

WHERE'S THE LIGHT ARMOR? ENHANCING THE FIREPOWER OF EARLY ENTRY FORCES

**A MONOGRAPH
BY
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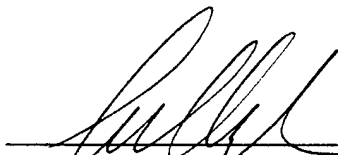
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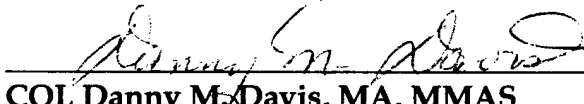
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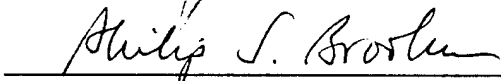
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I. Introduction

There is a looming gap in the Army's inventory. This gap may result in a shortfall in the structure of our rapid deployment forces. After April 1997 a strategically deployable, airdroppable lightweight armored vehicle to support early entry forces will not exist. The recent decisions to terminate the Armored Gun System (AGS) and to inactivate the 3d Battalion, 73d Armor Regiment in the 82d Airborne Division mark an extraordinary milestone in Army force modernization. "The year 1996 will be remembered as the time when both a currently deployed weapon system, the M551 Sheridan, and its replacement, the M8 AGS, were cut in the same year."¹

This study will determine whether there is a requirement for a armored vehicle to support U.S. airborne forces in contingency operations and if there is a valid requirement, is it being met? The secondary questions of this study are, to identify what direct fire weapon requirements exist in the airborne division? Does the airborne division need an armored direct fire weapon system? Specifically does the 82d Airborne Division need a lightweight armored vehicle to replace the M551 Sheridan tank? What kind of light armored vehicle can fight against armored adversaries, yet be air dropped if needed or airlifted in greater quantities than the M1? Finally this study will examine viable alternatives to replace the terminated Armored Gun System.

With the end of the cold war, the Third World became the centerpiece of American national security strategy. Although Europe remains important, security issues such as U.N. peace operations, Haiti, Somalia, Iraq, North Korea, and weapons proliferation typify Third World problems. Major regional conflicts in the Third World have become the basic conceptual building block of

U.S. military strategy.² What should be particularly alarming to American strategic planners is not only the increased volatility of the world situation and its global forces, but also the proliferation of modern lethal weapons systems among Third World nations, where the threat of a low to mid-intensity conflict is most likely.³

The regional and ethnic tensions kept in check by the Cold War are resurfacing in the Balkans, the Confederation of Independent States, Africa, the Korean peninsula and in Southwest Asia. Threat groupings are emerging as regional coalitions or informal alliances with strategic interests contrary to U.S. interests, examples include Iran, Libya, and Sudan.⁴

According to Steven Metz in his essay *America in the Third World*, there are three types of security challenges that will dominate the third World during the coming decades:

- low-level conflict ranging from widespread crime to a form of semipolitical organized crime;
- internal war against or between primal militias and fundamentalists insurgencies, or violence against groups forced to migrate by ecological decay and economic stagnation; and,
- interstate war instigated by what Anthony Lake calls "backlash states" with large conventional militaries and, increasingly, weapons of mass destruction.

It is possible for a single conflict to present two or three of these challenges.⁵ To meet these challenges U.S. military forces developed a strategy of rapidly projecting combat power from CONUS to protect national interests.

The Army now focuses on deploying and fighting as part of contingency and reinforcing forces. The Army's current position is that contingency forces

can be supported by heavy ground combat vehicles, such as the M1-series Abrams main battle tank and the M2-series Bradley Fighting Vehicle. Ground combat vehicles, AH-64s, and AH-58s would be flown in to support light contingency forces such as the 82d Airborne Division. Unfortunately, since they must be moved by strategic airlift (C-17s and C-5Bs), a secure airfield is required.

Today, U.S. military forces face a wide range of global contingencies. The U.S. must remain organized and equipped to respond across the entire spectrum of operations. This spectrum includes conflicts ranging from crudely equipped insurgents to a technologically advanced conventional force. Also included are military organizations of developing nations capable of fielding multi-battalion sized armored forces, many with at least 105mm main gun equivalents and modern fire control systems.⁶

A burgeoning market for military hardware has provided developing nations with an arsenal of armored vehicles ranging from pre-World War II M-4 Sherman tanks to modern Soviet T-72s. Even relatively obsolescent tanks have been upgraded to M1 and T-72 standards with a variety of retrofits, laser rangefinders, improved fire control systems, and enhanced armor protection.⁷ While still not a match for the latest western MBTs, these refitted vehicles are still formidable threats to unarmored forces.

Armor inventories have grown in the past 20-30 years. Regional totals include 80,000 tanks in Europe, 23,000 in Asia, 12,000 in the Middle East, 7,000 in Africa, and some 3,000 in Latin America. These totals include both modern and antiquated armor systems. These diverse weapons will likely be effective on regional battlefields of the future. Older tanks, anti-tank guided missiles

(ATGM), and recoilless rifle systems are still a deadly combination against a light force without tank support or extensive anti-armor weapons.⁸

<u>Country</u>	<u>Size Force</u>	<u>Tanks</u>	<u>IFV</u>	<u>Arty</u>	<u>AC</u>	<u>SSM</u>	<u>NBC</u>
China	2,935,000	10,100	4500	14,500	4000	yes	yes
Cuba	100,000	1500	1100	1040	130+	unk	unk
India	1,145,000	3500	607	4325	778	yes	NBC
Iran	513,000	1520	850	2948	295	yes	NBC
Iraq	382,500	2700	2900	2100	310	yes	NBC
Libya	65,000	2210	1250	1870	420	yes	BC
N. Korea	1,054,000	3940	2200	6700	611	yes	NBC
Serbia	113,900	1360	629	950	204	yes	C
Sudan	89,000	320	432	1004	60+	no	no
Syria	421,000	4600	4450	2560	579	yes	BC

IFV-Infantry Fighting Vehicle

SSM-Surface to Surface Missiles

NBC-Nuclear, Biological, Chemical

Arty-Artillery and Multiple
Rocket Launchers

AC-Aircraft

Figure One (Selected Threat Capabilities)⁹

At the tactical and operational level the real threat is not the geographic region of the world in which the U.S. military might have to fight, but rather the weapons systems and technologies that we will encounter. Third world nations are capable of countering U.S. armor capabilities through the use of improved antitank weapons systems, Global Positioning Systems, thermal sights and a host of other relatively low cost countermeasures.¹⁰

Early entry forces are particularly vulnerable. The Army's decision to inactivate the 3-73rd Armor and not to field the AGS has left our contingency forces without the light armored required to face these regional threats. The primary purpose for the AGS was to provide early entry forces with the capability to conduct an airborne assault with armored firepower and provide

immediate support to the infantry on the ground. What the AGS provided is what airborne and light infantry divisions sorely lack--a tactically and operationally mobile direct-fire infantry support vehicle, packaged for quick air transport.

The decisions to inactivate the 3-73 Armor and terminate the AGS will yield savings of about 1 billion dollars and some 560 personnel spaces. The downside is the risk associated with loss of Sheridan firepower in anti-armor, anti-bunker, and anti-personnel roles; a risk that could result in higher casualties among airborne infantry units.¹¹

The requirement for a rapidly deployable, airdropped assault gun is evident. If paratroopers are to conduct an airborne assault, establish and defend an airfield, they need additional organic direct fire support. When Apache helicopters arrive, they are helpful. Effective anti-tank missiles for the infantry are essential, but in the long run a replacement for the aging Sheridan may better serve the Army's strategic, operational, and tactical needs.¹²

Light armor-if available-adds to our capability to fight against a variety of threat forces across the full spectrum of conflict. We cannot gamble deploying our early entry forces without the vital lightweight armored vehicle support. Although risk is present in any contingency operation it is an element we should avoid placing on soldiers when there are other viable options. If the U.S. desires success in compensating for smaller forces and declining defense spending, it must tailor its use of technology to deal with the most likely contingency requirements.¹³

II. Review of Current Service Doctrine for Light Armored Forces.

FM 17-18, Light Armor Operations, is the Army's manual containing the doctrine, tactics, and techniques for the employment of light armor units and provides many useful insights. Prior to the 1994 publication of FM 17-18, Army doctrine concerning light armor force operations was limited to division, corps, armor and mechanized task force and cavalry operations field manuals.

When publishing the manual in 1994, the assumption was that the M8 Light Tank (AGS) would replace the M551A1. The manual provides guidance for light armor battalion commanders, their staffs, company commanders, and platoon leaders in the conduct of combat operations with light infantry. It also familiarizes light infantry leaders with the capabilities of light armor units and offers techniques for effective deployment. Specifically, the manual states that light armor can use its unique capabilities in support of contingency plans, across the entire operational continuum (peacetime, conflict, and war). Light armor may operate in a wide range of political, military, and geographical environments. The primary purpose of light armor is to operate with light infantry during rapid-deployment contingency operations (CONOPS). Its tactical missions include providing security, reconnaissance, and anti-armor firepower to the light infantry division (LID) or airborne corps, as well as standard armor operations to engage and destroy enemy forces using mobility,

firepower, and shock effect in coordination with other combat arms. These missions may require rapid strategic and tactical deployment worldwide.¹⁴

The manual provides the tactics, techniques, and procedures applicable to armored units when supporting light infantry operations. The manual identifies two objectives. First, it gives an overview of doctrinal principles for the employment of light armor forces. Second, it describes tactics, techniques, and procedures for light armor platoons, companies, and battalions and identifies where they differ from armored forces. The Light Armor Operations manual complements the doctrine in FM 100-5, Operations, FM 100-15, Corps Operations and FM 71-100, Division Operations.¹⁵

The description of light armor doctrine in existing publications is incomplete and often inconsistent. For example, FM 100-5 provides a brief discussion on the uses of light armor. The manual states that:

Light armor units can participate in a variety of Army operations, including rapid worldwide deployment, throughout a wide range of environments. Tactical missions include providing security, reconnaissance, and anti-armor firepower to the light infantry or airborne division. Light armored units also conduct standard armor operations, including the destruction of enemy forces in coordination with other arms.¹⁶

The Corps Operations manual provides a brief discussion of heavy-light mix considerations in support of offensive and defensive operations. The sections in each chapter discuss basic planning considerations for employing

light forces in conjunction with heavy forces. The manual was published in 1989 and does not discuss the M8 or light armor force operations.

