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THE HISTORICAL COMBAT EFFECTIVENESS OF LIGHTER-WEIGHT ARMORED FORCES

FINAL REPORT

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I. INTRODUCTION

There has been a long-standing awareness in the defense community that a tank-like vehicle of lighter weight than the current main battle tank may be desirable. Such a vehicle would have greater strategic mobility and transportability than current main battle tank designs and could be used more flexibly in a wider range of scenarios. It would be the basis for an entire family of vehicles including an infantry carrier, a mobile gun system, and a self propelled howitzer, as well as sub-variants (mortar carriers, ATGM carriers, reconnaissance vehicles, engineer vehicles, and so on). Currently the Interim Armored Vehicle (IAV) selected to meet the initial requirements of this proposal is a medium-weight armor vehicle of 20 tons.

The tank is an 86 year old weapon system, having been in existence since 1915. A tank is traditionally considered to have three major design elements, weapons, armor and mobility. Tank design has always been a compromise between these three traditional elements, and the smaller the tank, the more compromises that must be made. In the last 86 years, virtually every combination and trade-off between gun, armor and mobility has been tried. Tanks have ranged in size from a couple of tons to over 70 tons in an attempt to find an ideal combination of components. Lighter tanks have an extensive lineage, having been used side-by-side with heavier tanks by most of the armies in World War II. Light tanks, in various forms, continued to be used by the US in the Korean and Vietnam War. There is no lack of valid historical comparisons and lessons to draw on when looking at the impact of tank design and design trade-off on combat effectiveness of lighter versus heavier armor.

Definitions

In this study we will have attempted to utilize a common set of terms for the different types of armored vehicles addressed.

Tank. A tank is a tracked fighting vehicle with armor protection. It is designed to use its protection, mobility and firepower to close with and destroy the enemy by means of maneuver, fire and shock.

Light Tank. A light tank is a design that has sacrificed some protection (and often also gun power) to improve tactical mobility and maneuverability. Light tanks are commonly used for reconnaissance.

Medium Tank or Main Battle Tank (MBT). A medium tank is designed to balance mobility with protection and gun power.

Heavy Tank. A heavy tank is designed to optimize protection over speed, although not necessarily over gun power. In modern armies the distinction between the medium tank or MBT and the heavy tank have largely disappeared.

Light Armor. Any lightly protected armored vehicles (including light tanks) designed to optimize weight over protection or gun power. They may be tracked or wheeled (and in some

cases half-tracked) and may mount a variety of weapons. They include armored personnel carriers and variants, and armored cars.

Medium-weight Armor. A generic term for a planned family of lighter weight armored fighting vehicles designed to enhance the strategic mobility of the US Army in the near future. It includes the current Interim Armored Vehicle (IAV) family of vehicles and the planned follow-on design that will utilize advanced technologies to enhance the vehicle survivability, lethality, maneuverability, and strategic mobility. Thus, in a sense, the IAV is a precursor to the MAV.

Study Plan

This study intended to use real-world experience to look for measurable combat performance differences between lighter and heavier armor. As years of combat experience have established, the heavier tank usually has the advantage over the lighter tank in conventional armored combat. What has not been established is what are the advantages and disadvantages of lighter armor in other scenarios or situations. This study examines the effectiveness of lighter-weight armor based upon real-world experience in six possible scenarios. These scenarios are:

1. Conventional conflicts against an armor supported or armor heavy force.
2. Emergency insertions against an armor supported or armor heavy force.
3. Conventional conflict against a primarily infantry force (as one might encounter in sub-Saharan Africa).
4. Emergency insertion against a primarily infantry force.
5. A small to medium insurgency (includes an insurgency that develops during a peacekeeping operation).
6. A peacekeeping operation or similar Operation Other Than War (OOTW) that has some potential for violence.

It is understood that in any particular scenario, one style of vehicle design may have an advantage over the other. The goal is to examine the entire range of scenarios where hostile action would be encountered, so that one can develop an informed understanding of what trades-off are made in developing medium weight armor.

