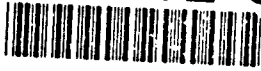


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**Mobile Firepower for Contingency Operations:
Emerging Concepts for U.S. Army Light
Armor Forces**

**A Monograph
by
Major James W. Shufelt Jr.
Armor**



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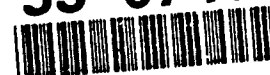
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ABSTRACT

MOBILE FIREPOWER FOR CONTINGENCY OPERATIONS: EMERGING CONCEPTS FOR U.S. ARMY LIGHT ARMOR FORCES by MAJ James W. Shufelt, Jr., USA, 68 pages.

This monograph discusses the adequacy of emerging concepts for the doctrine, organization, and materiel of light armor forces in the U.S. Army. The U.S. Army is currently developing new light armor organizations and procuring a modern light armor vehicle, due to deficiencies with existing light armor forces and the increased importance of contingency operations. In addition, emerging doctrine for these organizations addresses their employment on future contingency operation battlefields. This monograph evaluates the adequacy of emerging U.S. Army concepts for light armor forces in contingency operations against doctrinal considerations for contingency operations and the experiences of other armed forces.

This monograph first presents doctrinal considerations for U.S. Army contingency forces, based on the current and future version of the Army's keystone doctrinal manual, FM 100-5, Operations. Next, current and emerging concepts for the use of light armor forces by the U.S. Army are reviewed, followed by discussion of the light armor forces and operational experiences of two major Western users of light armor vehicles, South Africa and France. Analysis reveals that while the emerging doctrine, organization, and materiel for U.S. Army light armor forces generally satisfies keystone doctrinal considerations, the valuable experiences of other nations with light armor forces have not been applied.

This monograph concludes that emerging U.S. Army concepts for light armor forces in contingency operations should result in the more deployable armor organizations demanded by contingency operations requirements. Documented flaws in the doctrine, organization, and materiel of these forces, while important, should not be permitted to delay creation of these required forces. Finally, this monograph notes that despite flaws in emerging concepts for U.S. Army light armor forces, the number of light armor units is so small that improvement should be an evolutionary process, as occurred with French and South African light armor forces.

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Section 1 - Introduction

Too few strategically deployable light armor units and an obsolete light armor vehicle have been acknowledged deficiencies in U.S. Army contingency forces for many years. Unfortunately, potential solutions to these problems had extremely low priority in the Army budget and force design process prior to the demise of the Soviet Union, the dissolution of the Warsaw Pact, and the resulting redirection of the United States strategic focus. As recently as 1990, the Government Accounting Office (GAO) severely criticized the Army and the other services for failing to develop weapons systems designed for potential enemies other than the traditional Soviet threat. Two years later, the U.S. Army is moving rapidly to correct its light armor force deficiencies by procuring new light armor vehicles and developing new light armor organizations.

Currently, the 82nd Airborne Division's armor battalion is the only light armor unit in the U.S. Army force structure. This unit, the 3rd Battalion, 73rd Armor Regiment, is equipped with the M551A1 Sheridan Armored Reconnaissance Airborne Assault Vehicle (ARAAV), a lightly armored reconnaissance vehicle introduced during the Vietnam War.² Although the Sheridan and 3-73 Armor have faithfully served in numerous deployments and exercises throughout the world, American combat experiences in Operations JUST CAUSE, DESERT STORM, and DESERT SHIELD highlighted the urgent requirement to replace the obsolete M551A1 with a modern light armor vehicle.³

Major changes in the international security environment have also forced the U.S. Army to increase its focus on contingency operations and dedicated contingency forces. Despite the demise of the Soviet Union and the Warsaw Pact, many nations, friendly or otherwise, possess significant quantities of heavy and light armor vehicles.⁴ In addition, the increased threat of mid-intensity conflicts against well equipped Third World militaries requires different forces than a pure low intensity conflict (LIC) focus.⁵ As a result, while heavy forces faced major cuts over the last two years, few, if any cuts occurred in Army contingency forces. In addition, the vulnerability of U.S. Army and United States Marine Corps (USMC) light forces during Exercise DESERT SHIELD prior to the arrival of Army heavy forces highlighted the need in contingency operations for additional strategically deployable light armor forces.

Responding to demonstrated deficiencies in U.S. Army light armor forces and the U.S. Army's heightened concentration on contingency operations, the Army is aggressively developing new designs and equipment for its light armor force. Organizational and doctrinal initiatives include improvement of the existing light armor battalion (LAB) design and doctrine, the creation of two additional LABs, and an entirely new light organization, the light armored cavalry regiment (LACR). In addition, Army materiel developers recently selected the XM8 Armored Gun System (AGS) as the replacement for the M551A1.

Although the validity of the U.S. Army's requirement for improved light armor forces is clear, the U.S. Army may be rushing into inadequate or

incomplete solutions for deficiencies in the light armor force. Many other Western nations have used light armor forces for contingency operations; perhaps their experiences present pertinent lessons for U.S. light armor force designers. The French and South African armies, in particular, have successfully used light armor vehicles in contingency operations for many years -- the experiences of these forces may provide valuable insights for the emerging doctrine, organization, and materiel of U.S. Army light armor forces. There is, of course, no requirement for the U.S. Army to apply the military lessons of other nations blindly ; indeed, there may be numerous logical reasons to ignore these lessons. However, the lessons that other major western powers have determined concerning the use of light armor forces in contingency operations should serve as a common sense check on American concepts for light armor forces. French and South African Army experiences with light armor forces have particular relevance to this study because these organizations are similar in structure and size to the American Army, emphasize contingency operations, and have fought enemy armor forces trained and equipped by the Soviet Union or their allies.

Reflecting concern over the pace and direction of solutions to the deficiencies in the U.S.Army's light armor force, this study will evaluate emerging U.S. Army doctrine, organization, and materiel for light armor forces against: (1) selected considerations for contingency operations contained in the 1986 edition of FM 100-5 Operations and the 1992 preliminary draft version of the same document, and (2) lessons extracted from French and South African experiences

with light armor forces. The resulting monograph research question is: Do emerging U.S. Army concepts for light armor forces in contingency operations satisfy doctrinal considerations for contingency forces and reflect contemporary French and South African combat experiences with light armor forces?

This study will utilize the following methodology: (1) determine applicable current and emerging U.S. contingency force considerations, based on national security documents and U.S. Army doctrinal publications; (2) review the historical experiences, current characteristics, and emerging features of light armor forces in the American, French, and South African armies, to include determination of lessons from French and South African experiences with light armor forces; and (3) evaluate the adequacy of emerging U.S. Army doctrine, organization, and materiel for light armor forces, utilizing the general contingency force considerations developed earlier in the study and the experiences of the French and South African armies.

One requirement that must be satisfied prior to answering this study's research question is the definition of key terms used within the research question and the monograph text. The subject of this monograph, light armor forces, are military forces equipped with light armor vehicles -- lightweight, minimally armored, wheeled or tracked vehicles, equipped with gun or missile systems, designed to provide direct fire support.⁶ The type of operations that usually require these forces, contingency operations, are "... military operations

requiring rapid deployment to perform military tasks in support of national policy,"⁷ while force projection is "a demonstrated ability to rapidly alert, mobilize, deploy and conduct operations anywhere in the world."⁸ Doctrine, as utilized by the U.S. Army, is a statement of how an army operates on the battlefield; the primary sources of U.S. Army doctrine for this study are the 1986 and 1992 (preliminary draft) versions of FM 100-5, Operations and the preliminary draft of "FM 17-18, Light Armor Operations." A final key term, **organization**, pertains to the structure, including both personnel and materiel authorizations of a military unit.

Section 2 - American Contingency Force Considerations

Current U.S. Army considerations for contingency forces are derived from a variety of national defense policy sources, to include the President's National Security Strategy (NSS) and the Secretary of Defense's National Military Strategy (NMS). The current NSS, published in 1992, highlights the complexity of the contemporary international security situation, explaining that "... we [currently] confront dangers more ambiguous than those we previously faced. What type and distribution of forces are needed to combat not a particular, poised enemy, but the nascent threats of power vacuums and regional instabilities?"⁹ A consistent theme throughout the NSS is the increased importance and numerous challenges of contingency operations. Faced with the changing threat in Europe, the NSS notes the increased importance of regional contingencies, which will, in part, "... shape

how we organize, equip, deploy, and employ our active and reserve forces."¹⁰

The NSS also defines the challenge of developing technologies that permit forces to be lethal and yet more readily deployable and sustainable than today.¹¹

The NMS elaborates on the force requirements presented in the NMS, explaining that America's national defense strategy requires forces that are highly trained, highly ready, rapidly deliverable and initially self-sufficient.¹²

The 1986 version of FM 100-5 Operations, the U.S. Army's current keystone doctrinal manual, reviews a number of considerations for contingency forces: mission, adequacy, deployability, supportability, affordability, availability of forces, and use of indigenous forces.¹³ Of these considerations, the following are usable in this study as evaluation criteria:

1. **Adequacy.** A trained force capable of performing tasks determined from the mission analysis process is available in the force structure.¹⁴ In other words, if a mission analysis determines that a light armor force is necessary for success of a contingency operation, an appropriately trained, equipped, and organized light armor force should exist in the Army structure.

2. **Deployability.** Means must be available to deploy forces to the contingency area of operations.¹⁵ Deployability is a function both of the physical characteristics of an organization and its equipment, and the capability of the allocated deployment means. A light armor force is more deployable than a regular armor unit because of the reduced size and weight of its equipment, but if

suitable aircraft are not available to support unit deployment, light and heavy units may be equally deployable.