The Division Operations manual contains an appendix entitled, Heavy-Light Operations. Light armor is not addressed at all. The appendix contains sections on the concept of employment, command and control, offensive and defensive operations, combat support, and combat service support of heavy-light forces. The manual states that heavy and light forces can operate together effectively, providing the commander tailors his force to the factors of METT-T. The employment of heavy-light forces allows the commander to maximize combat power by offsetting the inherent weaknesses of one type unit with the inherent strengths of another type unit. Heavy-light operations are therefore an extension of the combined arms concept.

In addition to doctrine, the Army also publishes tactics, techniques, and procedures (TTP) which develop, expand, and explain doctrine. FM 71-100-2, Infantry Division Operations: Tactics, Techniques, and Procedures, published in August 1993, briefly discusses heavy-light operations. This TTP recognizes the use of armored forces in support of the infantry division, specifically an armored brigade supporting an infantry division. The heavy-light chapter discusses the division commander's considerations in planning and executing tactical operations with armored forces. The manual refers the reader to FM 17-18 for detailed information.

The Tank and Mechanized Infantry Battalion Task Force, FM 71-2, discusses the integration of heavy and light forces. The manual, published in 1988, does not address light armored operations. The appendix focuses on the battalion task forces' planning considerations and likely roles while subordinate to a light brigade.

In reviewing available manuals several conclusions are obvious. First, doctrine for armored systems is plentiful; however, doctrinal references concerning light armor systems are scarce. Secondly, there are many useful insights in the still-born FM 17-18. And finally, the doctrine available does reinforce the importance of a complementary tank-infantry team.

In anticipation of a future light armor role, doctrine must consolidate modern, historical, and conceivable uses of light armor and present this in a cohesive, rational and structured manner. FM 17-18 attempts to address this challenge. Light armor employment will rely, to a degree, on the employment experiences of soldiers of the 82d Airborne where light armor was task-organized down to, and sometimes below, platoon level. Experiences gained in light-heavy operations, deployments, and JRTC/NTC rotations combining armor forces with light infantry will also help determine how light armor forces should, and should not be used.¹⁷ The following chapter provides historical insights into the use of assault guns and light armor in various military operations.

III. Historical Parallels

Light armor vehicles enjoy a long and mixed history in the American armed forces. Light armored vehicles have served as infantry support vehicles, as substitutes for tanks, as fighting reconnaissance vehicles, and as force multipliers for airborne infantry. On more than one occasion a single generation of a light armored vehicle has performed several battlefield functions simultaneously. A brief overview of the past uses of light armored vehicles, assault guns, and other direct-fire weapons is provided. The following events present useful historical lessons, World War II, Vietnam, Operation Just Cause and Haiti.

World War II

The use of light armor in the infantry support role dates back to the use of the Renault FT17 in World War I. It was continued by M10 and M18 tank destroyers in WWII, and M24 light tanks and M41 tanks in Korea.¹⁸ U.S. doctrine during WWII initially viewed tanks as shock weapons to attack soft targets while tank destroyers fixed and killed enemy tanks. However, combat experience demonstrated that tanks, not tank destroyers, were the best anti-tank weapons. As a result, since WWII the tank's principal role in the U.S. Army has been to fight and destroy other tanks.

The German Army's development and use of assault guns during WWII demonstrated the effectiveness of a direct fire weapons system in support of the infantry. Within a year of the formation of the new *Wehrmacht* the requirements for the basic battle tanks and many of the tactics to be used had been accepted by the German High Command. Although the future of the Panzer divisions was secure, many infantry officers expressed concern about the lack of a suitable vehicle to support infantry advances. Many high ranking infantry officers saw the need for a heavily armored support gun that could eliminate strong points and obstacles during the assault.¹⁹

With this in mind, General von Manstein conceived the *Sturmgeschütz* (assault gun) in 1935 as the indigenous armored unit for each infantry division. He drafted a memorandum to the Chief of the General Staff indicating that technical studies had shown the need for a self-propelled armored gun to work under infantry control and give them the support required.²⁰ The army tested the few available *Sturmgeschütz* in the French Campaign, they were a major success. The only concern with the new weapon was that the German economy could only produce 40-50 *Sturmgeschütz* each month. It would take time to produce a sufficient number for the entire army.²¹

A manual entitled *Instructions for the Employment of Sturmartillerie* was published in 1942. The manual states that the *Sturmgeschütz* was an offensive weapon. Owing to its cross-country performance and its armor, it was capable of following its own infantry or armored troops anywhere. Support for the

infantry in the attack was the primary mission of the assault gun. The *Sturmgeschutz* supported infantry attacks by engaging the enemy heavy infantry weapons not quickly or effectively destroyed by other weapons. The presence of the *Sturmgeschutz* provided significant moral support for the infantry.²²

A description of a series of actions in the Leningrad area, in support of the infantry of the German I Corps, illustrates the effectiveness of the assault gun concept.

At the spearhead of the breakthrough wedge was *Sturmgeschutz* Battery 667. The captures made by the Corps during 12 to 19 September 1941 were 6,500 prisoners and 92 guns, 225 modern bunkers were stormed and 301 heavy weapons and machine gun posts destroyed. It was entirely a result of the resolute actions of the 667th Assault Gun Battery that these results were achieved. The battery was expanded into a full battalion and in 1942 went back into action in the Chleppen bridgehead. A Russian tank attack threatened to isolate the bridgehead and caused some panic among German infantry. Only the efforts of the 1st and 3rd batteries succeeded in halting the enemy. Having stabilized the Russian attack the assault guns mounted a counterattack with only 20 infantrymen, and restored the integrity of the bridgehead, destroying 19 T-34 tanks in the process. The battalion was later engaged in a series of defensive actions against heavy Russian tank attacks north-west of Moscow. During four days no less than 83 enemy tanks were destroyed. During the fifteen months on the Rzhev sector 667 Assault Gun Battalions's three batteries alone had destroyed a total of 1,000 Russian tanks.²³

By the spring of 1944 it was estimated that assault guns had destroyed 20,000 enemy tanks.

The *Sturmgeschutz* experiences emphasizes the requirement for armored fire support for the infantry. In the U.S. Army tank destroyers and other light

systems proved more survivable and effective in reconnaissance and infantry support roles. Light units realized they could not continue to employ lightly armored vehicles as tanks and survive.²⁴ The light armor systems' failure to perform successfully as a tank eventually led to its removal from the Army's inventory, except for those light armor forces retained for their air-deployability.

General James M. Gavin, a WWII commander of the 82d Airborne Division, published Airborne Warfare in 1947. Airborne Warfare contain a history of American airborne operations during WWII and Gavin's vision of the future airborne force. Gavin felt that in order to remain an effective fighting force, the WWII airborne forces must be improved. He stated that "armor in the future must fly, just as all other means of war must fly. Possessing good cross-country mobility, and gunned to destroy any earthbound vehicle, the tank will play the decisive role in the coming battles of the airheads."²⁵

According to Gavin, the greatest weaknesses of the WWII airborne force was the lack of ground mobility and effective anti-tank weapons.²⁶ He recommended that we develop air transportable light armored vehicles with highly penetrative guns. The vehicles must "possess great cross country mobility yet have enough armor to protect the crew from flak, small arms, and air bursts."²⁷ Like the U.S. and German experiences in WWII, infantry combat in Vietnam reinforced the need for armored fire support.

Vietnam

In early 1969 the U.S. Army introduced the M551 Sheridan into its armored forces. Cavalry commanders in Vietnam had long expressed a need for a tracked vehicle with more firepower than the armored cavalry assault vehicle but with the same mobility. The Sheridan was a partial answer; it was to replace M48 tanks in cavalry platoons of divisional cavalry squadrons and ACAV's that had been substituted for tanks in cavalry platoons of regimental cavalry squadrons.²⁸ In his book, Mounted Combat in Vietnam, retired General Donn Starry stated that the Sheridan had greater mobility, firepower, range, and night-fighting ability than the M-48. A total of 200 Sheridans were sent to Vietnam by late 1970. Eventually almost every cavalry unit in Vietnam was equipped with the Sheridan.