For the first scenario, conventional conflict, *The Dupuy Institute* (TDI) primarily explores operations where lighter and heavier tanks were fighting side-by-side. It may be expected that lighter armor would be at a disadvantage in an armor intensive environment.

The second scenario, an emergency insertion, may be more in line with the potential value of such a vehicle. In this case, the lighter forces are placed in danger first because they are more easily deployed, with armor heavy forces following later (as was the case with the US Gulf War deployment). The data is again derived from real-world events where US armored forces were inserted into an emergency combat environment.

The third and fourth scenarios address situations where the opposing force is primarily infantry. While conventional conflict in Europe, the Middle East and the Korean Peninsula would most likely include armor heavy forces; operations in most other parts of the world would result in the US encountering primarily infantry forces (often militia). In this case, the opposition would have a limited number of main battle tanks. In such scenarios, a medium weight armor vehicle may well be able to perform most of its functions adequately. TDI examines situations where heavier armored forces opposed infantry, compared with situations where lighter armored forces opposed infantry.

The fifth scenario addresses the use of tanks in a guerrilla war. In particular, TDI researched the use by the German Army of armor in Yugoslavia and other occupied countries in World War II. We also examined the US experience in Vietnam, when both the US and the Army of the Republic of Vietnam (ARVN) used light tanks (M-24 and M-41), and the ill-starred Sheridan.

The sixth scenario addresses the use of tanks in peacekeeping and other similar environments. TDI looked at the relative difference in performance between forces armed with heavy tanks and forces armed with lighter armored vehicles. We utilized data from our Small Scale Contingency Operations (SSCO) Data Base in this scenario.

The thrust of the analysis is to look at "laboratory-like" side-by-side comparisons from real-world situations. This includes analyzing similar or related operations that employed a mix of lighter and heavier tanks, or where heavy armor was used in one situation and lighter armor was used in a similar situation. TDI then examines if measurable or clearly visible differences are found in these comparisons. In most cases, the comparisons are developed from our existing data bases or from additional research.

Technology

Technology does change over time. As such, any study that is based upon historical analysis needs to consider these changes and how they may make the historical data less relevant or change it in some fashion. To date, the changes in technology over the last 86 years have not made the tank obsolete. While technological changes have greatly improved the performance of tanks, and changed the details of how tanks are handled, overall, there is not a significant difference in armor operations now as opposed to 50 years ago. Furthermore, as the issue is a comparison of lighter weight armor with heavier armor, there have not been any overriding changes in technology over the last 50 years that favors one over the other. In fact, any technology developed, which can be used to help develop a “medium weight tank”, can also be used to improve a more traditional "main battle tank".

In some of the plans for medium weight armor, it is expected that some weight savings will be achieved by various technological improvements. This includes reducing crew size by the development of more automatic systems and fully automated turrets (removing all crew from the turret). If these changes are truly advantageous for armored fighting vehicles, they can also be made to main battle tanks. Our analysis includes comparison of lighter weight armor with heavier weight armor *at similar stages of technological advancement*. As such, we assume that the alternative to any unusually high-tech ‘medium-weight armor vehicle’ is in fact an equally high-tech ‘main battle tank.’ Thus, the trade-off will remain; in what situations and roles does a lighter armored vehicle perform better than a heavier vehicle? We do not compare higher technology lighter tanks to lower technology heavier tanks.

Wheeled Tanks

A tank does not have to be tracked. Some of the plans under discussion for medium-weight armor vehicles include wheeled tanks. Traditionally, ever since the "Little Willie" in 1915, tanks have relied upon tracks to provide off-road mobility. It is felt by some that the advantages of wheels (primarily weight savings and increased reliability) out-weighs the potential disadvantages. The main disadvantage is a potential for reduced off-road capability with a secondary disadvantage of increased vulnerability. For the proponents of wheeled tanks, the much more extensive road networks, increased population and general development found in the world in the last decades have reduced the disadvantage of wheeled tanks. They expect that tanks will be operating in more urban

environment where the cross-country capabilities of the vehicle are not as critical. There is also an argument that cross-country capabilities of wheeled vehicles have improved noticeably in the last 20 years. The problem of increased vulnerability (primarily from damage to wheels, tires, or suspension systems) is somewhat addressed by technology and design improvements.