3. Supportability. Logistic support assets must be available to support and sustain the contingency force throughout the time period necessary for mission accomplishment.¹⁶ Support and sustainment operations include provision of fuel, maintenance, and ammunition for the deployed force.

4. Affordability. The forces and other resources determined necessary for successful accomplishment of a contingency operation must be weighed against vital missions elsewhere.¹⁷ This consideration concerns the relative importance of the specific contingency mission and the quantity of light armor units available. If only one light armor battalion exists -- the current situation in the U.S. Army -- its use must be evaluated against other possible contingencies. Obviously, the more light armor units that exist, the more likely their employment if mission analysis determines they will be necessary or useful. At the same time, the total number of light armor forces in the force structure must be supported by existing and postulated contingency operation requirements.

Emerging requirements for contingency forces are also apparent in NATO's evolving missions in the wake of the demise of the Soviet Union and the Warsaw Pact. American General John Galvin, Supreme Allied Commander Europe (SACEUR), described NATO's new strategy during an April 1992 interview as "... a strategy of crisis response, inviting an understanding that we are not simply getting ready for some massive defense against massive attack."¹⁸

The SACEUR then predicted that a future conflict involving NATO might be a ". . . modern, high intensity, three dimensional, multinational and highly mobile war," highlighting the fact that contingency operations are not necessarily low intensity, small scale operations involving lightly equipped adversaries.¹⁹ The importance of this new strategy is also apparent in NATO's development of a multinational contingency corps designed, in part, for deployment outside of the traditional NATO area of operations. Interestingly, despite changes in NATO's focus and organization, the SACEUR's comments reinforce the continued importance of adequacy as a key consideration for contingency force design. GEN Galvin's comments clearly illustrate that the warfighting capability required to accomplish a mission is paramount in force design. Mere deployability is immaterial if the deployed force is incapable of performing necessary combat tasks.

Proposed changes to U.S. Army doctrine elucidated in FM 100-5 (Preliminary Draft) illustrate the U.S. Army's philosophic and practical change from a "forward defense" army to a "force projection" army and highlight the increased importance of contingency force operations. This document also presents key considerations for force projection operations. These considerations are anticipation, versatility, force tailoring, intelligence, logistics, command, communications, special operations forces, training, public affairs, combined operations, and interagency operations.²⁰ Of the twelve considerations, two -- versatility and force tailoring -- are new and useful criteria for evaluating

emerging light armor force doctrine, organization, and materiel. Versatility refers to the ability of a unit to accomplish a diverse set of missions in a variety of locations throughout the world.²¹ Versatility is a function both of the flexibility of a unit's doctrine, organization, and materiel and the breadth and depth of the individual, unit, and leader training in an organization. Force tailoring is the process of configuring task-organized units, based on the mission, deployment options, and unit capabilities.²² Force tailoring is based on existing and potential mission requirements, and is facilitated by habitual relationships between units, detailed SOPs, and common or similar doctrine, organization, and materiel.

The resulting criteria that this study will utilize to evaluate the adequacy of emerging U.S. Army doctrine, organization, and materiel for light armor forces in contingency operations are a combination of the considerations for contingency forces extracted from the 1986 version of FM 100-5 and the 1992 preliminary draft of the same manual: adequacy, deployability, supportability, affordability, versatility, and force tailoring.

Section 3 - Light Armor Forces

The U.S. Army and Light Armor Forces:

Despite the U.S. Army's extensive historical experience in contingency operations, the U.S. Army's recent combat experience with light armor forces in contingency operations is limited. This limited experience is due to a variety of

factors to include actual mission requirements, available means for force deployment, and the limited quantity of light armor units available for contingency operations. Many contingency operations have no requirement for light armor forces because the contingency operation does not involve an opponent with credible armored forces. Similarly, the rapid nature of most contingency operations demands primary reliance on airlift for force deployment; diversion of this critical resource for light armor force deployment is only justified if the mission truly requires the immediate presence of light armor units for force protection or mission accomplishment. Finally, with only a single LAB in the current U.S. Army force structure, deployment of this battalion or its subordinate elements must be evaluated against the requirements of all other possible contingencies. The end result is a low probability that the 82nd Airborne's LAB will deploy for a typical contingency operation.

Although U.S. Army light armor forces were deployed for OPERATION JUST CAUSE, the U.S. military's December 1989 victory over the Panamanian Defense Force (PDF), the actual number of Sheridans deployed to Panama was very small -- a single company from 3-73 Armor-- due to limited requirements for light armor forces and the difficulty of clandestinely deploying the vehicles to Panama prior to the operation. Four Sheridans, in combination with USMC Light Armored Vehicles (LAVs) and 5th Infantry Division M113 Armored Personnel Carriers (APCs), did play a major role in the capture of the PDF headquarters, the Commandancia.²³ The remainder of the company, dropped by parachute onto

Tocumen Military Airfield and Omar Torrijos International Airport on 20 December 1989, performed convoy security operations and assisted in the reduction of PDF strongpoints in Panama City.²⁴ Despite the successful integration of the 82nd Airborne Division's Sheridans with infantry forces throughout this operation, the performance of the Army's light armor forces during Operation JUST CAUSE was limited by the obsolescence of the Sheridan. Lacking sophisticated modern fire control systems and thermal sights, the Sheridans had limited night utility.²⁵ In addition, the advanced age of the Sheridans made maintaining adequate materiel readiness a constant struggle throughout the operation.²⁶

The initial phase of OPERATION DESERT SHIELD, clearly a contingency operation involving a significant enemy armor threat, presented a legitimate requirement for the deployment of the 82nd Airborne Division's entire LAB. However, the vulnerability of the 82nd Airborne Division prior to the arrival of U.S. Army heavy forces demonstrates the U.S. Army's need for additional light armor forces, if only for contingency force protection.

The U.S. Army's current light armored force doctrine, organization, and materiel clearly reflect the specific experiences of the 82nd Airborne Division's LAB, 3-73 Armor. Accordingly, current light armor doctrine focuses primarily on direct fire support to airborne infantry units, while the current LAB organizational design reflects its normal employment: attachment of an armor company with each combat brigade of the 82nd Airborne Division. In addition,

the peacetime and combat operations of 3-73 Armor demonstrate numerous deficiencies of the M551A1 Sheridan. In addition to the deficiencies identified during Operation JUST CAUSE, additional problems with the Sheridan include its inadequate armor and the limitations of its 152mm main gun: insufficient range and long time of flight, due to the trajectory of its oversized ammunition.²⁷

Reflecting the lessons of JUST CAUSE and DESERT STORM, emerging doctrine, organization, and materiel for U. S. Army light armor forces focuses on improvement of both the number and capability of U.S. Army light armor units available for contingency operations. Draft LAB doctrine, contained in the preliminary draft of FM 17-18, Light Armor Operations, retains a primary focus on the operation of light armor units in support of light infantry units. This draft doctrine also recognizes the role of light armor forces in contingency operations, to include traditional tactical missions in support of light infantry forces as well as standard armor force operations. The requirement for "rapid strategic and tactical worldwide deployment" is highlighted, as is the need to operate in a wide variety of political, military, and geographic environments.²⁸

The bulk of the draft doctrine for light armor operations addresses the employment of these forces in a traditional light infantry support role, accomplishing missions such as close assaults with infantry, infantry and armor combined arms battle drills, reduction of obstacles, enhancing the mobility of dismounted infantry units, combat operations in urban environments, defense in strongpoints, convoy security, mobile reserve, rear area operations, and

Noncombatant Evacuation Operation (NEO) support.²⁹ Similarly, FM 17-18 identifies a variety of standard security and reconnaissance missions that can be performed by the LAB either with or without the division's cavalry assets, to include guard, screen, covering force, zone or area reconnaissance, reconnaissance in force, and route reconnaissance, clearance, and security.³⁰ The draft doctrine also notes that light armored forces can perform standard armor missions requiring "massed direct, heavy caliber firepower, mobility, and shock effect," such as deliberate attack, movement to contact, hasty attack, counterattack by fire, limited penetrations, and exploitation.³¹ While FM 17-18 recognizes that light armor units may be required to perform reconnaissance, security, and armor missions, the manual does not explain how light armor units perform these operations; rather, the manual refers the reader to FM 71-1, The Tank and Mechanized Infantry Company Team and FM 71-2, The Tank and Mechanized Infantry Battalion/Task Force and then devotes the remainder of the manual to light armor platoon, company, and battalion operations with light infantry units.