In the May 1966 *Armor* magazine, LTC Raymond Battreall stated that armor in Vietnam was capable of the full range of normal armor operations but, performed best when employed on offensive missions in close cooperation with the infantry.²⁹ An example of the fighting capabilities of light armor occurred on 11 March 1969, when Troop A, 3rd Squadron, 4th Cavalry moved into a night defensive position. The unit was located on a well known infiltration route. The Sheridans in the perimeter were equipped with night observation devices. One of the crews detected a group of enemy troops in an open field, moving directly toward it. The commander instructed the Sheridan crew to hold fire and load its canisters. As the enemy came closer, the large number of radios indicated that

the unit was the command group of a North Vietnamese battalion. When the commander gave the order to fire, the first round eliminated the entire command group. Having lost its leadership, the enemy soldiers panicked. In a few minutes the enemy lost forty-two men killed in action and one prisoner of war as compared to two U.S. soldiers wounded. The encounter demonstrated that the Sheridan was a significant combat weapon even during the hours of darkness.³⁰

Use of armor in Vietnam was not limited to large cavalry or task force-sized operations. Platoons and sections often operated alone, were attached to infantry units, or served as convoy escorts. Ralph Zumbros's book, Tank Sergeant, contains many examples of such independent action and demonstrates the impact that even a pair of tanks can have in a low intensity style conflict.³¹ Operation Just Cause in Panama provides similar examples of platoons and sections operating as part of a combined arms team.

Operation Just Cause

In December 1989, U.S. military forces successfully conducted a coup d'état to neutralize the Panamanian Defense Forces (PDF) and overthrow the dictatorship of General Manuel Noriega. By the end of the first day of the invasion, the principal units of the PDF were destroyed or dispersed. Noriega was fleeing, unable to rally any resistance. He was replaced by Guillermo

Endara as the Panamanian president. Operation Just Cause had worked according to plan.³²

During Just Cause, the Sheridan provided overwhelming firepower in comparison to the assets of the PDF. The Sheridan demonstrated its ability to strategically deploy on two separate occasions. The first involved the air landing of a platoon of four Sheridans with ammunition and support equipment on a single C-5 Galaxy transport into Howard AFB, Panama. The second involved a larger deployment of the ten Sheridans attached to 1st Brigade, 82d Airborne Division. This operation was history's first combat heavy drop of armored vehicles from six C-141 aircraft, eight Sheridans remained operational after the drop. The M551s' airdrop capability during the airborne assault phase of Just Cause provided planners enormous flexibility - and gave the commander on the ground an enormous advantage.³³

The Sheridans formed the nucleus of the brigade's firepower. Initial missions were to block counterattacks and support the infantry's simultaneous assault on four D-Day objectives. In subsequent combat operations, the Sheridans successfully performed the classic roles of armor/armored cavalry: reconnaissance, security, lethal fire support to dismounted forces, and shock effect.³⁴ During Just Cause the Sheridan was a classic example of armor supporting infantry in a combined arms effort.

Sheridans were critical to fighting in built-up areas by providing direct fire support to infantry, including precision fires capable against reinforced

concrete buildings. The 152mm HEAT-T rounds penetrated reinforced concrete walls from six to ten inches thick. This round created up to eight foot holes in many walls and caused extensive damage to the interior structure of buildings. Additionally the crews found the M2 .50 caliber machine gun superior to the weapons station found on M60 or M1 series tanks. Although the tank commander was exposed, it was easier for him to acquire targets and bring the .50 caliber into action.³⁵

Perhaps more than anything else, the aging Sheridan demonstrated to its critics that it remained the only armor system with the strategic capability to accompany assault forces during forced entry operations.³⁶ LTG Lindsey, Commander of Special Operations Command (SOCOM), testified before the House Armed Services Committee in February 1990 on Operation Just Cause. In answering questions for Sam Nunn, he stated that, although the Sheridan tank performed adequately in Panama, there was a strong need for a new, modern light tank to support LIC operations.³⁷ Haiti was to provide yet another example of the need for a armored direct fire weapon system to support infantry operations.

Haiti

The 82d Airborne Division planned to use the Sheridans in the 1994 invasion of Haiti. Although the invasion was halted, due to the surrender of the Haitian military junta in return for "assisted" departure, elements from the

division's armor battalion were deployed later to support the 10th Mountain Division (Light Infantry). Sheridans were used by the joint task force in Haiti for point security, convoy security, cordon search and seizure, and screening missions. Planning for the low-intensity Haitian operation reinforced lessons learned during high-intensity conflicts such as Operations Desert Shield and Desert Storm when Sheridans provided the initial U.S. armor presence in the region.³⁸

As the historical examples in this chapter illustrate, light armor vehicles, assault guns, and other direct fire weapons systems, have made significant contributions in support of infantry. The next chapter provides a review of the Army's requirement for a light armor vehicle to support early entry forces.

IV. The Requirements for a Light Armored Vehicle to Support Early Entry Forces

This chapter will review the Army's requirement for light armor, discuss the capabilities and limitations of the current light armored vehicle and review the operational requirements established for the (now terminated) Armored Gun System. A review of several U.S. and foreign manufactured light armored vehicles is provided, as well as a summary of their specifications, capabilities and limitations.

The Army's Requirement for Light Armor

The U.S. military realizes the need for rapidly deployable early entry forces that can respond to conflicts worldwide. However, the Army's force planners have stripped an important asset out of our early entry forces, an adequate armor component.³⁹ Historical experience tells us that contingency forces must be able to deploy rapidly, deter the enemy on arrival and, if necessary, conduct combat to defeat the enemy. In doing so the force must be deployable, survivable, capable of killing tanks and possess mobility to move around the battlefield.⁴⁰

In the U.S. Army, the 82d Airborne Division is organized to deploy rapidly anywhere in the world. Due to its forced entry capabilities, the Division plays a major role in many contingency plans. It is likely to be the initial force deployed for contingency operations (CONOPS). The 82d is ideally suited to seize, secure, and repair airfields that provide an airhead for follow-on forces. The division also delays, disrupts, and reduces enemy forces.⁴¹ It is debatable, however, whether the 82d can currently compete with the main battle tanks with which many potential U.S. opponents are equipped.⁴²

The Army's Current Light Armor (M551A1 Sheridan)

The only airdroppable light armored vehicle currently in the Army inventory is the M551A1 Sheridan. Years later, the sole combat ready M551s in the U.S. Army are the 57 assigned to the 82d Airborne Division. Approximately

300 have been modified to serve as Opposing Force (OPFOR) armored vehicles at the National Training Center at Fort Irwin, California, but they are no longer combat vehicles.⁴⁴

Since 1967, when the Sheridan was first assigned to the division, it has provided the 82d Airborne Division and XVIII Airborne Corps a unique light armor capability. The vehicle is light enough to participate in airborne forced entry operations utilizing low velocity airdrop (LVAD), or airland insertions using C-130, C-141, C-17, or C-5B aircraft. The Sheridan's excellent mobility and 152mm gun/launcher system enable the vehicle to fire a wide range of munitions including the obsolescent Shillelagh missile (range: 2500 meters against moving targets and 3000 meters against stationary targets) and a number of conventional anti-personnel and anti-tank rounds. The vehicle is also armed with a coaxial 7.62mm machine gun. A .50 caliber machine gun is mounted on the forward part of the commander's cupola.⁴⁵

The Sheridan's major operational shortcomings include turret mechanical problems, transmission failures, limited armor protection, and no kinetic energy killing power. These shortcomings are largely the result of age and obsolescent 1960's technology. A modern tank fire-control and night fighting capability was hurriedly installed as the vehicles were deploying to Saudi Arabia for Operation Desert Shield/Storm.⁴⁶

The Sheridan maintains a respectable operational readiness rate, but due to its age and low service density, logistical support by both Tank Automotive

Command (TACOM) and Army Munitions Command (AMCCOM) is difficult. The Army has relied upon depot cannibalization to keep the vehicles mission capable. The last major procurement of parts was in 1977. Despite these efforts, there have been numerous delays and spot shortages. This is not the level of reliability the U.S. Army requires in a system deployed for a bare-based contingency operation, thousands of miles from the continental United States.⁴⁷

One area where the Sheridan performs exceptionally well is airborne assault. The Sheridan is a rugged vehicle, capable of surviving a parachute drop and fighting almost immediately upon landing. The vehicle can be derigged from all airdrop equipment and be on its assigned combat mission within seven minutes. As the vehicles proved during the combat assault into Panama, boresight and zero are retained after airdrop. The main gun, .50 caliber, and 7.62mm coaxial machine gun give the light armor battalion an important role in a wide array of combat missions as well as considerably more firepower than other light divisions.⁴⁸ More importantly, the Sheridan allows the 82d Airborne to form light tank, infantry, and artillery combat teams for employment in mid-intensity combat.

The Search for a Light Armored Vehicle

The search for a light armored tank is not new. General Vuono's program, called the Armored Gun System (AGS), was actually the resurrection of a series of efforts which officially began in 1976 with the Army-sponsored

Armored Combat Vehicle Technology analysis. The intent of the exercise was to increase the tank's strategic mobility and battlefield survivability by minimizing its physical signature. The challenge was to reduce the size without sacrificing the firepower.⁴⁹ The U.S. Army's interest in the Armored/Assault Gun System coincided with general disenchantment with the M551 during Vietnam. "In the intervening years the requirement for a versatile, readily deployable, yet lethal armor system to provide both anti-tank and infantry assault gun functions has changed direction almost as many times as it has changed its name."⁵⁰

Reviewing the past and analyzing the future, the U.S. Army saw a need for a rapidly deployable contingency force for use in low-to-mid intensity conflicts. This force would require an AGS to support infantry, destroy bunkers, and kill other armored vehicles. The concept was to deploy the AGS as part of airborne and light infantry units providing them a direct fire asset that could destroy anything from bunkers to tanks. The 2d Armored Cavalry Regiment (ACR) was also scheduled to field the AGS, providing them with both rapid deployment and lethality.