Although extensive testing and experimentation was done with wheeled tanks in the 1920s and 1930s, few apparently were ever used in combat so there is not much that can drawn from the historical records to address the issue of their feasibility.[1] However, in the scenarios we analyzed there were many wheeled armored fighting vehicles. They were mostly armored cars, which were usually lightly armored and lightly armed, and primarily intended for reconnaissance. Wherever possible we have addressed their use in particular scenarios, but no specific conclusions can be drawn from the available data.

The Interim Brigade/Division

Medium-weight armor vehicles are not simply a lighter substitution for an existing system. It is part of an attempt to create a more mobile and flexible unit for combat, interventions and operations other than war. The United States currently fields five heavy divisions (1st Armored, 1st Cavalry, 1st Infantry, 3rd Infantry and 4th Infantry). The force structure also includes five light divisions (10th Mountain, 25th Infantry, 82nd Airborne, and 101st Air Assault) and one other division (2nd Infantry Division). The new Interim Brigade Combat Teams (IBCT) (currently the 3rd Brigade, 2nd Infantry Division and the 1st Brigade, 25th Infantry Division are scheduled for conversion by December 2002) will be added to this force mix.

The eventual plan is to create from six to eight Interim Brigade Combat Teams (IBCT). The next four brigades slated for conversion include three from existing US Army units (one brigade from a light infantry division, one from a separate infantry brigade and one from the 2nd Armored Cavalry Regiment [Light]), and one from a National Guard division. In the case of all but the National Guard unit, the development of medium-weight armor vehicles will add armor capabilities that the units do not currently have. It is not, as is often the impression, replacing current Main Battle Tanks with lighter armor.

[1] British, Russian, French, and American armored vehicle designers after World War I all attempted to solve the problem of track-life and increased mobility by utilizing wheeled tank systems. Most were built so as to run on either tracks or wheels. However, the systems were simply too cumbersome and were eventually dropped.

II. USE OF ARMOR IN CONTINGENCY OPERATIONS

For the foreseeable future, the US Army will remain involved in various contingencies, peacekeeping operations and operations other than war. This is not new – the US Army has been involved in a large number of such operations over the course of its history. In many ways the new Interim Brigades are being structured for these types of missions.

The Dupuy Institute Small Scale Contingency Operations (SSCO) Data Base tracks a wide range of contingency operations by the US and other nations. Each SSCO database record consists of 149 fields, a number of which are filled with data for each 'combatant' (up to six combatants and three factions are allowed for), each of 46 fields. This database of 196 records (see Appendix III) was used as the basis for the analysis of armor in contingency operations, although no statistical analysis was done on the data. While this database is not complete and certainly is not exhaustive, it is the most extensive available on contingency operations.

TDI has avoided defining what a SSCO is for four reasons. First, we do not want to limit the range and selection of data by definition. Second, most SSCOs are easily recognized. Third, even questionable SSCOs (like **Loughall**) have SSCO-like characteristics and are therefore useful for analysis. Fourth, TDI wishes to focus on doing substantive work as opposed to conducting "angels dancing on the head of pins" debates. We have observed that previous efforts at defining terminology for OOTW consumed considerable time and resources without producing a useful product, so we choose not to follow that path. Therefore, no definition of SSCOs is provided for this paper. However, we did categorize SSCOs by 10 operational types (see Appendix III). They are:

Abbreviation	**Operation Type**
AID	Aid
ASSIST	Military Assistance
CONV	Conventional Hostilities
EVAC/RESC	Evacuation/Rescue
INSG	Insurgency/Counterinsurgency
INTRV	Intervention
PKPG	Peacekeeping
POLACT	Police Action
RAID	Raid
STF	Show-the-Flag, maintain presence, show-of-force, etc.