Reflecting the "newness" of additional light armor forces in the U.S. Army, doctrine for the light armored cavalry regiment (LACR) is still in the concept development stage. Indeed, doctrine for this new organization is limited to general concepts for employment of the organization and reflects the fact that this organization is primarily based on existing armored cavalry regiment (ACR) doctrine, organization, and materiel. For example, the objective design LACR

squadron can perform the same missions as its ACR ancestor: reconnaissance, security, and economy of force.³²

The U.S Army Training and Doctrine Command (TRADOC) is currently developing an updated LAB organizational design and a series of organizational designs for the LACR. The organizational design for the LAB presented in FM 17-18 (see appendix A) is based on the current armor battalion design, with the only significant difference the substitution of light armor vehicles for the M1 tanks in the current armor battalion design. This organizational design specifies a battalion headquarters company (HHC) and four light armor companies.³³ The HHC consists of scout, medical, maintenance, support, communications, and mortar platoons.³⁴ Each light armor company consists of a company headquarters, equipped with two armored gun systems, and three light armor platoons of four armored gun systems each.³⁵ According to Combined Arms Command - Combat Developments (CAC-CD) representatives, this organization is not finalized, however, with inclusion of the scout and mortar platoons the primary point of contention.³⁶

Similarly, the objective design of the LACR (see appendix A) is based on the existing ACR design, updated with new or lighter armor vehicle. The decision to model the organization of the LACR on the existing ACR design was based on the following factors: the basic design of the ACR is combat-proven, the ACR design is optimized for security missions but is capable of performing reconnaissance missions, and standardization of design minimizes turbulence in

institutional training and results in less turbulence for individual soldiers rotating between different cavalry organizations. The resulting organization is more than 50% lighter than a traditional ACR.³⁷

The proposed LACR design specifies the following organizations: a regimental headquarters and headquarters troop (HHT), a chemical company, an air defense artillery battery, an engineer company, a military intelligence company, a non-line-of-sight anti-tank company, three light armored cavalry squadrons, a regimental aviation squadron, and a support squadron. Paralleling existing ACR squadron organizational design, the light ACR squadron consists of an HHT; three light armored cavalry troops equipped with M113A3 scout vehicles, armored gun systems, and 120mm mortars; a light armor company with fourteen armored gun systems; and an artillery battery with eight self-propelled 155mm howitzers.³⁸

The key materiel component of the LAB and LACR designs is the XM8 Armored Gun System (AGS), the replacement for the M551A1. The basic design priorities for the AGS are deployability from United States Air Force (USAF) tactical airlift aircraft, sufficient lethality to destroy threat main battle tanks (MBTs) at extended ranges, adequate armor protection to protect crewmembers against artillery blasts and direct fire weapons up to light antitank weapons, and sufficient sustainability to allow an AGS-equipped unit to fight with minimal external support.³⁹ Reflecting these basic design priorities, the preliminary AGS requirements specified a weight of less than 17.5 tons in an airdrop configuration,

mandated armor protection and mobility at least equal to that of the M551A1, and required an M60A3-level fire control system with full main gun stabilization and a low-recoil 105mm main gun.⁴⁰

In June 1992, the U.S. Army's Tank and Automotive Command (TACOM) awarded FMC Corporation a 46 month development contract for production of six prototype vehicles, a hull and turret for ballistic testing, and a technical data package for a manufacturing program, based on FMC's Close Combat Vehicle Light (CCVL). Low rate production of the AGS is scheduled for September 1994, with first delivery in late 1996 or early 1997 to the 82nd Airborne Division. Fielding of the AGS to the 2nd ACR (Light) is scheduled for 2000, with the fielding of two additional LABs in 2001-2002.⁴¹

Selected characteristics of the FMC AGS design include a main gun auto-loader, reduction of crew size to three men, a twenty-one round main gun ammunition magazine with an additional nine rounds stored in the hull by the driver, a tracked propulsion system with low ground pressure (8.7 lbs/in²), and a governed maximum speed of 45 miles per hour. In addition, the XM8's 150 gallon fuel capacity provides a 300 mile cruising range. Development costs and AGS-unique maintenance requirements are minimized through maximum use of existing military components, to include the XM-35 105mm main gun, the M977 HEMMT engine, the M2/M3 IFV/CFV transmission and power control handles, Challenger II MBT fire control components, and LAV-105 primary sight units.⁴²

Other XM8 technical characteristics are presented in appendix B, including comparisons with other armor vehicles.

The XM8 is designed for deployment by a variety of deployment means, to include sealift and airlift. The physical dimensions and weight of the XM8 permit the transport of one XM8 on a C-130 transport aircraft, two XM8s on a C-141 aircraft, and up to three XM8s on a C5-A or C-17 aircraft.⁴³ The key to the XM8's strategic deployability is its modular add-on armor packages, which allow configuration of the XM8 to meet the weight and height restrictions of various deployability methods. The basic XM8 configurations are summarized in Table 1.⁴⁴

Table 1 - XM8 Delivery Methods

Delivery Method	XM8 Weight	Protection Level	Remarks
Parachute	17.8 Tons	Level I (Artillery fragments and small arms)	Cupola and basic load delivered separately
C130 Roll-on and Roll-off	19.2 Tons	Level I (Artillery fragments and small arms)	
C141 Roll-on and Roll-off	21.2 Tons	Level II (Heavy machine guns and light cannons)	
C5A Roll-on and Roll-off	24.8 Tons	Level III (Cannon up to 30mm)	

As the XM8 configuration matrix indicates, the XM8 is not designed to have the same level of crew protection as a modern MBT, such as an M1A1 or LEOPARD II. Instead, the XM8 crew is forced to rely on the XM8's speed and agility to fight even the oldest MBTs that it might face.

The XM8 has not been significantly shortchanged in armament or fire control. Its 105mm main gun is capable of firing projectiles that can defeat all but

the most modern MBTs, while its fire control system includes full turret stabilization and a thermal sight unit. The recoil of the 105mm cannon mounted in the XM8, normally a significant problem in armored vehicles as light as the XM8, is reduced by utilization of a long recoil stroke and a muzzle brake. The selection of this caliber of main gun was based on the widespread availability of NATO standard 105mm ammunition and the range of threats that the XM8 is postulated to face.⁴⁵

The French Army and Light Armor Vehicles:

The French Army has utilized light armor forces and wheeled light armor vehicles in its conventional and contingency forces since the end of World War II. The primary reasons cited for the French Army's reliance on wheeled light armor vehicles are the light weight of these vehicles and their improved supportability compared to tracked vehicles.⁴⁶ In addition, the French Army believes that these vehicles are especially suited for contingency operations because they possess adequate strategic and tactical mobility, as well as sufficient armament to effectively defeat the typical armor systems in most Third World nations: T-54/55/62 tanks.⁴⁷

The French Army's rapid deployment force, the Force d'Action Rapide (FAR), has relied on light armor forces since its creation, deploying these forces in operations throughout the world, to include Africa and the Middle East. Light armor vehicles easily meet the basic design characteristics of all vehicles in the

FAR: air transportable, amphibious, mechanically reliable, simple to operate, and easily supported logistically.⁴⁸

The FAR was formed in 1983 from existing units in the French Army and is designed to provide forces to support France's many defense agreements with other nations, especially its former colonies in Africa, while retaining the capability to assist in the defense of continental France.⁴⁹ The creation of the FAR reflects general French principles for contingency operations: prevent crises by prepositioning forces and equipment, protecting forward airfields, and maintaining a robust military retaliation capability.⁵⁰ Basic characteristics of the FAR include its power projection capability, achieved through the strategic and tactical mobility of its forces, and its firepower, enhanced through a balanced combination of assets. In addition, the FAR possesses tactical flexibility, achieved through its modular structure, modern communications systems, and a robust capability for joint operations developed from numerous joint exercises. Finally, the FAR has a proven capability to rapidly react to crises, provided by its professional soldiers, high state of readiness, and mature alert system.⁵¹

The FAR has extensive experience with contingency operations since its organization. FAR deployments in support of United Nations peacekeeping operations include Beirut (1984), Aden (1986), Cambodia (1991), and Bosnia/Croatia (1992).⁵² Units of the FAR have also deployed to Africa on numerous operations, to include a series of major operations in Chad from 1983 to 1992 during which FAR elements, including light armor forces, and Chadian light

armor units successfully fought and defeated Soviet-equipped Libyan Army forces.⁵³ In addition, French Army forces deployed for Operation DESERT STORM included the light armor forces of the FAR's 6th Light Armored Division, augmented with a regiment of AMX30B MBTs and additional artillery.⁵⁴ Finally, recent newspaper stories report that French peacekeeping forces in Yugoslavia will shortly include light armor forces.⁵⁵

The primary fighting forces assigned to the FAR are five combat divisions: the 9th Marine Infantry Division, the 11th Parachute Division, the 27th Mountain Infantry Division, the 4th Airmobile Division, and the 6th Light Armored Division.⁵⁶ All of these units, except for the 4th Airmobile Division, contain light wheeled armor units. The 11th Parachute and 27th Mountain Divisions' light armor forces consist of a single armored cavalry regiment, while the 9th Marine Infantry and 6th Light Armored Divisions both contain two armored cavalry regiments and two motorized infantry regiments. An organizational diagram for a French armored cavalry regiment is at appendix A.⁵⁷

Current doctrine, organization, and materiel for French light armor forces reflect the French Army's concept of tailoring organizations for specific contingency operations. Based on the unique requirements of each crisis situation, units are selected from both FAR assets and French Army conventional forces. These forces are then task-organized into temporary combined arms organizations. If the situation demands a significant antitank capability, the basic

building blocks of the task force will be armored cavalry and mechanized infantry units.⁵⁸

Despite the difficulty of creating temporary task forces for specific contingency operations, the French Army's doctrine for contingency forces is much less detailed than comparable U.S. Army doctrine.⁵⁹ In fact, the French Army currently has no specific doctrine for the use of light armor forces in contingency operations, although such doctrine is in development at the French Armor School. Lacking specific doctrine for the employment of light armor forces in contingency operations, the French Army relies on the initiative and improvisation capabilities of junior leaders to arrive at appropriate solutions to tactical problems presented in contingency operations.⁶⁰

The primary light armor vehicles used by the French Army are the AML-245 armored car, the ERC-90 armored reconnaissance vehicle, and the AMX10RC armored reconnaissance vehicle. Although no longer used by active units in the French Army, the AML-245 series of armored cars was one of the most successful western armored cars ever produced. More than 4800 AML-245s were produced in France from 1961 to 1987 and more than 30 nations still utilize variants of this vehicle. In addition, South Africa has manufactured an additional 1300 AML-245s under license. The primary variants of the lightweight (6 ton) 4X4 AML-245 are the AML-60, which mounts a 60mm mortar in its turret and the AML-90, equipped with a 90mm main gun.⁶¹