Based on past experience and in anticipation of future operations, Army planners made deployability and lethality their priorities for the AGS. The planners wanted a system that had add-on armor packages to increase armor protection levels depending on the threat. The system would operate in sections of two or as a maneuver unit up to the battalion level. The search was on to find

a lightweight, rapidly deployable, highly mobile assault gun that is not a tank, yet can kill like one.⁵¹

Operational Requirements of the Armored Gun System

The Army issued a validated Requirement Operational Capability (ROC) document in April 1990. The ROC formally established the need for an AGS armed with a 105mm weapon capable of firing NATO-standard ammunition. Combat operations during Operation Just Cause demonstrated that large-caliber high explosive, anti-tank rounds readily penetrated reinforced concrete walls and caused extensive damage to the interior of the buildings. The 1990 ROC outlined the following characteristics for the AGS: Deployability, Lethality, Survivability, and Sustainability.

The Army envisaged procurement of a baseline AGS weighing less than 35,500 lbs for use by the 82d Airborne. (The weight restriction results from the requirement for the AGS to conduct low-velocity air-delivered (LVAD) by parachute from C-130s). A heavier AGS incorporating add-on armor would be fielded by other light forces. However, in the push to field the AGS beginning in FY 1997, the Army dropped the LVAD requirement from the C-130, and instead specified the C-17 as the airdrop delivery means with an acceptable drop weight of 22 tons. This simplified some of the engineering challenges posed by the AGS requirement.⁵² (LVAD from C-130s is a desired feature, and an AGS "roll-

on/roll-off" capability from the C-130, C-141, and C-17 is required). Details of the four characteristics are provided in Appendix A.

The current ROC for the AGS provides for a modernized, airborne light armor system with a strategic capability to function world-wide as part of a combined arms team engaged in forced entry or other contingency operations. The system is designed to provide light forces a number of advantages in areas where they are currently deficient: increased protected mobility; increased anti-armor/anti-material lethality; shock effect; and high technology on the battlefield.⁵³ The ROC for the AGS highlights one very key point as far as the 82d Airborne Division is concerned--the necessity of retaining the airdrop option for the purpose of forced entry operations. This position is retained for two principal reasons:

(1) Airdrop of personnel and equipment during the combat assault permits much more rapid assembly of combat power in the objective area than does airland. (A lesson learned by the 82d Airborne Division during Operation Urgent Fury in Grenada).

(2) Airdrop permits quick turnaround of transport aircraft for other follow-on missions, such as airlanding a second echelon. This is significant in less developed Third World scenarios where available airfields generally have limited maximum onground (MOG) off-load capacity.⁵⁴

Alternative Assault Gun Systems

Although the Army has terminated the AGS, the ROC identified the need for a deployable, lethal, survivable, and sustainable assault gun. The section that follows is a review of several alternative systems that may fill the requirement for a future assault gun system. Descriptions of U.S. and foreign manufactured systems are provided for comparison. There are several U.S. and foreign manufactured assault gun systems that meet many, but not all, of the ROC requirements established for the AGS. Three potential U.S. candidates are reviewed below, including a Product Improved M551A1 Sheridan. In addition descriptions of several foreign light tanks and light armored vehicles are provided for comparison.

LAV-105

The Light Assault Vehicle (LAV) is a lightly-armored, amphibious version of the Swiss-designed Piranha. It is manufactured by General Motors of Canada for both the USMC and USAF. It has eight-wheeled drive, independent suspension and a powerful engine giving it excellent off-road capabilities. The LAV-105 is fitted with the EX-35 105mm gun and a 7.62mm coaxial machine gun. The LAV has a crew of three and a top speed of 65 miles per hour. The vehicle can swim at 6.5 mph with no preparation required before entering the water. The LAV-105 is C-130 roll on, roll-off capable and has been successfully airdropped using both Low Altitude Parachute Extraction System (LAPES) and

LVAD. While the LAV can be airlifted by C-141, each C-141 can only carry two LAVs per sortie. The vehicle weighs 30,500 pounds combat-loaded.⁵⁵

The greatest advantage of the LAV is that it already is in service with the USMC and the USAF, as well as the Canadian and Australian armies. The LAV-105 offers significantly reduced transportation costs since, as a wheeled vehicle, it can travel on ordinary roads and bridges, reducing the need for a heavy transporter. The LAV has established an excellent maintenance record (4000 mean miles between major failures verses 500 miles for the M1 tank), reducing spare part requirements at the unit level. It has greater vehicle mission availability as compared to tracked vehicles. The LAV is transportable by CH-53E or similar rotary wing aircraft, giving it the unique capability of an airmobile armor force. Eight LAVs are transportable aboard a C-5B.⁵⁶

The LAV-105 has several drawbacks. Since it is a wheeled vehicle it does not have cross-country mobility equal to tracked vehicles. The vehicles' frontal armor does not meet the Army requirement, nor is the LAV-105's armor sufficient to protect against 12.7-14.4mm flanking fire. The vehicle would require additional armor to meet the Army's requirements. The LAV-105 only carries eight ready rounds of main gun ammunition, far fewer than the ROC requires. Thermal sights would have to be added to the current LAV to give it a true night-fighting capability.⁵⁷

Although the vehicle is capable of LVAD it must be modified to meet the height requirement. Additionally there is a concern that the length of the

105mm gun may cause "tip-off" problems during LVAD extraction. As currently configured, the LAV-105 does not mount a .50 caliber anti-aircraft machine gun. In contrast to the Marine Corps, the U.S. Army still says that a wheeled heavy weapons platform, as currently configured, fails to meet its AGS requirements. Although admitting that the LAV-105 presents off-the-shelf opportunity with the potential savings of a joint program, the Army is adamant in its belief that the LAV does not meet user requirements, since its mobility and armor protection is not equal to or better than that of the Sheridan.⁵⁸

Cadillac Gage LAV-600 Armored Car

The LAV-600 armored car was previously known as the V-300 A1 but was renamed in mid-1986. The LAV-600 is fitted with Cadillac Gage 105mm Low Recoil Force Turret. The hull and turret are of all-welded Cadloy armored steel which provides small arms and splinter protection. The turbocharged Cummins V-8 engine develops 270 hp, giving a power to weight ratio of 14.59 bhp per ton. The engine is coupled to a fully automatic Allison Transmission. The maximum speed is 62 mph with a range of 370 miles. The turret is identical to that installed on the Stingray light tank and holds eight rounds. An additional 28 rounds are carried in the hull. The vehicle has a roof mounted 7.62mm machine gun that can be replaced with a .50 caliber machine gun for anti-aircraft defense. The combat weight of the LAV-600 is 18,500 kg. Crew size is four. Although a prototype exists, the vehicle is not yet in production or service.⁵⁹

Cadillac Gage Stingray Light Tank

The Commando Stingray light tank was developed by the Cadillac-Gage Textron Company in the late 1970's/early 1980's. The system was designed to provide a vehicle with the lethal firepower of a main battle tank but with greater tactical and strategic mobility. Priorities established for the system included: a high lethality 105mm main gun that would fire standard NATO ammunition; high mobility; large operational range; low profile for increased survivability; light weight, and C-130 transportability.

The main gun is the Royal Ordnance 105mm Low Recoil Force (LRF) gun. Thirty-two rounds of 105mm ammunition are carried. Fire control is provided by an M36E1 day/night sight incorporating a laser rangefinder and a thermal sight. A 7.62 machine gun is mounted coaxially to the main gun and there is a flexible mount for either an additional 7.62mm or .50 caliber machine gun at the commander's station. The hull and turret are of all-welded Cadloy steel armor providing frontal arc protection against 14.5mm armor-piercing rounds fired from the Soviet KPVT heavy machine gun. The remainder of the vehicle is armored against 7.62 mm armor-piercing rounds. The power plant is a 535 hp eight-cylinder Detroit Diesel coupled to the same transmission found in the M-109 self-propelled howitzer. The top speed is 42 mph with a cruising range of 300 miles. The vehicle has a four man crew.⁶⁰

One of the primary advantages the Commando Stingray is that it is currently in production. In 1989, the Royal Thai Army purchased 106 Stingray light tanks.⁶¹ The engine, transmission, automotive, and fire control systems are based on systems currently in use, offering commonality of spare parts and maintenance.

The major disadvantage of the Commando Stingray is its combat weight--46,750 lbs. This is almost 11,000 lbs over the maximum AGS weight. Combat weight could possibly be modified for airdrop. Overhang of the main gun may cause a problem in meeting the "tip-off" angle required in LVAD.

Teledyne Vehicle Systems Expeditionary Tank

The Teledyne Vehicle System is a radical departure from the standard armored vehicles. It has an externally-mounted overhead main gun, crew in-hull configuration, and a front-mounted fuel and power pack. In designing the TVS, Teledyne decided on a number of key requirements: roll-on, roll-off air transportability in C-130 and C-141 aircraft, as well as LAPES capable; maximum use of off the shelf components; 105 mm main gun with autoloader; a fire control system with the same accuracy as the M60A3 main battle tank; high cross country mobility; and a low profile to help its survivability on the battlefield.⁶²

The power pack consists of the Cummins eight-cylinder turbocharged diesel producing 600 hp coupled to a Lockheed Martin Defense Systems hydromechanical transmission. It has a top speed of 45-50 mph with a cruising

range of 300 miles on a 170-gallon fuel capacity. Chassis armor is comprised of a combination of rolled homogenous steel plate, steel and ceramic composite, ballistic aluminum and Kevlar, and ceramic appliques to provide 23mm frontal and 7.62-14.5mm side protection. Protection levels may be raised or lowered according to the threat or delivery method (airland or airdrop) through the addition of bolt-on armor plates.