Within these 10 broad categories, a number of sub-categories were created where necessary to differentiate the nature of the operations. For example, a sub-category for small hostage rescue/anti-terrorist missions was developed for EVAC/RESC. POLACT include four other sub-categories to cover 'Drug Interdiction,' 'Anti-terrorist,' 'Urban Riots,' and 'Prison Riots.' RAID was split into two sub-categories, 'Raid' and 'Incident.' Overall, the data is broken into 16 categories and sub-categories, plus some operations not yet classified, and some air and naval operations. The following table shows the degree of armor use in these operations:

Type of Operation	Number of Operations	Number of Cases Where the Intervening Force Had Heavy Armor	Number of Case Where the Intervening Force Had Light Tanks	Number of Cases Where the Intervening Force Had Light Armor	Number of Cases Where the Indigenous Force Had Heavy Armor	Number of Cases Where the Indigenous Force Had Light Tanks	Number of Cases Where the Indigenous Force Had Light Armor
Aid	0	0	0	0	0	0	0
Military Assistance	5	0	0	1	0	0	0
Insurgency/Counterinsurgency	9	4	3	8	1	1	1
Show the Flag, etc.	8	5	3	6	5	4	6
Raids	1	1	0	1	0	0	1
Interventions	19	7	7	13	3	1	10
Conventional Hostilities	5	3	4	4	2	2	4
Evacuation/Rescue	20	0	0	0	0	0	0
Small Hostage Rescue/ Anti-Terrorist Missions	13	0	0	1	0	0	0
Police Action	5	0	0	0	0	0	0
Drug Interdiction	2	0	0	0	0	0	0
Anti-terrorist	2	0	0	0	0	0	0
Urban riots	27	3	0	9	0	0	0
Prison Riots	4	1	0	2	0	0	0
Incidents	2	0	0	0	0	0	0
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	122	24	17	45	11	8	22

Not Analyzed:	
Peacekeeping	39
Not yet Classified	18
Air	9
Naval	8

Presence of Armor in SSCOs

Examination of the aggregate statistics show that heavy armor (medium tanks or main battle tanks) were used by the intervening forces in 20 percent of the SSCOs studied (24 cases). Heavy armor was commonly used (meaning more than 25 percent of the time) in conventional hostilities, counter-insurgencies, interventions, raids (one case) and show-the-flag (maintain presence) operations.

In 14 percent of the SSCOs studied (17 cases) light tanks were present with the intervening force. They only appeared in conventional hostilities, counter-insurgencies, interventions or show-the-flag (maintain presence) operations. Overall, in 32 operations (26 percent) the intervening force used tanks in some form. There were only nine operations with both heavy and light tanks present. Where heavy tanks were present, there were either no light tanks or the number of light tanks used was less than number of heavy tanks used (often significantly). In none of the cases where heavy armor was present, did light tanks appear to be the preferable weapon system.

In 39 percent of the SSCOs (47 cases), some form of armor was used by the intervening force. In only two cases, were tanks present but no other light armor (**Bay of Pigs** and **Falklands War** and only a handful in either case). In 61 percent of the SSCOs, no use was made of armor by the intervening force. When tanks are deployed in SSCOs, other AFVs are almost always deployed.

In the case of the indigenous forces, in only nine percent of the cases did they have heavy armor and in 18 percent of the cases (22 cases) was any armor used. In 82 percent of the SSCOs, no use was made of armor by the indigenous forces. This figure is certainly distorted by the over-representation of civil disturbances in the database. Armor is only found in insurgencies, show-the-flag (maintain presence) operations, raids, interventions, and conventional hostilities. Even in this more limited selection of 42 cases, armor appears 52 percent of the time.