The ERC-90 SAGAIE is the current standard armored car of the FAR, replacing AML-90s in the 11th Parachute and 27th Mountain Divisions' armored cavalry regiments. First fielded in 1984, the 9 ton ERC-90 is designed to meet specific French intervention force requirements: transportable on the C160 TRANSALL aircraft, amphibious, light enough to use typical African bridges, and capable of defeating T-72 MBTs.⁶² The 6 wheeled ERC-90's welded steel hull provides increased crew protection, compared to the AML-245, as well as improved automotive performance and mechanical reliability, while being cheaper and lighter than the AMX10RC.⁶³

The AMX10RC is the primary light armor vehicle currently used by the 6th Light Armored and 9th Marine Infantry Divisions' armored cavalry regiments, as well as armored cavalry regiments not assigned to the FAR. First fielded in 1979, more than 400 AMX10RCs have been produced by GIAT industries for the French, Singapore, and Moroccan Armies. The 17.5 ton airliftable AMX10RC has a 6 X 6 wheeled drive configuration, a 105mm main gun, and a level of mobility claimed to be equal to an MBT.⁶⁴ This vehicle has been extensively used in French contingency operations, to include Operation MANTA in Chad (August 1983 - November 1984) and Operation DESERT STORM, where its reliability and maneuverability were praised by users.⁶⁵ This vehicle is not without its critics, however. Many French armored cavalrymen dislike the AMX10RC, believing it too large and heavy for properly conducting mounted reconnaissance operations. In addition, the AMX10RC is faulted for

looking like a tank, while lacking the protective armor of a tank.⁶⁶ Illustrating the French Army's recognition of the limitations of this vehicle, the 6th Light Armored Division was immediately augmented with an AMX30B MBT Regiment when the division was alerted for duty in Saudi Arabia for Operation DESERT STORM. In addition, the 6th Division's AMX10RCs were upgraded in Saudi Arabia with additional turret armor and improved 105mm kinetic energy ammunition.⁶⁷

Lessons From French Experiences with Light Armor Forces:

The French Army has recognized a variety of lessons concerning the utility of its light armor vehicles and forces. Colonel Castillon, the French LNO to Fort Leavenworth in 1986 and a former armored cavalry regiment commander, stated that "Fast mobile forces are the key to effective operations in the desert. . . . our AMX10RC wheeled light tank has proved to be the light, rapid, reliable armored vehicle we need on sand as well as on roads."⁶⁸ The official French Army lessons from the 6th Light Armored Division's service in Operation DESERT STORM, according to the current French LNO to Fort Leavenworth, include the demonstrated adequacy of the FAR's strategic and tactical mobility, as well as the successful interoperability achieved both within and outside of the FAR.⁶⁹ In the wake of Operation DESERT STORM, however, numerous faults of the French armed services have been publicly highlighted, to include the obsolescence of French aircraft and MBTs, inadequacy of French military

intelligence systems, and shortages of ammunition.⁷⁰ No specific faults with the FAR's light armor forces were identified, however, confirming the general success of the doctrine, organization, and materiel of these forces.

Still, there are several lessons demonstrated by the French Army's combat experiences with light armor forces. The foremost lesson is the French Army's realization that a light armor vehicle should not be employed as an MBT unless no other option is available. This lesson is demonstrated by the FAR's use of MBTs for Operation DESERT STORM, where the enemy armor threat demanded more capable vehicles than the 6th Division's AMX10RCs. In addition, the French Army recognizes that contingency forces should be task-organized based on the unique requirements of each contingency operation. Finally, the numerous deployments of the FAR since 1983 demonstrate the French Army's realization that all units in a task-organized contingency force must have comparable tactical mobility. As a result, regardless of the type of infantry unit selected for deployment, battlefield ground transportation means are normally provided in the contingency area of operations.

Planned future developments for French light armor forces include organizational enhancements and a new family of light armor vehicles. For example, the French Army is considering the addition of a fourth armored cavalry squadron to each armored cavalry regiment, further increasing the regiment's flexibility and combat power.⁷¹ In addition, the French Army is planning to increase the tactical mobility of the airborne infantry units in the FAR through the

provision of sufficient VAB APCs in each airborne regiment to transport one company.⁷² Finally, the French Army is currently planning its next generation of armor vehicles, the VBM family of vehicles. A 17 to 18 ton troop transport vehicle and a 30 to 35 ton direct fire support vehicle are two potential VBM variants. These vehicles will match the mobility of the new French MBT, the LECLERC, and will replace the existing AMX10 and VAB series of vehicles. Recognizing the success of their predecessors and the continued importance of strategic mobility requirements, the VBM vehicles will probably retain wheeled drive systems, while resolving shortcomings of the AMX10 and VAB designs.⁷³

The South African Defense Force and Light Armor Vehicles:

The South African Defence Force (SADF), the other leading Western user of wheeled light armor vehicles, indeed the most powerful and best equipped military force south of Egypt, relies on lightly armored wheeled reconnaissance and fire support vehicles to provide strategic and tactical mobility, as well as direct fire support, for its border security and counterinsurgency units.⁷⁴

Although its military operations were not well-publicized in the United States, the SADF conducted an extensive series of combat actions in Namibia and Angola from 1975 to 1989. During this period, SADF units, consisting primarily of task-organized motorized infantry and armored reconnaissance units equipped with light armor vehicles, fought and defeated Angolan rebel forces up to brigade size that were trained, equipped, and supervised by the Soviet Union and Cuba.

The SADF has four general missions: internal security, counter-terrorism, conventional combat, and border/counter-insurgency operations.⁷⁵ The first two missions are primarily accomplished by paramilitary security police organizations, while the last two missions are accomplished by the military components of the SADF.⁷⁶ A mobilization-based army, the few standing units in the SADF are primarily organized to conduct contingency operations: border security, raids, and economy of force operations pending mobilization and transportation of heavy forces. These units are threat and terrain-oriented; the design of these forces is optimized for the use of quick, highly mobile infantry combat vehicles (ICVs), proven to be successful in the vast expanses of the country and border areas.⁷⁷

Like the French Army, SADF doctrine for contingency operations stresses combined arms, junior leader initiative, leadership from the front, and aggressive offensive operations, rather than detailed, prescriptive doctrine.⁷⁸ An example of a typical combined force used in South Africa's numerous actions in Angola was the 61st Mechanized Battalion Group, formed from the Namibia-based 61st South African Infantry Battalion. This group, which participated in every major SADF operation in Angola from 1979 to 1989, totaled approximately 1200 personnel and 326 vehicles when it participated in Operation HOOPER in 1987. Clearly demonstrating the SADF's belief in task organization, the components of the 61st Mechanized Battalion Group for this operation included mechanized infantry, armored reconnaissance, armor, and artillery units.⁷⁹

An MBT company was included for this operation because of the increasing number of Soviet-supplied T-54/55 tanks facing the South African forces. While the SADF's standard fire support vehicle, the RATEL/90, is capable of defeating most MBTs with a well-placed main gun round, its only protection against enemy MBT fires is its mobility advantage. Accordingly, the SADF gradually developed tactics similar to those used by French-trained Chadian forces when fighting Libyan armor forces: employ highly mobile light armor vehicles to lure enemy armor forces into prepared antitank weapon ambushes, then destroy the enemy MBTs with friendly MBT, ATGM, and artillery fires.

The SADF possesses a large fleet of armor vehicles, consisting of approximately 250 OLIPHANT MBTs, 1600 ELAND armored cars, 1500 RATEL-family mechanized infantry fighting vehicles, and 1500 other APCs and fire support vehicles. The OLIPHANTs are modernized British Centurian tanks with 105mm main guns. Although the latest version of the OLIPHANT is capable of defeating T-54/55/62 tanks and possibly T-72 MBTs, if required, the OLIPHANT's lack of strategic mobility and extensive logistic and maintenance requirements severely restrict its utility in any operation. In addition, the terrain of most of southern Africa is more suitable for wheeled operations; accordingly, all of the SADF's armor vehicles, except for the OLIPHANT and its recovery variant, are wheeled.⁸⁹

The primary armor vehicles currently used by the SADF, other than the OLIPHANT, are the ELAND armored car, the RATEL family of vehicles, and a new vehicle, the ROOIKAT combat reconnaissance vehicle. The ELAND is the South African version of the French Army's AML-245 armored car. Versions of the ELAND used by the SADF include 90mm main gun, and 60mm mortar, and 20mm cannon equipped models.⁸¹ The ELAND is primarily used as an armored reconnaissance vehicle, providing long-range reconnaissance and security for mechanized infantry forces.

Recognizing the requirement for a modern infantry fighting vehicle, the SADF developed the RATEL family of vehicles. Incorporating lessons learned from South Africa's years of border and counterinsurgency operations, the 6 X 6 RATEL incorporates many features designed to improve crew and vehicle protection from mine blasts, to include a welded steel monoque hull with a pronounced vee-shaped profile. The SADF uses many different configurations of RATELs, to include versions equipped with machine guns, cannons, mortars, 90mm main guns, and command and control systems.⁸²

The ROOIKAT, the South African Army's newest light armor vehicle, was specifically developed because of operational deficiencies in the ELAND/90 and RATEL/90 demonstrated during combat operations in Angola. Although the ELAND/90's HEAT ammunition was capable of defeating Angolan T-54 and T-55 tanks at short ranges, the inferior cross-country mobility of the ELAND, especially compared with RATEL-mounted infantry units, highlighted the

ELAND's obsolescence. The RATEL/90, created by mounting the ELAND/90 turret on the RATEL chassis, was an expedient solution to this problem, but the effectiveness of its low pressure 90mm main gun against more modern MBTs was questionable. In addition, the RATEL/90 was handicapped by its rudimentary fire control system and lack of a main gun stabilization system. As a result, the South African Army began evaluating a potential replacement for the ELAND/90, the ROOIKAT, in 1976.