Main armament consists of the U.S. Army 105mm M68A1 or XM35 rifled tank gun. The gun is externally mounted and presents a very small target to enemy weapons. The small profile increases survivability of the vehicle. Since the turret is rear-mounted there is much less gun overhang than on most vehicles of this type. Additional weapons, such as two TOW or HELLFIRE missile launchers, can be mounted on either side of the 105mm gun. The main gun is automatically loaded from a nine-round magazine which, in turn, is fed from rear replenishers, providing a total of 30 to 42 rounds of ready use ammunition. The vehicle has a coaxial 7.62mm M240 machine gun. A similar weapon can be mounted externally on the commander's cupola. As an alternative a 7.62mm M60D, 40mm grenade launcher or .50 caliber machine gun can be mounted in place of the coaxial machine gun. The vehicle requires a three-man crew.⁶³

The design of the TVS offers a number of inherent advantages. The location of engine and fuel forward provides added crew protection. This is enhanced by the fact that the entire crew is housed inside of the hull. The power-to-weight ration is an impressive 31.49 hp/ton. In regards to airdrop, the

turret is well to the rear of the vehicle, resulting in less barrel overhang and reduced "tip-off" during LVAD. The power pack can be removed as a complete system to facilitate replacement in the field.

One disadvantage of the Teledyne Vehicle System is the lack of all-round visibility for the two crew members, whose vision is partially blocked on one side by the gun mount. This may present a significant target acquisition problem when on the move. The present combat weight of the system is also too heavy to meet LVAD requirements. Removing the side armor plates for airdrop and making other small changes would reduce the weight to approximately 17.5 tons, just under the maximum airdrop weight.⁶⁴

Product-Improved M551A2 Sheridan

In addition to the American manufactured options discussed above, significant product improvements to the existing Sheridans are possible. Some of the proposed improvements include:

- Replace the engine and transmission with a more modern automotive powerplant.
- Upgrade the existing fire control system and night driving viewers to M1 standards.
- Upgrade protection by adding ceramic or kevlar applique armor.
- Develop a 152mm armor-piercing disposable sabot round (APDS) if the current main gun is maintained.

- Incorporate the LAV-105 turret, autoloader, and EX-35 105mm main gun to the existing Sheridan chassis.

Although a product-improved Sheridan may meet the survivability and airdrop weight requirements, there are logistical supportability concerns, electronics, and NBC requirements, among others that must be addressed.⁶⁵

Foreign Light Tank and Light Armored Vehicle Systems In addition to the American systems described above, several foreign manufacturers have comparable systems that can fulfill the requirements for a light armored tank/vehicle.

Hagglunds IKV 91-105 Light Tank

Manufactured by Sweden, the IKV 91-105 was submitted as a candidate for the AGS. The 105mm version of the Tank Destroyer has an all-welded steel hull. The vehicle has 20mm protection over the frontal arc and a double-skinned sidearmor. Three of the four crew are seated in the all welded steel turret. The Bofors turret mounts the German Rheinmetall 105mm super low-recoil gun capable of firing all NATO ammunition, including the latest kinetic energy rounds. The Bofors is not U.S. safety certified and would require extensive redesign of both the tube and the muzzle brake.⁶⁶

The vehicle weighs approximately 39,000 pounds and would require significant weight reductions for airdrop. The vehicle is powered by a 360 hp

Volvo six-cylinder diesel with a power-to-weight ratio of only 20hp/ton. The maximum speed is 40 mph with a cruising range of 120 miles cross-country or 300 miles on the road. Haggblunds is no longer marketing the 105mm version but has teamed with Giat Industries of France and is offering the CV90105 TML. This vehicle is not an off the shelf solution and there are a number of unanswered questions that make its candidacy weak.⁶⁷

Italian B-1 Centauro

Early in 1984 the Italian Army formulated its requirement for a new highly mobile wheeled tank destroyer with a standard NATO 105mm rifled tank gun. The vehicle was required to have a high road speed for strategic mobility and a computerised fire control system. Late in 1992 eight Centauro B1 105mm armed tank destroyers were deployed to Somalia and during the first four months they averaged 8,400 km without any significant problems. The hull of the Centauro is of all-welded steel armor construction which provides the crew of four with protection from small arms fire and shell splinters. Over the frontal arc, protection is provided against penetration against 20mm projectiles and against 12.7mm attack all around.⁶⁸

The turret is mounted on the hull slightly to the rear of the vehicle's centerline. The main gun is an OTOBREDA designed 105mm stabilised rifled gun that fires standard NATO tank ammunition. The vehicle carries 40 rounds of 105mm ammunition, 14 of which are in the turret and the remainder in the

hull. A 7.62mm M42/59 machine gun is mounted coaxially to the left of the main gun with a similar weapon mounted on the turret roof for anti-aircraft defense. The vehicle is powered by a IVECO MTCA V-6 turbocharged diesel coupled to a German fully automatic transmission. The engine produces 520 hp with a power-to-weight ratio of 21.6hp/ton. The range of the Centauro is 500 miles and the maximum road speed is 62 mph. The vehicle has a combat weight of 24 tons, with additional armor protection added the maximum combat weight rises to 28 tons.⁶⁹

As illustrated above there are many potential assault gun systems available. They do not currently meet the Army's requirements and cost has not been determined. In summary, the system must be capable of deploying as a key element of a tailored contingency force to conduct operations ranging from tactical to strategic in scope. The system should be designed to improve agility and deployability without sacrificing lethality.⁷⁰ The Assault Gun can expect to encounter a mix of Soviet, Western and indigenously produced equipment and a hybrid of tactical doctrine. The overriding requirement in developing an assault gun system is to provide the contingency force commander with a combat vehicle that possesses the strategic deployment, forced entry capability, armored mobility, firepower, and shock effect needed to gain and maintain the initiative, control the situation and accomplish the mission.⁷¹

V. Other Options

The Army's leadership is exploring several options to fill the gap created by the inactivation of the 3-73rd Armor Battalion and the cancellation of the AGS. Near-term proposals to compensate for the Sheridan phaseout have various operational shortcomings.⁷² The following are the primary ways the Army hopes to compensate for the loss in capability:

The Immediate Ready Company (IRC). As currently configured, the IRC is a company-sized task force from the 3d Infantry Division (Mechanized) at Fort Stewart, Georgia. The IRC consists of four M1A1 Abrams tanks and four M2A2 Bradley Fighting Vehicles ready for movement by C-5Bs or C-17s. The mission of the IRC is to deploy into battle with the 82d's initial contingency forces. Like the 82d's division-ready brigade, the IRC is required to be deployable within 18 hours of notification.

The IRC's main drawback, compared to the Sheridan or the AGS, is that neither the Abrams or the Bradley can be airdropped into combat. An airfield must be seized or controlled by friendly forces before the IRC can be deployed. The IRC requires either eight C-5B Galaxy or eight C-17 aircraft to airlift it into combat. There are several drawbacks to airlifting armor support. The C-5B and C-17 can carry only one tank and a support vehicle at a time. To move a company team(-) requires eight to ten C-5Bs/C-17s. This is a significant portion

of the strategic airlift (7-10% of the C-17 fleet). Despite the shortcomings, the Army's senior leadership feels that airlifting the Abrams and Bradleys into an area quickly and combining them with the 82d gives them the armored support they need.⁷³

The Javelin. Previously known as the Advanced Antitank Weapon System-Medium, the Javelin is replacing the Dragon. The Javelin provides a man-portable medium anti-tank capability to the infantry. The system is highly lethal against tanks with conventional and reactive armor. The Javelin system weighs less than 50 lbs and has a maximum range of 2000 meters. The system allows the gunner to fire and immediately take cover.

The Javelin consists of two components, a command launch unit (CLU) and a round of ammunition. The system features a top attack and/or indirect fire modes (for targets under cover).⁷⁴ However, the primary "fly-over, shoot-down" mode is not likely to be effective against log bunkers and concrete emplacements shielding heavy machine guns and grenade launchers. The missile is an anti-armor weapon. It is not a infantry support weapon. If Javelin missiles are employed in the alternative direct-fire mode against these lower-priority targets, available missile supply could be quickly depleted.⁷⁵

The Javelin was fielded to the 3rd Battalion, 75th Rangers on 27 June 1996, marking the first deployment of a precision strike, fire-and-forget technology to the individual soldier. The survivability of the infantry antitank gunner will

significantly improve through the combination of greater standoff, fire-and-forget technology, reduced launch signature, and the ability to fire from enclosures. Anti-tank sections in the Army (82d Airborne Division), USMC, and selected brigades of the National Guard are scheduled to receive the system starting as early as April, 1997.

The Enhanced Fiber Optic Guided Missile (EFOGM). Mounted on a heavy HMMWV chassis, the EFOGM should have excellent anti-armor and anti-helicopter capabilities at ranges up to 15 kilometers. The EFOGM is one of the weapons being evaluated in the Rapid Force Projection Initiative Advanced Technology Demonstration (ACTD) scheduled to begin at Fort Benning, Georgia, in July 1998. The XVIII Airborne Corps will receive two EFOGM platoons of four firing vehicles each to participate in the demonstration. At the conclusion of the ACTD the corps will receive another platoon, forming a full company. A two year extended user evaluation will follow. The company will not be considered deployable until 1999. Concern over the 82d's anti-armor capabilities has forced the Army to revise its initial plan to field the EFOGM company to the 101st Airborne Division (Air Assault). The ACTD may be accelerated and EFOGM fielded to the 82d instead.⁷⁶

Line-of-Sight Antitank (LOSAT). The LOSAT is another potential system to enhance the 82d's anti-armor capability. The LOSAT will provide a high volume

of lethal missile fire, effective against heavy armor systems at ranges exceeding main tank gun ranges. The LOSAT weapon system consists of a kinetic energy missile (KEM) turret mounted on an air mobile armored combat vehicle chassis.