One is left with the rather limited conclusion that the use of armor is not the norm in SSCOs. That said, the use of armor varies widely depending on the type and nature of the SSCO. Heavy armor (medium tanks and main battle tanks) was used in conventional hostilities, counter-insurgencies, interventions, raids and show-the-flag (maintain presence) operations. Heavy armor was used by the intervening force in 60 percent of the examples of conventional hostilities, 44 percent of counter-insurgencies, 37 percent of interventions, 63 percent of show-the-flag (maintain presence) operations (mostly Korea) and in the single raid recorded in our data base. In at least one intervention (**Panama** 1989), heavy armor was desired but was not deployed due to bridge capacity limitations in the area of operations. On the other hand, light armor of all types (including light tanks) – not surprisingly – shows up in 81 percent of the 42 examples. The indigenous forces have heavy armor in 40 percent of the conventional hostilities, in only one insurgency (11 percent), 16 percent of the interventions and 63 percent of the show-the-flag (maintain presence) operations (again, mostly Korea). The use of light armor by the indigenous forces shows up in 52 percent of these 42 examples.

Other use of light armor outside of these five categories is very limited. There are 11 cases of light armor used in civil disturbances (urban rioting or prison riots) and in two other cases. In none of these 13 cases is the number of vehicles used very significant. There are no examples of indigenous use of armor in any of these other cases. In our database conventional hostilities, insurgencies, interventions, raids and show-the-flag operations accounted for 23 percent (42 of 179) ground operations identified. Due to time constraints, we were unable to analyze the 39 peacekeeping operations or the 19 ‘not yet classified’ (almost all are peacekeeping or police actions). More research and a "wider net" are recommended for this effort, but it is not expected that the percentages represented above would change significantly with additional research.

Size of Armor Forces in SSCOs

The next step is to examine the actual number and extent of armor use in SSCOs. The amount of armor was coded into four rough categories. These categories were (see Appendix II for the coding by operation):

None – armor was not present (although in some cases it may mean that no armor was used),
Some – less than a regiment or brigade was present,
Moderate – one or two regiments/brigades of armor were present,
Considerable – a division or more, or over 150 tanks or 300 light armored vehicles, was present.

This gross coding system is keyed to the concept of deployment of an interim (medium) brigade. Thus, in a scenario where an opposing force is coded as having 'some' armor available, a US brigade-size force could easily handle it. An opposing force coded as having a 'moderate' amount of armor available could pose a risk to such a force. An opposing force coded as having a 'considerable' amount of armor available is essentially beyond the capabilities of a brigade.

In the 24 cases where the intervening force used heavy armor, it was deployed in division-sized forces twelve times. Eight of these cases are from the Middle East and are derived from two operations (Gulf War and Israeli Intervention in Lebanon 1978-1985). Three of these cases are from the US deployment in Korea and one from the USSR Intervention in Czechoslovakia (where there was a potential opposition armor threat, although the Czech Army never deployed against the intervening Warsaw Pact forces).

Armor was deployed in regiment/brigade size force in three cases and at much smaller levels (usually company or platoon-size units) in nine cases. As the 12 cases where heavy armor was deployed in considerable amounts were effectively conventional war scenarios, the value of lighter armor in these situations is best covered in the conventional conflict discussion (see Part IV). As it is, since these operations all occurred in primarily open (no heavy vegetation) terrain, there would be little advantage of lighter weight armor over heavier armor in them.

This leaves 12 cases worth additional study. The three cases where brigade-size forces were deployed were the **ELAS Insurgency** (Greece 1944-45), **The Greek Civil War** (1946-1948) and **Vietnam (US participation)**. In addition, in the case of the **Australian Army in Vietnam** case, some armor was used. These four examples of the use of tanks in counter-insurgency are best covered in the section on insurgencies (see Part III).