The ROOIKAT design selected for production has a 27 ton 8 X 8 wheeled drive configuration. The vehicle's welded steel hull provides crew protection against small arms, artillery fragments, and armor piercing cannon rounds up to 23mm, as well as mine blasts. A high velocity 76mm main gun enables the ROOIKAT to defeat enemy T-54/55/62 MBTs from all angles of attack at ranges up to 2000m using armor-piercing fin-stabilized discarding sabot tracer (APFSDST) rounds, while allowing more ammo storage than afforded by a larger weapon. The main gun is also capable of firing a high explosive-tracer (HE-T) round for direct and indirect fire support. Modern fire control systems support stabilized target engagement during cross-country movement, while passive night sights enhance the vehicle's night capability. Other key design features of the ROOIKAT are its high cross-country mobility and 1000 km radius of operation. The ROOIKAT's primary role is reconnaissance; when fully fielded, it will replace most of the ELAND/90s currently used by the SADF's reconnaissance units.⁴³

Lessons from South African Experiences with Light Armor Units:

Although its light armor vehicles were adequate for most operations against Angolan rebel forces, the SADF found it necessary to activate reserve MBT units when faced with a significant armor threat. Once these heavy forces had deployed to the Angolan area of operations, SADF contingency forces relied on the OLIPHANT MBTs and highly accurate indirect fire systems to destroy Angolan armor forces. The SADF's activation of MBT units demonstrates the SADF's realization of the firepower and protection shortcomings of light armor vehicles.

The SADF has also developed highly-mobile logistic support vehicles designed to support platoon size light armor and infantry units. The platoon support version of the RATEL, for example, is designed and equipped to support a mechanized infantry or armored reconnaissance platoon for seven days of operations.⁸⁴ In addition, the SADF is considering the development of a ROOIKAT-based platoon support vehicle.⁸⁵

Future developments in the SADF include organizational restructuring, major budget reductions, doctrinal initiatives, and continued fielding of the ROOIKAT. The SADF is also studying the feasibility of upgrading the ROOIKAT with a 105mm main gun to improve its ability to defeat modern MBTs, although this change may be driven more by a desire to sell the ROOIKAT outside of South Africa than by local armor threats.⁸⁶

Section 4 - Analysis of Emerging U.S. Army Concepts for Light

Armor Forces

The following section of this study analyzes emerging U.S. Army concepts for the doctrine, organization, and materiel of light armor forces, using the contingency force considerations developed in section 2 - adequacy, deployability, supportability, affordability, versatility, and force tailoring. In addition, the lessons determined from French and South African use of light armor forces, presented in the preceding section of this study, are used to examine emerging U.S. army concepts for light armor forces.

Analysis of Emerging Doctrine:

Although there is no explicit requirement for light armor forces in Army keystone doctrine, current and future versions of FM 100-5, Operations recognize the increased importance of contingency operations and the need for more deployable Army forces. Emerging doctrine for light armor forces recognizes the limitations of these forces and focuses on their most likely employment with light infantry units, but fails to adequately address other possible employment options, such as employment of light armor forces with heavy armor, mechanized infantry, or antitank units.

Adequacy. Existing and emerging army doctrine does not explicitly recognize a requirement for light armor forces in the army force structure. For

example, the 1986 version of FM 100-5, Operations describes six types of maneuver units: light infantry, mechanized infantry, motorized infantry, armor, cavalry, and aviation. In addition, the discussion of armor units in this manual does not specifically address either heavy or light armor units, although it does identify the slow strategic deployability of armor units as a key limitation, "... because their weight and amount of equipment require deployment by sea."⁸⁷ Similarly, the 1992 preliminary draft of FM 100-5 does not specifically address light armor units, although it does delete any references to the slow deployability of armor units in its discussion of types of forces in the military.⁸⁸

Deployability. Emerging doctrine recognizes the existence of a tradeoff between the speed of deployment and the magnitude of ground firepower necessary for a contingency operation. This does not preclude the use of heavier forces in a contingency operation, however, as the 1992 preliminary draft of FM 100-5 explains:

Often a rapidly deployed force can resolve a crisis and achieve theater aims faster and with a smaller commitment of forces than a larger but slower response option. Accordingly, all types of Army units -- light, armored, and special operations forces -- must be prepared for deployment.⁸⁹

Supportability. Emerging light armor doctrine recognizes the criticality and inherent difficulty of supporting light armor units in their usual situation: attached to light infantry forces; FM 17-18 (Preliminary Draft) states that "Light Infantry units are not equipped to support the LAB's combat service support (CSS) needs, especially in Class III and Class IX."⁹⁰ The doctrinal answer to this

limitation is task-organized support packages from the LAB's CSS assets and available division and corps support assets, although this solution depends on sufficient strategic lift to deploy these additional CSS assets.⁹¹

Affordability. Emerging doctrine does not specifically address the issue of force affordability. FM 17-18 does, however, note that suitability and availability are two major considerations when the use of light armor forces is considered in any type of contingency operations.⁹²

Versatility. FM 100-5 (Preliminary Draft) stresses that the Army must be "... ready to go virtually anywhere, at any time, in different mixes and combinations of forces, for varying purposes, in war and operations other than war."⁹³ Similarly, FM 17-18 recognizes that light armor forces must be prepared to operate in any state of the operational continuum -- peacetime competition, conflict, and war -- anywhere in the world, against a wide variety of threats.⁹⁴

Force Tailoring. Combined arms operations is a fundamental principle of Army doctrine, according to both versions of FM 100-5.⁹⁵ Demonstrating this fundamental principle, FM 17-18 states that light armor platoons and companies are normally employed with light infantry forces of squad through brigade size, as dictated by mission requirements. In addition, this manual recognizes that LABs may be employed as a division or corps maneuver force.⁹⁶ However, FM 17-18 does not address other attachment situations, such as the possible employment of light armor forces with armor, mechanized infantry, or antitank units. All of these situations are possible in contingency operations and should be addressed by

doctrine. Finally, although FM 17-18 relies on existing armor doctrine to handle these situations, this reliance may be inappropriate because of the questionable applicability of existing armor doctrine, due to the significant differences in the lethality and protection characteristics of an AGS-equipped unit and a MBT-equipped unit.

Evaluation of Organizational Concepts:

The proposed organizational designs for light armor forces closely parallel successful existing designs for the M1-equipped armor battalion and ACR. Although modeling new light armor organizations on existing armor organizations greatly simplifies the force design process, the result may not reflect actual mission requirements or employment considerations for the new organizations. In addition, the characteristics and limitations of the primary weapon system of these new light armor organizations -- the XM8 AGS -- should be a major factor in the organizational design process.

Adequacy. Plans for two different types of light armor organizations ensure the proper type of light armor force is available for different types of contingency operations. The LAB is designed for task organization with light infantry units and is optimized for deployment by strategic airlift. Although capable of traditional armor missions, the LAB will probably devote most of its assets to support of light infantry organizations. In contrast, the LACR is an innately combined arms organization, possessing greater flexibility and firepower

than the LAB. The LACR's most probable deployment is as a reinforcing organization following the initial deployment of light forces, because of its sealift requirements, with its most likely employment the performance of traditional armored cavalry missions.

Deployability. Organizational designs for the LAB and the LACR, although paralleling existing heavy organizations, are inherently more deployable than heavy organizations because of the smaller size and weight of their primary fighting vehicles. In addition, both types of light armor organizations can be reorganized into smaller, more deployable sub-units, such as platoons and companies/troops.

Supportability. Although the LAB and LACR designs have sufficient flexibility in their organizational designs to create support packages for detached sub-units, these units are still heavily dependent on support not normally available from light infantry organizations. The LACR is the more supportable of the two organizations, because of the robustness of its organic support assets. The price of this robustness, however, is the reduced deployability of this organization.

Affordability. Three LABs and a single LACR should be adequate to cover a wide variety of possible contingency operations and provide sufficient forces for peacetime training, although the difficulty of creating new organizations in light of current and future U.S. Army strength and budget reductions cannot be ignored. This difficulty has been minimized, however, by creating the LACR

through conversion of an existing unit and the procurement of an essentially off-the-shelf AGS design.

Versatility. The organizational designs of the LAB and the LACR support their employment in almost any environment. The designs of these organizations are flexible, facilitate task organization, and are not designed for operations in any specific theater of operations.

Force Tailoring. The designs of the LAB and the LACR are very amenable to task organization. Despite the flexibility of these designs, the units to which light armor forces will normally be task-organized -- light infantry units -- have a very limited capability to provide logistic support to light armor units.

Evaluation of Materiel Concepts:

The AGS appears to be an adequate direct fire system for support of light infantry operations. The AGS shortcomings in firepower and crew protection, if forced to fight modern MBTs, demonstrate the importance of rapid deployment of American heavy forces if combat operations against a threat force with a significant quantity of MBTs are envisioned.

Adequacy. The AGS system will provide adequate firepower for direct fire support to infantry operations. Although the 105mm main gun of the AGS is inherently less capable than the 120mm and larger main guns on modern MBTs, continued advancements in munitions technologies may improve the performance of the low-recoil 105mm gun. Regardless of the effectiveness of its main gun, the

armor of the AGS does not provide adequate protection for its crew if utilized to fight MBTs.

Deployability. The AGS itself and the AGS-equipped LAB are designed for deployment by a variety of means to include airdrop operations. The LACR depends on more traditional deployment means because of its greater size and the bulk of many of its vehicles, especially its self-propelled howitzers.

Supportability. The AGS, despite its high degree of component commonality with existing U.S. Army systems, will be a challenge to support because of the low number of procured systems and the difficulty of supporting AGS units cross-attached to light infantry units and due to the austere combat service support capabilities of these units. In addition, none of the systems that provide components to the XM8 AGS design are organic to the light division, further highlighting the unique maintenance support requirements of the LAB.