The advantage of the system is its lethality and deployability, which is compatible with early entry forces. The LOSAT may potentially satisfy critical anti-armor needs of the early entry forces, providing anti-tank fire to fix and destroy enemy armored formations. The LOSAT will replace selected mounted TOW systems.⁷⁷ Other advantages include:

- (1) High rate of fire and rapid target engagement
- (2) Ability to engage armor targets, bunkers and helicopters
- (3) Ability to defeat all advanced armors and active protective systems⁷⁸

The Army planned to mount the system on the AGS chassis. When the Army abandoned the AGS, the decision left the LOSAT weapon system without a chassis. Lockheed Martin Vought Systems integrated the system on an Enhanced-Capability HMMWV (ECH). The ECH LOSAT will weigh 12,100 pounds, considerably more than the typical HMMWV's 8,200 pounds. Two ECH LOSATs can be airlifted by a C-130. A disadvantage as presently envisioned is the rearming of the four missiles which takes approximately 30 minutes.⁷⁹ Additional drawbacks are that the system is very expensive and is a single function system (tank killer). The Army is approximately two years from deciding whether to produce the LOSAT, if so, it may be an additional four or five years before the system is fielded to the troops.

Army leaders are confident that a combination of systems detailed above will be adequate to fill the void left by the cancellation of the AGS and inactivation of 3-73 Armor. However, all of these proposed weapons are 'anti-tank' systems. The 82d already has 180 ground TOW systems and numerous AH-58's. What the 82d is losing is a tracked, large caliber, airdroppable, armored system which can support the infantry.

VI. Conclusions

This paper has identified a major gap in the structure of the Army's early entry forces. An airdroppable armored assault gun system is desperately needed in order to give the contingency force commander options in tailoring forces to fight any enemy across the full continuum of conflict.⁸⁰ Our early entry forces need a deployable lightweight armored vehicle with increased tactical mobility, lethality, and survivability capable of operating with light infantry-based contingency forces worldwide.⁸¹ We must make up this shortfall in our rapid deployment forces resulting from the inactivation of the 3d Battalion 73d Armor and cancellation of the Armored Gun System.

As Section IV illustrates the problem is not a shortage of options but an unwillingness to recognize a simple, cost effective solution to our problem. The Army has struggled unsuccessfully for a decade to field a replacement through

various Army-Marine and Army-only programs. We must consolidate and support efforts to field a replacement for the M551A1.⁸²

Although airborne forces are the most responsive type of force structure for early entry operations, they continue to lack the tactical and operational firepower critical for many missions. Rapidly deployable light forces are currently vulnerable on introduction into the theater of operations. We cannot afford to continue deploying airborne forces with inadequate direct fire support. The Army's early entry forces need firepower and crew protection, packaged in a system that is easily deployable, maintainable, and sustainable. This must be done without compromising the essential character of the airborne forces.

It is obvious that the Army is entering a new period of forced austerity. There is no clear road to dealing with the military requirements of the post-cold war periods, or to using technology to compensate for a smaller force. Any trend toward increasingly expensive weapons, especially for airborne forces, is unrealistic in today's environment. Weapons must be less expensive to procure and operate, and be capable of fulfilling multiple requirements. Light armor vehicles have a place in our modern multi-role force, but we must act now.⁸³

There are systems, like the Armored Gun System, that can provide a survivable, airdropable, mobile, and lethal capability to fill the void in the current light and airborne infantry force structures. Potential assault gun systems should include the following capabilities:

(1) Deployment - The assault gun would deploy as part of the larger contingency force by either strategic or tactical airlift. This force might require forced entry into the area of operations by airdrop by all or a portion of the force, as well as airlanding by follow on elements.

(2) Lodgement Area - The assault gun would be initially employed in the seizure and rapid expansion of the lodgement area and its subsequent defense. The vehicle must possess both the firepower and mobility to quickly reinforce infantry forces on the lodgment perimeter or to conduct mobile reconnaissance and security on high speed avenues of approach.

(3) Offensive Operations - In offensive operations the assault gun should capitalize on mobility and high volumes of fire using a wide range of munitions. It should operate as part of a combined arms team to support infantry forces with suppressive and close-in direct fire from its main gun and machine guns. It could also be called upon to operate independently against enemy infantry and armor. Because of its light armor, the assault gun should not be employed in a direct assault role where the enemy has anti-tank weapons unless it has been upgraded with a additional armor protection. When operating with dismounted infantry it should normally be employed in a fire support role from defilade positions with the infantry providing close security.

Military history since WWI has proven that in most scenarios the tank-infantry combined arms team is a far superior force than infantry alone. It is important to remember that a weapon system is only as effective as the sum of

its parts and its integration into the overall scheme. No one weapons system is capable of winning the battle on its own.⁸⁴

(4) Defensive Operations - In the defense, the assault gun should be positioned to provide high volumes of direct fire against enemy forces as they close within effective range. Whenever possible, assault gun and anti-tank guided missiles (ATGM) weapons systems should be integrated to permit the ATGM to engage enemy vehicles at long range, while the assault gun maneuvers to destroy the enemy with fires from defilade positions. In this manner the two systems would have a synergistic effect, enhancing each other's strengths and offsetting inherent weaknesses. The lightly armored assault gun is not intended to be a main battle tank and must not be employed in such a manner as to slug it out tank-to-tank. Instead, it should use stealth, agility, and a shoot-on-the-move capability to hit the enemy on the flanks or similar weak points. Survivability rests more on the system's low profile and agility than on heavy armor protection. The assault gun would be an ideal weapon for the conduct of counterattacks or spoiling attacks by the contingency force commander.⁸⁵

(5) Reconnaissance/Security - A contingency corps assault gun would provide the corps with the same mission capabilities that the Armored Cavalry Regiment provides the heavy corps, except that it would be capable of rapid deployability by airlift and less capable against a heavy enemy force than the heavy ACR.

(6) Retrograde - light armor can conduct a high risk delay operation against a mounted enemy where success depends heavily upon firepower and mobility. The contingency force commander can use light armor to delay when the force's strength is insufficient to attack or defend.⁸⁶

(7) Additional roles and missions - When employed as part of a contingency force, assault gun capabilities are ideal for application in a variety of specialized roles and missions. The protection and mobility provided by the assault gun makes it well suited for support of noncombatant evacuation operations (NEO), convoy security, border patrol operations, military operations in urban terrain (MOUT), and peacekeeping operations.⁸⁷

The former Chief of Staff of the Army, General Carl E. Vuono, identified two fundamental imperatives laid out in his White Paper of January 1990. He stated that the Army's first imperative was to maintain a sufficient and balanced force structure. Secondly, the Army must modernize continuously to maintain our warfighting capabilities.⁸⁸ These two imperatives stand true today as we face the challenges of the 21st century. The Army must focus its warfighting strategy to obtain the optimal balance of forces and equipment.

It is clear that the Army must maintain a mix of forces and technologies with sufficient flexibility to deal with a wide range of contingencies.

Tomorrow's Army will have to prove that it not only has the capability to deploy strategically, but also that it has a credible combat capability once deployed.⁸⁹

This will be increasingly difficult if global weapons proliferation continues at the

present pace. The force that will meet these worldwide contingency challenges must be increasingly capable, deployable, versatile, lethal and survivable. As a former Commander-in-Chief of U.S. Army Europe, General Frederick J. Kroesen, eloquently stated, "We owe to our soldiers the best equipment we can buy. Anything less is a breach of faith and a courtship of dishonor by the people of the United States."⁹⁰

APPENDIX A

Characteristics Outlined in the 1990 ROC for the Armored Gun System (AGS)

Deployability - One configuration of at least one battalion (70) vehicles capable of low-velocity airdrop from C-130, C-141, and C-17 aircraft. The system must be capable of fighting with all weapon systems within 15 minutes after derigging. The remaining AGS configuration must be capable of vehicle powered roll-on, roll-off. Both configurations should be on a common chassis and provide maximum commonality of systems.

Lethality - The AGS should have a 105mm main gun capable of firing kinetic energy rounds. The system must mount a 7.62mm coaxial machine gun and a .50 caliber machine gun at the commander's station. The AGS must store approximately 30 main gun rounds. At least half of 30 main gun rounds should be accessible for immediate loading. The fire control system should have a integrated laser range finder. Accuracy and target acquisition should provide a dual-stabilized fire-on-the-move capability for both the main gun and the coaxial machine gun. Night sights are required and both primary and auxiliary sights must retain boresight and zero following airdrop operations.

Survivability - The system must provide mobility/agility equal to or better than the M551A1. It must have a cruising range of at least 480km at 40km/hour, and

be capable of towing another AGS. There must be sufficient armor protection to ensure survivability against small arms and indirect artillery fire. The actual level is classified but a 7.62mm armor-piercing protection all-around and 12.7-14.5mm frontal protection is likely. The vehicle must also possess an add-on, modular armor capability to upgrade the level of protection. The vehicle must also possess an integrated crew NBC protective system.