What we are left with are eight other operations where heavy armor was deployed. The examples are **Sikh Golden Temple**, **Musketeer**, **Grenada**, **UK Mission to Kuwait** and four civil disturbances. In the case of **Musketeer** and **Grenada**, the heavy armor was landed as part of an amphibious force to support operations, and in both cases they did not appear to have actually seen action. In the case of the **Sikh Golden Temple**, the armor was used to help take an 'urban area' held by lightly armed infantry forces. No "combat action" was seen in the other five cases.

The use of light tanks also occurred in 17 cases. Five of these were in conjunction with heavy tanks in a conventional war or potential conventional war environment (Kuwait/Gulf **War**, Korea, Czechoslovakia) and three were in conjunction with heavy tanks in a guerrilla war. These are covered in the sections on conventional war and insurgencies as well. We are left with nine other cases of light tank use. These are the **Indian Occupation of Goa**, **Falklands War**, **Musketeer**, **Battle of Bizerte**, **Bay of Pigs**, **Dominican Republic**, **Instability in Panama**, **Panama,** and **Haiti (MNF)**. In the case of the **Indian Occupation of Goa**, it was a conventional overland invasion, and it does not appear that the nature of the operation influenced the choice of armor used. The **Battle of**

Bizerte used light tanks, as that was what was available in country at the time. The **Dominican Republic**, **Panama** and **Haiti** were all poorly developed areas where use of heavy armor may have proven difficult (and definitely was in the case of Panama). In all three of these cases, transportability was not a major restriction. The **Falklands War**, **Musketeer** and **Bay of Pigs** were amphibious operations. Transportability issues may have played a part in the decision to employ light tanks as opposed to heavy tanks in Falklands, but terrain issues were actually of paramount importance there. For all other eight cases, the choice of what size tanks to use appears to have been driven primarily by availability and other considerations, not transportability issues. The weight (mobility) of the light armor forces did appear to influence the decision as to what tanks to deploy in three cases (Panama and Falklands)

The seven cases where the intervening force inserted brigade-size light tank forces consist of six conventional wars, interventions or maintain presence operations and the case of the **US Army in Vietnam**. Transportability or time constraints were not major issues in any of these except for the initial buildup for Desert Shield. It does not appear that the emergency insertion of brigade-size armor forces is a norm. In those cases where less than a brigade-size armor force were inserted, the armor inserted was inadequate to successfully complete the mission only in the case of the Cuban exile invasion at the **Bay of Pigs**.

In the seven of the 11 cases where indigenous forces deployed heavy armor, division-size armored forces were used. Again these were active or potential conventional war scenarios like **Korea,** the **Gulf War** and **Lebanon 1982**. The other four cases include two where the indigenous armor forces were not used extensively (**Vietnam** and **UK Mission to Kuwait**) and two cases where the indigenous forces deployed limited numbers of armor (**Musketeer** and **Bay of Pigs**). Even though indigenous forces tended to operate in less developed areas, light tanks show up even less often. There are no cases where there were light tanks, but no heavy tanks. Again, light tanks are always deployed in noticeably smaller numbers than heavier tanks, regardless of region. The armor threat from tanks (either heavy or light) in SSCOs therefore is pretty much limited to major conventional war scenarios. Light armor (armored cars, CFVs, IFVs and APCs) is more common and is present in 11 scenarios that do not have heavy armor. In all of these other scenarios, the indigenous light armor forces are not available in regimental or brigade size forces. As such, the additional threat posed by light armored forces to the intervening force is limited.

Use of Armor in Peacekeeping

No in-depth analysis was specifically conducted on peacekeeping operations for this project. This was entirely due to time and budget limitations. As there are a large number of peacekeeping operations (around 60), fully researching them would take considerable time. This research is complicated by their multinational characteristics. As a result *The Dupuy Institute* deferred the analysis on this entire category of SSCOs.