Affordability. The LAB and the LACR are affordable forces because of the low number of AGSs required to equip these units and the low number of contingency operations that should require their use. Another factor improving the affordability of these units is the fact that they will usually be replaced by heavier units once these organizations have deployed to a contingency area, releasing these light armor units for other contingency operations, as required.

Versatility. The equipment used in the LAB and the LACR, especially the AGS, are designed for operations throughout the world. The AGS should

actually be more usable than its heavier counterparts, due to its low weight and low ground pressure.

Force Tailoring. The materiel of the LAB and the LACR are not unique to these organizations, with the exception of the AGS, which simplifies their task organization with a variety of other forces.

Application of French and South African Light Armor Experiences:

The first challenge for the U.S. Army is to identify and extract appropriate lessons from the light armor experiences of other armed forces. This does not mean that U.S. Army light armor forces should necessarily resemble or operate like light armor forces of other nations. The U.S. Army should, however, be capable of evaluating its concepts against the experiences of the French Army and SADF and decide whether or not the U.S. Army is making correct decisions about the doctrine, organization, and materiel of its emerging light armor forces.

The French lessons for use of light armored forces, presented in section 3 of this study, are: (1) Light armor vehicles should not be employed as main battle tanks unless no other option is available, (2) Contingency forces should be task-organized based on the unique mission requirements of each specific contingency operation, and (3) All forces in a task-organized contingency force should have comparable tactical mobility.

The South African lessons, also presented in the preceding section, are:

(1) Light armor forces have great utility in contingency operations because of their

tactical and strategic mobility, firepower, and supportability, (2) Task-organize contingency forces based on mission requirements and threat capabilities, (3) Destroy enemy armor forces with MBT-equipped units and artillery fires whenever possible, and (4) Adequate logistic support for task-organized light armor forces requires highly-mobile dedicated logistic support vehicles.

Evaluation of Emerging Concepts for U.S. Army Light Armor Forces

Evaluated against the lessons of the French and South African armies, U.S. Army doctrine for light armor operations correctly focuses on task-organized operations, but should address more task organization alternatives than the traditional attachment of light armor units to light infantry organizations. In both French and South African experience, the attachment of light armor forces to light infantry units was the exception, rather than the norm. Although these forces do not possess the strategic deployment means available to American contingency forces, the French and South African armies have opted for the use of heavier contingency forces, task-organized from motorized, mechanized, and light armor forces, rather than the light infantry forces favored by the U.S. Army. The French and South African militaries selected these heavier types of contingency forces because of the increased lethality, mobility, and protection provided by the equipment and organization of these units. The decreased strategic mobility of these organizations is countered by the use of prepositioned equipment, preference

for wheeled rather than tracked systems, and the use of indigenous military units whenever possible.

In addition, American light armor force doctrine needs to specifically address how light armor units should fight an enemy with MBTs, if this situation occurs, given the documented capabilities and limitations of the AGS. The French and South African armies have developed specific techniques for the defeat of enemy MBTs by light armor-equipped contingency forces, based on their extensive combat experiences against Soviet-equipped third world forces. The key characteristics of these techniques is the use of combined arms and friendly MBTs, if available.

Neither foreign army examined in this study has LABs; instead, their light armored forces are organized as armored cavalry, infantry fire support, and reconnaissance units. The implicit reason for this organizational decision is the realization by both foreign armies that light armor vehicles are not MBTs, and, therefore, light armor organizations should not be designed or employed like MBT-equipped units. Does the U.S. Army actually require LABs, or could the AGS assets procured for these organizations be more effectively employed in a different organization?

In addition, although the doctrine, organization, and materiel of emerging U.S. Army light armor forces support task organizing to meet specific mission requirements, an organic platoon logistic support vehicle, as used by the SADF, would appear to further increase the supportability and versatility of any light

armored organization. Such a vehicle, based on the AGS chassis, would reduce the difficulty of task-organizing light armor units with light infantry units and increase the operating range and flexibility of light armor units.

Finally, the AGS is comparable in general design and capability to the very successful "heavier" light armored vehicles used by the South African and French armies, such as the AMX10RC and the ROOIKAT, although the long-range impact of the AGS' fewer crewmembers and tracked rather than wheeled drive system is unknown. These vehicles have performed well in a variety of environments throughout the world, against a wide range of threats, and have proven both strategically and tactically deployable, as well as economical to operate and support.

Section 5 - Conclusion and Recommendations

Emerging U.S. Army concepts for light armor forces in contingency operations should result in the more deployable armor organizations demanded by contingency operations requirements. There are, however, major flaws in the emerging doctrine, organizations, and materiel for these forces, suggesting that additional analysis and study should focus on these forces even while they are being created, organized and equipped.

Specifically, emerging doctrine for U.S. Army light armor forces, as presented in EM 17-18 (Preliminary Draft), fails to adequately address both the firepower and protection limitations of the AGS and the possible employment of

the LAB with any organization other than light infantry units. In addition, the proposed organizational designs for the LAB and the LACR reflect existing heavy organizational designs rather than specific requirements for light armor forces in contingency operations and the limitations of the AGS. The XM8 AGS does appear to be an improvement over its predecessor, however, while remaining an appropriately deployable system. The XM8 AGS is, therefore, an appropriate light armor vehicle for U.S. Army contingency forces, despite the limitations in its firepower and armor protection.

Recommendations for Changes to U.S. Army Light Armor Forces.

Doctrine. An AGS-equipped organization is not an MBT-equipped organization. Emerging doctrine must reflect this difference, as well as employment options other than attachment to light infantry units. Reliance on existing armor doctrine in all situations other than attachment to light infantry organizations is an inadequate answer.

Organization. Although copying existing proven organizational designs should significantly shorten the force design process, the rush to field new light armor organizations should not prevent continued examination of the requirements of contingency forces and consideration of different organizational designs. Problems with the doctrine and organization of light armor forces should not, however, delay AGS procurement or light armor unit activation. Even if the emerging doctrine and organization for U.S. Army light armor forces is flawed,

the number of AGS-equipped units is so small that improvements can and should appear in an evolutionary fashion, as occurred with both French and South African light armor forces.

Matériel. The development of a dedicated highly-mobile logistic support vehicle for AGS-equipped units, preferably on an AGS chassis, should be vigorously pursued. In addition, continued research and development efforts to improve the lethality and protection of the AGS should be supported.

ENDNOTES

¹Molly Moore, "GAO Says Low-Intensity Threat Unmet," The Washington Post (16 March 1990): A10.

²Combined Arms Command - Combat Developments, Briefing Slides for the Chief of Staff of the Army, subject: Light Armored Cavalry Regiment (Ft Leavenworth, KS: U.S. Army Combined Arms Command - Combat Developments, undated). Although the 199th Motorized Brigade was renamed the 2nd Cavalry Regiment (Light) in 1992, its subordinate units will remain motorized infantry until its actual reorganization in 1995-1994 to an interim light cavalry organization design.

³John A. Nagi, "The Armored Gun System: Sheridan Replacement Offers Better Firepower Plus Worldwide Mobility," Armor (July-August 1991): 26.

⁴Deputy Chief of Staff of the Army, cited in Jon H. Moilanen, "The Light Cavalry Regiment in Contingency Operations," Military Review (October 1992): 66. According to this article, more than 29 nations each possess more than 1000 main battle tanks; nearly one-half of these nations pose potential threats to U.S. interests.

⁵Field Manual 100-20, Military Operations in Low Intensity Conflict defines LIC as "... a political-military confrontation between contending states or groups below conventional war and above the routine, peaceful competition among states." According to FM 100-20, the predominant American forces involved in LIC are security assistance and special operations forces. U.S. Army, Field Manual 100-20, Military Operations in Low Intensity Conflict (Washington, DC: Department of the Army, December 1990), 1-1, 1-11.

⁶The focus of this monograph is not on whether light armored vehicles should be wheeled or tracked or if their primary armament should be a missile or gun system, although these are important issues deserving of additional study.

⁷U.S. Army, FM 100-5, Operations (Washington, DC: Department of the Army, May 1986), 169.

⁸U.S. Army, "FM 100-5, Operations (Preliminary Draft)" (Ft Monroe, VA: U.S. Army Training and Doctrine Command, 21 August 1992), 3-1.

⁹Office of the Secretary of Defense, National Security Strategy of the United States (Washington, DC: Government Printing Office, 1992), 1.

¹⁰Ibid., 25.

¹¹Ibid., 29.

¹²Office of the Chairman, Joint Chiefs of Staff, National Military Strategy of the United States (Washington, DC: Government Printing Office, 1992), 7-8.

¹³FM 100-5, 170.

¹⁴Ibid.

¹⁵Ibid.

¹⁶Ibid.

¹⁷Ibid.

¹⁸Brigitte Sauerwein, "Interview: 'Our New Strategy is one of Crisis Response' - SACEUR General John Galvin," International Defense Review 22 (April 1992): 319.

¹⁹Ibid.

²⁰"FM 100-5", 3-5 - 3-7.

²¹Ibid., 3-3.

²²Ibid., 3-4.

²³Thomas Donnelly, Margaret Roth, and Caleb Baker, Operation Just Cause (New York: Lexington Books, 1991), 135-160.

²⁴Ibid., 368.

²⁵Ibid., 404.

²⁶Nagi, 26.

²⁷Ibid.

²⁸U.S. Army, "FM 17-18, Light Armor Operations (Preliminary Draft)" (Ft Knox, KY: U.S. Army Armor Center, 1 May 1992), 1-1.

²⁹Ibid., 1-2

³⁰Tbid., 1-12.