Sustainability - The vehicle must possess a high degree of reliability. The ratio of maintenance manhours per operating hours must be kept to a minimum. The system should seek commonality of parts with the M1, Bradley Fighting Vehicle and other existing systems. The vehicle should also accommodate Preplanned Product Improvements for a vehicular navigational aid system compatible with the Global Positioning System (GPS). It must accept current and planned radio and secure voice systems and incorporate an external telephone for communication with supported infantry troops.

ENDNOTES

¹Richard K. Fickett. "3-73 Armor: Down, But Not Out." Army Times, (October 1996), p. 62.

²Steven Metz. "America in the Third World: Strategic Alternatives and Military Implications." (U.S. Army War College, Carlisle Barracks, Pennsylvania, May 1994), p. 1.

³Carl H. Freeman. "The Army Needs A Strategic Armored Gun System--Now!" (U.S. Army War College, Carlisle Barracks, Pennsylvania, 1991), p.4.

⁴John W. Nicholson Jr. "America's Middleweight Force: Enhancing the Versatility of the 82d Airborne Division for the 21st Century." (School of Advanced Military Studies, Fort Leavenworth, Kansas, December 1993), p.4-5.

⁵Ibid., p. 18.

⁶James Etchechury. "The Armored Gun System Debate: Let It Begin Before It Is Too Late." Armor, (January-February 1991), pp. 32-34.

⁷Freeman, Strategic AGS, p. 5.

⁸John K. Boles and Vincent C. Schmolli, "The Regional Threat", Armor, (July-August 1990), pp. 30-35.

⁹John Chipman. The Military Balance; 1996/1997. (London: Oxford University Press, 1996), pp. 15-235.

¹⁰U.S. Department of the Army, Light Armor Operations, Field Manual 17-18, (Washington, D.C.: March 1994), pp. 1-6 to 1-7.

¹¹Fickett, "3-73 Armor", p. 62.

¹²Sean D. Naylor. "Army Trades Off AGS System For Cash." Army Times, (February 1996), p. 3.

¹³Anthony H. Cordesman. "Compensating for Smaller Forces: Adjusting Ways and Means Through Technology." (U.S. Army War College, Carlisle Barracks, Pennsylvania, April 1992), pp. 11-12.

¹⁴FM 17-18, Light Armor Operations, p. 1-1.

¹⁵Ibid., p. ii.

¹⁶Kevin Rieders. "What Can We Do With Light Armor?" Armor, (May-June 1994), p. 44.

¹⁷Ibid., p. 42.

¹⁸Steven J. Zaloga. U.S. Light Tanks: 1944-1984. (London: Osprey Publishing, 1984), p. 10.

¹⁹Bruce Culver. Sturmgeschutz III in Action. (Carrollton, TX: Squadron Signal Publications, Inc., 1976), p. 4.

²⁰Bryan Perrett. Sturmartillerie and Panzerjager. (London: Osprey Publishing, 1979), p. 4.

²¹S. J. Lewis. Forgotten Legions: German Army Infantry Policy 1918-1941. (Connecticut, Praeger Publishers, 1985), pp. 113-114.

²²Hilary Doyle and Tom Jentz. Stug III: Assault Gun 1940-1942. (London: Osprey Publications, 1996), pp. 19-20.

²³Perrett, Sturmartillerie and Panzerjager, pp. 17-20.

²⁴Rieders, "What Can We Do With Light Armor?", p. 43.

²⁵James M. Gavin. "The Future of Armor". Armored Cavalry Journal, (March-April 1947), p. 3.

²⁶James R. Lunsford. "Keeping the Airborne Division a Viable Force.", (Command and General Staff College, 1993), p. 15.

²⁷Gavin, "The Future of Armor.", p. 4.

²⁸Donn A. Starry. Mounted Combat in Vietnam. (Department of the Army, 1978), p. 142.

²⁹William Butler and William Strode. Chariots of Iron: 50 Years of American Armor. (Kentucky: Harmony House Publishers, 1990), p. 64.

³⁰John H. Hay. Vietnam Studies: Tactical and Material Innovations. (Department of the Army, 1974), p. 112.

³¹Scott Womack. "The AGS in Low-Intensity Conflict: Flexibility is the Key to Victory." Armor, (March-April 1994), p. 42.

³²Kenneth O. McCreedy. "Winning the Peace: Post Conflict Operations." (School of Advanced Military Studies, December 1994), p. 22.

³³Frank Sherman. "Operation Just Cause: The Armor-Infantry Team in the Close Fight." Armor, (September-October 1996), p. 35.

³⁴Freeman, "Strategic AGS.", p. 1.

³⁵Kevin J. Hammond and Frank Sherman. "Sheridans in Panama." Armor, (March-April 1990), p.14.

³⁶Freeman, "Strategic AGS.", p. 1.

³⁷David L. Nobles. "The Light Armored Force: An Urgent Need, A Ready Solution." Armor, (May-June 1990), p. 3.

³⁸Scott R. Gourley. "M8 Armored Gun System." Army, (January 1996), p. 38.

³⁹Nobles, "The Light Armored Force.", p. 8.

⁴⁰Johnny W. Brooks. "Army Contingency Forces: What Should They Be?" (School of Advanced Military Studies, June, 1992), p. i.

⁴¹FM 17-18, Light Armor Operations, p. C-1.

⁴²Naylor, "Army Trades Off AGS System For Cash.", p. 14.

⁴³Christopher F. Foss ed., Jane's Armor and Artillery 1984-1985, p.146.

⁴⁴Hay, Vietnam Studies, p.112.

⁴⁵Freeman, "Strategic AGS.", p. 9.

⁴⁶Ibid., p. 10.

⁴⁷Ibid., p. 10.

⁴⁸Hammond, "Sheridans in Panama.", p. 15.

⁴⁹Nick Nichols. "Tanks for the Future." Popular Mechanics, (May 1988), p. 70.

⁵⁰Freeman, "Strategic AGS.", p. 11.

⁵¹Stewart M. Hickey. "Why Not the AGS?" Marine Corps Gazette, (August 1992), p. 41.

⁵²Ramon Lopez. "USMC Rolls with LAV-105 Project, Army Seeks Replacement AGS.", International Defense Review, (June 1991), p. 575-576.

⁵³Freeman, "Strategic AGS.", p. 19.

⁵⁴*Ibid.*, p. 19.

⁵⁵Christopher F. Foss ed., Jane's Armor and Artillery 1995-1996, p. 242.

⁵⁶David Segal. "Whatever Happened to Rapid Deployment?" Armed Forces Journal International, (March 1991), p. 39-40.

⁵⁷Foss, Jane's 1995-1996, p. 242.

⁵⁸Lopez, "USMC Rolls with LAV-105 Project.", p. 575.

⁵⁹Foss, Jane's 1995-1996, p. 241.

⁶⁰*Ibid.*, pp. 234-235.

⁶¹Fickett, "3-73 Armor.", p. 62.

⁶²Foss, Jane's 1995-1996, p. 236.

⁶³*Ibid.*, p. 237.

⁶⁴*Ibid.*, pp. 236-237.

⁶⁵Freeman, "Strategic AGS.", p. 35.

⁶⁶Foss, Jane's 1995-1996, p. 519.

⁶⁷Freeman, "Strategic AGS.", p. 32.

⁶⁸Foss, "Strategic AGS.", pp. 211-212.

⁶⁹Sergio Fiorentino. "Light Armor Units: An Italian Perspective." Armor, (July-August 1995), pp. 30-32.

⁷⁰Brooks, "Army Contingency Forces.", p. 48.

⁷¹Freeman, "Strategic AGS.", p. 36.

⁷²Fickett, "3-73 Armor.", p. 62.

⁷³Naylor, "Army Trades Off AGS System For Cash.", pp. 14-15.

⁷⁴Weapon Systems, United States Army 1996. (The Pentagon: Washington, D.C., 1996), p. 185.

⁷⁵Fickett, "3-73 Armor.", p. 62.

⁷⁶Naylor, "Army Trades Off AGS System For Cash.", p. 15.

⁷⁷Weapons Systems 1996. p. 191.

⁷⁸Ibid., p. 191.

⁷⁹John G. Roos. "Kinetic-Energy Wallop.", Armed Forces Journal International, (August 1996), p. 14.

⁸⁰Brooks, "Army Contingency Forces.", p. 57.

⁸¹FM 17-18, Light Armor Operations, p. 1-1.

⁸²Freeman, "Strategic AGS.", p. 39.

⁸³Nobles, "The Light Armored Force.", p. 13.

⁸⁴Sherman, "Operation Just Cause.", p. 4.

⁸⁵Andrew R. Finlayson. "The Need for an Assault Gun.", Marine Corps Gazette, (September 1987), p. 60.

⁸⁶FM 17-18, Light Armor Operations, p. 1-12.

⁸⁷Freeman, "Strategic AGS.", p. 37.

⁸⁸Carl E. Vuono. White Paper--A Strategic Force for the 1990s and Beyond, p. 4.

⁸⁹Cordesman, "Compensating for Smaller Forces.", p. 16.

⁹⁰Glenn K. Otis, Frederick J. Kroesen and Louis C. Wagner, Jr. "Our Deployment into the Persian Gulf--Three Views." Army, (November 1990), p. 14.

