicle Performance Specifications

VEHICLE	TOP SPEED	TURNING RADIUS	CRUISING RANGE	FUEL CAPACITY
Cadillac Gage Textron V150	62 mph	68 ft.	500 miles	80 gal.
Cadillac Gage Textron V300	62 mph	68 ft.	435 miles	80 gal.
DDGM Canada LAV	62 mph	51 ft.	410 miles	53 gal.
General Dynamics FOX	65 mph	56 ft.	495 miles	103 gal.

Table 13 - Tracked Vehicle Performance Specifications

VEHICLE	TOP SPEED	TURNING RADIUS	CRUISING RANGE	FUEL CAPACITY
BMY UFDCV	36 mph	Axis	217 miles	135 gal.
FMC Bradley XM4	38 mph	Axis	250 miles	175 gal.
FMC XM577A3	40 mph	Axis	300 miles	95 gal.
FMC Universal Carrier	41 mph	Axis	300 miles	120 gal.

CONCLUSIONS AND RECOMMENDATIONS

If cost is not the determining factor and a heavy armored tracked vehicle is desirable for CBPS, the FMC Bradley XM4 is the clear choice for a CBPS alternative vehicle. The Bradley is the most agile, best protected, and most technologically advanced heavy armored vehicle with CBPS potential. If vehicle cost is a driving factor, the BMY UFDCV is a good second choice for a heavy armored tracked vehicle for CBPS. The FMC XM577A3 and Universal Carrier are also viable options if a less expensive heavy armored tracked vehicle is desired for CBPS provided that all manufacturer performance claims can be verified.

Vehicle cost also will be a determining factor in selecting which, if any, of the light armored wheeled vehicles is most acceptable for CBPS use. The LAV, the Commando V150/300 and the FOX all represent viable light armored wheeled vehicles for CBPS once modifications to accommodate the CBPS system have been made. Variants of the Commando V150/300, the FOX and the LAV are in US and Allied inventories. The FOX, while more expensive than either the LAV or the Commando V150/300, won the NBCRS competition presumably for its superior performance. Because operation in an NBC environment is a critical requirement for CBPS, the FOX appears to be the better choice.

Determining the cost and operational effectiveness of any of these vehicles is beyond the scope of this effort. The disparity in operating costs between wheeled and tracked vehicles further complicates the choice for a CBPS alternative vehicle. Accordingly, a complete systems analysis should be conducted to verify vehicle cost estimates, determine operational effectiveness and to identify actual vehicle modifications required for the vehicles investigated before an alternative vehicle is selected for CBPS.

This document reports research undertaken at the U.S. Army Natick Research, Development and Engineering Center and has been assigned No. NATICK/TR-94/022 in the series of reports approved for publication.