³¹Tbid.

³²CSA LACR Briefing slides.

³³"FM 17-18," 6-2.

³⁴Tbid.

³⁵Tbid., 5-1.

³⁶Carl Van Bokern, Major, U.S. Army Combined Arms Command - Combat Developments, interview by author, Ft Leavenworth, KS, 25 September 1992. The CAC-CD position is that the scout and mortar platoons are unnecessary in the light armor battalion organization since this unit is normally attached to light infantry units which already possess scout and mortar platoons.

³⁷CSA LACR Briefing Slides.

³⁸Tbid.

³⁹Nagi, 26.

⁴⁰Ramon Lopez, "U.S. Army Dusts-off AGS," International Defense Review 23 (September 1990): 997.

⁴¹"The Soldier Armed: XM8 Armored Gun System (AGS)," Army (September 1992): 57. The total value of the development contract is \$119 Million, and the final value of the contract, based on a 300 AGS purchase, is approximately \$800 Million.

⁴²Nagi, 27-29.

⁴³"Soldier Armed," 57.

⁴⁴Tbid.

⁴⁵Tbid., 58.

⁴⁶Andre L. Rilhac, "Armor in French Rapid Assistance Force," Armor (September- October 1982): 22.

⁴⁷Gerard Turbe, "France's Light Armoured Cavalry; a Radical Change in Operational Concept," International Defense Review 22 (December 1989): 1651.

⁴⁸Rilhac, 22.

⁴⁹R.D.M. Furlong, "Light Armoured Vehicles for French Rapid Deployment Force," International Defense Review 14 (May 1981): 581.

⁵⁰Michael L. Castillon, "Low Intensity Conflict in the 1980s: The French Experience," Military Review (January 1986): 69-70.

⁵¹French Army Liaison Officer to the U.S. Army Combined Arms Center, Briefing Script: Force d'Action Rapide, Ft Leavenworth, KS, undated.

⁵²Ibid.

⁵³Munk-Koefoed, "Routing the Libyans," Marine Corps Gazette (August 1987): 26, and United States Naval Institute Database, "France - AML 245," (20 July 1990). For example, during Chadian Army operations against Libyan forces at Fada in January 1987, Chadian forces equipped with French-supplied AML-90 armored cars and MILAN ATGMs mounted on commercial pickup trucks destroyed over 250 Libyan tanks and other armor vehicles.

⁵⁴B. Mauponne, Colonel, French Army Liaison Officer to the U.S. Army Combined Arms Command, interview by author, Ft Leavenworth, KS, 30 September 1992.

⁵⁵"Campaign Furlough From World Leadership Role," Kansas City Star (29 September 1992): B5.

⁵⁶Giovanni DeBriganti, "Forces d'Action Rapide: France's Rapid Deployment Force," Armed Forces Journal International (October 84).

⁵⁷A French armored cavalry regiment is the rough equivalent of a U.S. armored cavalry squadron in number of vehicles and personnel.

⁵⁸FAR Script.

⁵⁹According to the French Army Liaison Officer to the Combined Arms Center, the French Army is currently embroiled in a debate over the correct form and purpose of military doctrine; traditionally, French doctrinal manuals have provided general guidance, although many officers, especially those

familiar with American Army manuals, are arguing for more prescriptive manuals.

⁶⁰Timothy R. Decker, "The French Armor Corps: A Branch in Transition in a Changing Army," Armor (January-February 1991): 40. General principles for the employment of armored cavalry forces are presented in the French Army's single existing doctrinal manual for armored cavalry operations, ABC 103/1, although this manual explicitly focuses on conventional operations in Central Europe.

⁶¹USNI Database, "AML-245"

⁶²Furlong.

⁶³Ibid., and Cristoper F. Foss, ed., Jane's Armour and Artillery 1991-1992 (Alexandria, VA: Jane's Information Group, 1991), 205-206. As of 1992, more than 380 ERC-90's have been produced for the French Army and five other nations. Of the French Army's 192 ERC-90s, forty-five are normally forward deployed with French garrisons in Africa.

⁶⁴John Reed, "The Current Status of the Wheeled Armoured Vehicle," Armada International (September-October 1987): 56.

⁶⁵J.L.P. Nouvell, "From the Land that Created the Word 'Elite:' France's FAR and GIGN," National Defense (December 1990): 60-61, and Turbe, "France's Light Cavalry," 1654.

⁶⁶Y. Kermorvant, Lieutenant Colonel, French Army Liaison Officer to the National Simulations Center, interview by author, Fort Leavenworth. KS, 30 September 1992.

⁶⁷"Armour Upgrades for AMX 10RCs in Saudi," International Defense Review 24 (February 1991): 106.

⁶⁸Castillon.

⁶⁹Interview with the French Army Liaison Officer to the Combined Arms Center.

⁷⁰William Drodziak, "War Feeds French Debate on Arms," The Washington Post (6 April 1991): A17, and Alan Riding, "France Concedes its Faults in War," New York Times (8 May 1991): A7.

⁷¹C. Kuzzell, Lieutenant Colonel, U.S. Army Liaison Officer to the French Army Armored School, telephonic interview by author, Fort Leavenworth, KS, 6 October 1992.

⁷²Interview with the French Army Liaison Officer to the Combined Arms Center.

⁷³Gerard Turbe, "Divining French Needs: GIAT Industries' VBM," International Defense Review 25 (June 1992): 575.

⁷⁴Herbert M. Howe, "Can the South African Defense Force Go it Alone?" Armed Forces Journal International (November 1986): 66.

⁷⁵Norman L. Dodd, "The South African Army in 1986," Armed Forces 5 (July 1986): 318.

⁷⁶Tbid, 319. Conventional combat operations are the primary responsibility of the Citizen Force, the South African equivalent of the United States' Army National Guard and Army Reserve organizations. Local defense operations are accomplished by Commando Units, the rough equivalent of state militias. The last mission, border/counter-insurgency operations, are performed by National Service White Units and Voluntary National Service Coloured/Black/Indian Units, augmented by called-up Citizen Force units, as needed. The National Service White Units are led by a small professional cadre and manned by conscripts, while the Voluntary National Service Coloured/Black/Indian Units are manned by coloured, black, and Indian South Africans serving a voluntary two-year enlistment. In 1992, the 685,000 members of the SADF were disposed as follows:

19,000	Permanent Force
31,000	National Service Troops (Conscripts)
360,000	Citizen Force
135,000	Citizen Force Reserve
140,000	Commando Units

⁷⁷Jurgen Heuchling, "The SADF: South Africa's Mighty Muscle," International Defense Review 21 (January 1988): 24, and International Institute for Strategic Studies, The Military Balance 1991-1992 (London: The International Institute for Strategic Studies, 1992), 142-143. While the primary operational focus of the SADF for the last twenty years has been contingency-type operations, its army is actually organized for a conventional western European-style war, with a heavy corps headquarters, an armor division, an infantry division, seven independent combat brigades, thirteen artillery battalions, seven ADA battalions, and a special reconnaissance battalion. The bulk of these forces are in the

Citizen Force, however; most contingency operations are conducted by South Africa's few standing units, units led by a small professional cadre and manned by conscripts. Other than training units, in 1992 the only full-time combat organizations in the SADF are nine infantry battalions.

⁷⁸Dodd, 323.

⁷⁹"Mobiltate Vincere: South African Battle Group," Armed Forces (October 1989): 11-14. The forces assigned to the 61st Mechanized Battle Group for Operation HOOPER were as follows:

- Tactical Headquarters Detachment
- 2 Mechanized Infantry Companies (with RATEL APCs)
- 2 Armored Car Troops (with RATEL/90 Fire Support Vehicles)
- 1 Tank Company (with OLIPHANT MBTs and transporters)
- 1 155mm Medium Artillery Battery (8 guns)
- 1 ADA Platoon
- 1 Mortar Platoon (with RATEL/81 Mortar Carriers)
- 1 Anti-Tank Platoon (with RATEL/90)
- 1 Assault Pioneer Platoon (with RATEL/20)
- 1 Engineer Platoon (Ratel/60)

⁸⁰Christopher F. Foss, "Rooikat: ARMSCOR's New Hit and Run Lynx," International Defense Review (22 November 1989): 1563.

⁸¹"The Sandock-Austral Group," Armed Forces (April 1987).

⁸²Ibid. The seven armed versions of the RATEL are as follows

- RATEL/12 with 12.7mm machine gun
- RATEL/20 with 20mm cannon
- RATEL/60 with 60mm mortar
- RATEL/90 with 90mm gun
- RATEL/81 with 81mm mortar
- RATEL/12 command vehicle with 12.7mm machine gun,
- RATEL/20 command vehicle with 20mm cannon

⁸³Foss, 1563-1566.

⁸⁴Dodd, 322.

⁸⁵"Upgunned Rooikat," Armed Forces (June 1992): 15.

⁸⁶Ibid.

⁸⁷FM 100-5, 41-42.

⁸⁸"FM 100-5," 2-27.

⁸⁹Ibid., 3-2.

⁹⁰"FM 17-18," 1-11. Class III supplies are petroleum products such as fuel and lubricants; class IX supplies are repair parts.

⁹¹Ibid., 1-19.

⁹²Ibid., 1-2.

⁹³"FM 100-5", 3-3.

⁹⁴"FM 17-18", 1-3.

⁹⁵FM 100-5, 25, and "FM 100-5," 2-3.

⁹⁶"FM 17-18," 1-11.