BIBLIOGRAPHY

BOOKS

- Bellamy, Chris. The Future of Land Warfare. New York, NY: St. Martins Press, 1987.
- Butler, William. Chariots of Iron: 50 Years of American Armor. Kentucky: Harmony House Publishers, 1990.
- Culver, Bruce. Sturmgeschutz III in Action. Carrollton, TX: Squadron Signal Publications, Inc., 1976.
- Chipman, John. The Military Balance 1996-1997. London: Oxford University Press, 1996.
- Culver, Bruce. Sturmgeschutz III in Action. Texas: Squadron/Signal Publications, Inc., 1976.
- Dean, David J. Low-Intensity Conflict and Modern Technology. Washington, DC: Government Printing Office, 1986.
- Deitchman, Seymour J. Military Power and the Advance of Technology. Colorado: Westview Press, 1983.
- Doyle, Hilary and Jentz, Tom. Stug III: Assault Gun 1940-1942. London: Osprey Military, 1996.
- Donnelly, Thomas. Operation Just Cause: The Storming of Panama. New York, NY: Lexington Books, 1991.
- Forty, George. Tank Action from the Great War to the Gulf War. London, England: 1995.
- Foss, Christopher F. Jane's Armour and Artillery 1995-1996. Virginia: International Thomson Publishing, 1995.
- Harris, J.P. and Toase, F.H. Armoured Warfare. London, England: B.T. Batsford Ltd., 1990.
- Haass, Richard N. Intervention: The Use of American Military Force in the Post-Cold War World. Washington, DC: Carnegie Endowment for International Peace, 1994.

- Hay, John H. Jr. Vietnam Studies: Tactical and Materiel Innovations. Washington, D.C.: Department of the Army, 1974.
- Lewis, Samuel J. Forgotten Legions: German Army Infantry Policy 1918-1941. Connecticut: Praeger Publishers, 1985.
- Mazarr, Michael J. Light Forces and the Future of U.S. Military Strategy. London: Brassey's Inc., 1990.
- Orr, Kelly. King of the Killing Zone. New York: W.W. Norton & Co., 1989.
- Perrett, Brian. Sturmartillerie and Panzerjager. London: Osprey Publishing Ltd., 1979.
- Reid, Brian and Dewar, Michael, eds. Military Strategy in a Changing Europe: Towards the Twenty-first Century. England: Brassey's Inc., 1991.
- Simpkin, Richard. Red Armor, An Examination of the Soviet Mobile Force Concept. England: Pergamon Press Ltd., 1984.
- Simpkin, Richard. Antitank: An Airmechanized Response to Armored Threats in the 90s. England: Brassey's Publishers Limited, 1982.
- Starry, Donn A. Vietnam Studies: Mounted Combat in Vietnam. Washington, D.C.: Department of the Army, 1978.
- Zaloga, Steven J. Modern Soviet Armor: Combat Vehicles of the USSR and Warsaw Pact Today. Englewood Cliffs, NJ: Prentice-Hall Inc., 1979.
- Zaloga, Steven. U.S. Army Light Tanks: 1944-1984. London: Osprey Publishing Company, 1984.
- Zumbro, Ralph. Tank Sergeant. California: Presidio Press, 1986.

STUDIES

- Brooks, Johnny W. Army Contingency Forces: What Should They Be? Fort Leavenworth, KS: School of Advanced Military Studies, June 1992.
- Cordesman, Anthony H. Compensating for Smaller Forces: Adjusting Ways and Means Through Technology. Carlisle Barracks, PA: U.S. Army War College, April 1992.

- Everson, Robert E. Light Infantry Vulnerabilities that Represent Strategic Vulnerability in Operations Other Than War. Fort Leavenworth, KS: School of Advanced Military Studies, December 1994.
- Freeman, Carl H. The Army Needs a Strategic Armored Gun System--Now! Carlisle Barracks, PA: U.S. Army War College, April 1991.
- French, Mark R. The Armor Force in Contingency Operations: Do We Have the Right Tactical Doctrine? Fort Leavenworth, KS: School of Advanced Military Studies, December 1991.
- Lunsford, James R. Keeping the Airborne Division a Viable Force. Fort Leavenworth, KS: Command and General Staff College, June 1993.
- McCreedy, Kenneth O. Winning the Peace: Postconflict Operations. Fort Leavenworth, KS: School of Advanced Military Studies, December 1994.
- McMichael, Scott R. A Historical Perspective on Light Infantry. Fort Leavenworth, KS: Combat Studies Institute, 1987.
- Nicholson, John W. America's Middleweight Force: Enhancing the Versatility of the 82nd Airborne Division for the 21st Century. Fort Leavenworth, KS: School of Advanced Military Studies, December 1993.
- Tomlin, Harry A. Organizational Design of Light Forces: A Structure for All Seasons. Fort Leavenworth, KS: School of Advanced Military Studies, November 1988.
- Weapons Systems: U.S. Army 1996. Washington, D.C.: The Pentagon, Prepared by: OASA (RDA), 1996.

LESSONS LEARNED

- Operation Just Cause Lessons Learned, Volume I, Soldiers and Leadership. Fort Leavenworth, KS: Center for Army Lessons Learned, (October, 1990)
- Operation Just Cause Lessons Learned, Volume II, Operations. Fort Leavenworth, KS: Center for Army Lessons Learned, (October, 1990)
- Operation Just Cause Lessons Learned, Volume III, Intelligence, Logistics, and Equipment. Fort Leavenworth, KS: Center for Army Lessons Learned, (October, 1990)

ARTICLES

- Armstrong, Richard N. MAJ. "Soviet Mechanized Airborne Forces." Infantry, (May-June 1985), pp. 24-28.
- Bacevich, A. J. LTC, and Ivany, Robert R. LTC. "Deployable Armor Today", Military Review, Vol LXVII, No. 4, (April 1987), pp. 14-23.
- Besch, Edwin W. CPT (Ret). "Tactical Use of the LAV-25 by the U.S. Marine Corps." International Defense Review, (February 1986), pp. 211-16.
- Boudinot, Burton S. LTC (Ret). "A missing Link in Support of Light and Heavy Forces." Armor, (March-April 1989), pp. 40-41.
- Corrigan, Sean CPT. "The 82d Airborne in Saudia Arabia." Armor, (September-October 1993), pp. 33-35.
- Crist, Stanley C. "Making the Case for An Airborne Infantry Fighting Vehicle." Armor, (September-October 1995), pp. 23-24.
- Etchechury, James LTC. "The Armored Gun System Debate: Let It Begin Before It Is Too Late." Armor, (January-February 1991), pp. 32-34.
- Fickett, Richard K. "3-73 Armor: Down, But Not Out." Army Times, (October 1996), p. 62.
- Finlayson, Andrew R. LTC. "The Need for an Assault Gun." Marine Corps Gazette, (September 1987), pp. 56-60.
- Fiorentino, Sergio COL. "Light Armor Units: An Italian Perspective." Armor, (July-August 1995), pp. 30-32.
- Foley, Thomas C. MG. "Armor in the New World Order." Armor, (November-December 1990), pp. 5-6.
- Gavin, MG James M. "The Future of Armor." Armored Cavalry Journal, (November-December 1947), pp. 1-6.
- Gourley, Scott R. "M8 Armored Gun System." Army, (January 1996), pp. 37-39.
- Hammond, Kevin J., and Frank Sherman. "Sheridans in Panama", Armor, (March-April 1990), pp. 8-13.

- Hickey, Stewart M. MAJ. "Why Not AGS?" Marine Corps Gazette, (August 1992), p. 41-42.
- Jones, Andrew R. LtCol. "British Armor in the Falklands." Armor, (January-February 1985), pp. 29-40.
- Lopez, Ramon. "USMC Rolls With LAV-105, Army Seeks Replacement AGS." International Defense Review, (June 1991), pp. 575-576.
- Naylor, Sean D. "Army Trades Off AGS System for Cash." Army Times, (February 1996), p. 3.
- Naylor, Sean D. "What's Next As the 82d Loses Only Tank Battalion?" Army Times, (September 1996), pp. 14-16.
- Nichols, Nick. "Tanks For the Future." Popular Mechanics, (May 1988), pp. 68-71.
- Nobles, David L. CPT. "The Light Armored Force: An Urgent Need, a Ready Solution." Armor, (May-June 1990), pp. 8-13.
- Rieders, Kevin 2LT. "What Can We Do With Light Armor?" Armor, (May-June 1994), pp. 42-45.
- Ross, John G. "Kinetic-Energy Wallop." Armed Forces Journal International, (August 1996), p. 14.
- Rozman, Tom LTC. "Making Light Forces More Flexible and Responsive." Armor, (January-February 1991), pp. 18-20.
- Segal, David. "Whatever Happened to Rapid Deployment?" Armed Forces Journal International, (March 1991), pp. 39-40.
- Sherman, Frank MAJ. "Operation Just Cause: The Armor-Infantry Team In the Close Fight." Armor, (September-October 1996), pp. 34-35.
- Witkowski, Steven R. 1LT. "The Return of the Gunned Tank Destroyer." Armor, (March-April 1989), pp. 21-25.
- Womack, Scott CPT. "The AGS in Low-Intensity Conflict: Flexibility Is the Key to Victory." Armor, (March-April 1994), pp. 42-44.

MANUALS

Field Manual 17-18, Light Armor Operations. Washington, D.C.: HQ Department of the Army, 1994.

Field Manual 71-2, The Tank Infantry and Mechanized Infantry Task Force. Washington, D.C.: HQ Department of the Army, 1988.

Field Manual 71-100, Division Operations. Washington, D.C.: HQ Department of the Army, 1990.

Field Manual 71-100-2, Infantry Division Operations, Tactics, Techniques, and Procedures. Washington, D.C.: HQ Department of the Army, 1993.

Field Manual 100-5, Operations. Washington, D.C.: HQ Department of the Army, 1993.

Field Manual 100-15, Corps Operations. Washington, D.C.: HQ Department of the Army, 1989.