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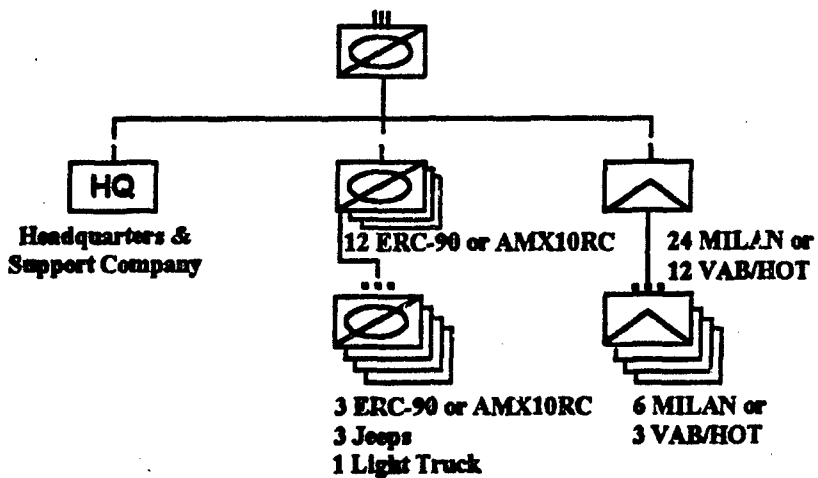
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Appendix A: Light Armor Organizations

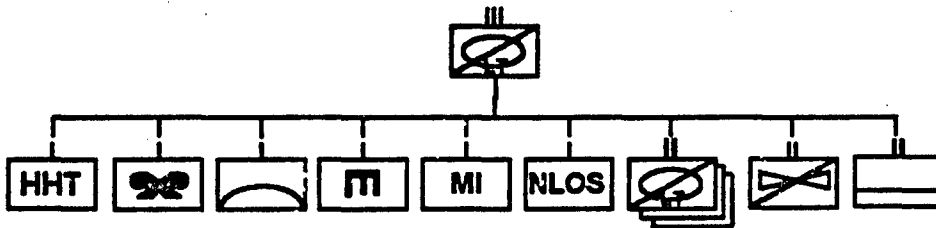
French Armored Cavalry Regiment



Total Regimental Assets:
36 ERC-90 or AMX 10RC
24 MILAN or 12 VAB/HOT
834 Men
268 Vehicles

Source: ABC 103/1

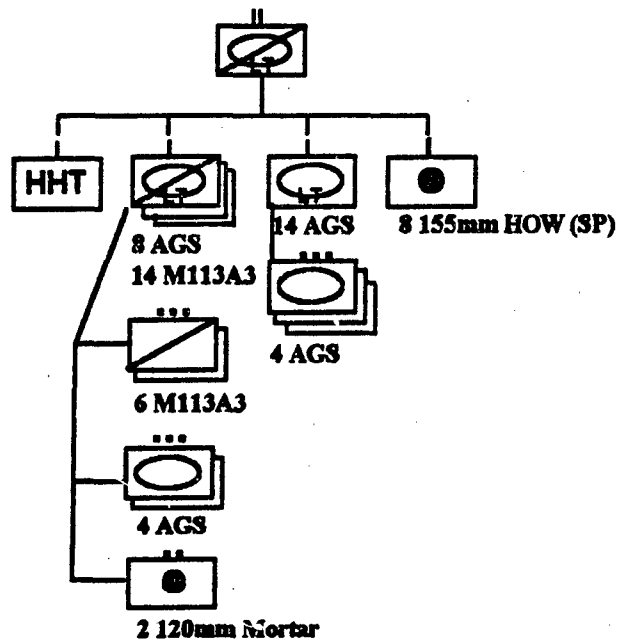
**U.S. Light Armored Cavalry Regiment
Objective (1999) Design**



Total Regimental Assets:	
114 AGS	12 NLOS
180 M113A3	6 SEE
24 155mm HOW (SP)	6 ACE
36 MPLH	3 VOLCANO
7 UH-60	3 MICLIC
8 UB-60 (C2)	18 AVENGER
18 120mm Mortar	8 NBCRS Veh.
4190 Personnel	

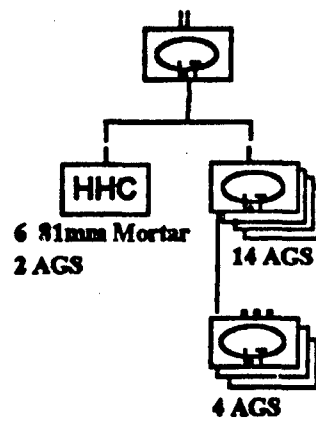
Source: CAC-CD CSA Briefing

**U.S. Light Armored Cavalry Squadron
Objective (1999) Design**



<p>Total Squadron Assets: 38 AGS 53 M113A3 8 155mm HOW (SP) 6 120mm Mortar 763 Personnel</p> <p>Source: CAC-CD CSA Briefing</p>

**U.S. Light Armor Battalion
FM 17-18 Design**



Total Battalion Assets:

58 AGS

6 81mm Mortar

Source: "FM 17-18 (Preliminary Draft)"

Appendix B: Technical Characteristics of Selected Armor Vehicles

Name of Armor Vehicle	Primary User	Main Weapon	Main Weapon Basic Load	Crew Size	Drive Type	Combat Weight	Engine HP	HP/WT Ratio	Ground Pressure	Max Road Speed	Fuel Cap.	Armor Construction
AML-90 Armored Car	France	Low-Pressure 90mm Gun	20 Rounds	3	4 X 4 Wheeled	5500 kg	90 hp	16.36 hp/ton	NA	90 km/hr	156 L	Welded Steel
ERC-90 Armored Recon Vehicle	France	Low-Pressure 90mm Gun	20 Rounds	3	6 X 6 Wheeled	8100 kg	155 hp	17.90 hp/ton	NA	85 km/hr	242 L	Welded Steel
AMX10RC Armored Recon Vehicle	France	105mm Gun	38 Rounds	4	6 X 6 Wheeled	15,880 kg	280 hp	16.45 hp/ton	NA	85 km/hr	500 L (est.)	Velded Aluminum
ELAND/90 Armored Car	South Africa	Low-Pressure 90mm Gun	20 Rounds	3	4 X 4 Wheeled	6000 kg	90 hp	15 hp/ton	NA	90 km/hr	156 L	Welded Steel
RATTEL/90 Direct Fire Spt Vehicle	South Africa	Low-Pressure 90mm Gun	69 Rounds	3 (+ 7)	6 X 6 Wheeled	19,000 kg	282 hp	14.84 hp/ton	NA	105 km/hr	430 L	Welded Steel
ROOIKAT Armored Recon Vehicle	South Africa	76mm Gun	48 Rounds	4	8 X 8 Wheeled	28,000 kg	563 hp	20.1 hp/ton	NA	120 km/hr	500 L	Welded Steel
M551A1 Armored Recon Abn Assault Vehicle	U.S.A.	152mm Gun	30 Rounds	4	Tracked	15,830 kg	300 hp	18.95 hp/ton	.49 kg/cm ²	70 km/hr	598 L	Welded Aluminum
XMB Armored Gun System	U.S.A.	Low-Recoil 105mm Gun	30 Rounds	3	Tracked	19,414 kg (Level II Protection)	552 hp	28.4 hp/ton	.69 kg/cm ²	70 km/hr	568 L	Welded Aluminum w/ Add-on Armor Plates
M1A1 Main Battle Tank	U.S.A.	120mm Gun	40 Rounds	4	Tracked	57,154 kg	1500 hp	26.24 hp/ton	.96 kg/cm ²	67 km/hr	1907 L	Laminated Steel

Name of Armour Vehicle	Primary User	Main Weapon	Main Weapon Basic Load	Crew Size	Drive Type	Combat Weight	Engine HP	HP/WT Ratio	Ground Pressure	Max Road Speed	Fuel Cap.	Armour Construction
M3 Cavalry Fighting Vehicle	U.S.A.	25mm Cannon	1500 Rounds	3 (+2)	Tracked	22,443 kg	500 hp	20.51 hp/ton	.53 kg/cm ²	66 km/hr	662 L	Welded Aluminium w/ Laminated Armour
LAV 185 Assault Gun	U.S.A. (USMC)	Low-Recoil 105mm Gun	30 Rounds (estimate)	3	8 X 8 Wheeled	13,653 kg	275 hp	20.14 hp/ton	NA	100 km/hr	204 L	Welded Steel
T-72 Medium Tank	C.I.R.	125mm Gun	36 Rounds	3	Tracked	44,500 kg	840 hp	18.9 hp/ton	.84 kg/cm ²	80 km/hr	1000 L	Laminated Steel
ASU-85 Airborne Assault Gun	C.I.R.	85mm Gun	40 Rounds	4	Tracked	15,500 kg	280 hp	13.5 hp/ton	.44 kg/cm ²	45 km/hr	250 L	Welded Steel
PT-76 Light Tank	C.I.R.	76.2mm Gun	40 Rounds	3	Tracked	14,000 kg	240 hp	17.1 hp/ton	.49 kg/cm ²	44 km/hr	430 L	Welded Steel
BMP-2 Infantry CM Vehicle	C.I.R.	30mm Cannon	500 Rounds (+7)	3	Tracked	14,300 kg	300 hp	20.30 hp/ton	.64 kg/cm ²	65 km/hr	462 L	Welded Steel
BMD-1 Airborne Infantry Cmt Vehicle	C.I.R.	73mm Gun	40 Rounds (+4)	3	Tracked	7,500 kg	300 hp	32 hp/ton	.57 kg/cm ²	70 km/hr	300 L	Welded Steel
BRDM-2 Scout Car	C.I.R.	14.5mm Machine Gun	500 Rounds	4	4 X 4 Wheeled	7000 kg	140 hp	20 hp/ton	NA	100 km/hr	290 L	Welded Steel

Data Source: Jane's Armour and Artillery 1991-1992