While *The Dupuy Institute* believes that such analysis would be useful, it does not feel that it would have much affect on the conclusions. Most aspects of a peace-keeping operation, whether a peaceful one (which most are) or a violent one, are effectively covered in the existing SSCO cases that the *Institute* did examine (military assistance, insurgencies, maintain presence, interventions, conventional hostilities, evacuation/rescue, police actions, urban riots, etc.).

Other Considerations

While a detailed study of each of these operations would be of use, a general look across all 122 operations show some general patterns and trends that may help address weapons design and doctrinal conceptions.

First, there is little evidence one way or the other establishing whether wheels or tracks are the preferable feature of armored vehicles in SSCOs. In the case of the **Sikh Golden Temple** (basically an urban operation) the wheeled Indian APCs were unable to move close to a building because they were unable to traverse a stair step. A main battle tank was then driven over the stairs to crush them so as to provide a pathway for the APC. But, when the APC moved up to the building to unload it was then destroyed by a Sikh antitank rocket. The defending Sikhs had a considerable amount of time to prepare because of the slowness of the Indian operations, which were partly a result of the inability of the APC to cross the stairs. Of course, the Indian Army operation was complicated by the fact that the Indians were not concerned about Sikh antitank capability – since they did not believe that they possessed any antitank rockets.

In some cases a large-caliber main gun (as was the case of the Sheridan tanks used in Panama) was useful for demolishing obstacles and penetrating buildings. This was not only true of **Panama**, but also of the **Sikh Golden Temple**, once the Indians relaxed their rules of engagement. In the case of the Sheridan, it carries 20 conventional rounds and nine missiles. Some of the supporting US M-113 APCs in Panama carried six AT4 and six LAW. As such, this high explosive and armor penetration capability of the main gun of the Sheridan was not unique and could be replaced by one or more CFVs, IFVs or APCs with anti-tank missiles.

There is no evidence that heavier or lighter armor made a significant difference in any of the scenarios that were not conventional war in nature. In almost all of these cases, so long as the armor was sufficient to protect against small arms, then it was adequate to meet the mission requirements. Obviously, armor that is proof against hand-held AT weapons would be useful.

Mines were a major threat to all types of armor in a number of cases. In many SSCOs it was the major cause of armored vehicle losses. In the case of Vietnam, it was a factor in the decision to deploy main battle tanks in I Corps. Any vehicle design needs to stress its anti-mine protection capability and protection of the crew. In many SSCOs this protection was field improvised – often the crew rode on top of the vehicle (usually in the open, unprotected by the vehicle armor) and by lining the bottom of APCs, CFVs and IFVs with sandbags, packs and other such protection.

Vehicle weight was a limiting factor in a few cases (Panama in particular). Otherwise, there does not appear to be a particular point when an AFV is too heavy or heavy enough. Since the unconventional SSCOs did not include a significant armor threat, the need for heavy armor in opposition is limited. Mobility and vehicle speed do not appear to be a major issue in most of the SSCOs.

The primary terrain problem is rivers and flooded areas. The inability to cross bridges was the reason the Sheridan was used in Panama instead of the M-1. The ARVN armor operations in Laos and I Corps in 1972 also suffered considerable losses due to a lack of river crossings. Indian armor in the **Invasion of Goa** was also halted by waterways. These problems also show up in conventional operations (see Part IV). It would appear that in difficult terrain, especially heavily forested terrain (areas with lots of rainfall, like jungles), a robust river crossing capability is required.

One thing that appears in some after action reports from Panama is the value of additional storage provided by CFVs, IFVs and APCs. Since units are operating in underdeveloped areas for days, their ability to operate without re-supply is useful. Furthermore, the ability to carry extra

equipment, sandbags, barbed wire, was also useful for police duties, blocking intersections, establishing strongpoints, etc. The robust carrying capabilities offered by an APC over a tank are an advantage during many SSCOs.

Urban Terrain and SSCOs

The degree that the operations were conducted in urban terrain varied, depending on the nature of the SSCO. A rough evaluation of terrain by operation type shows the following:

Type of Operation	Number of Cases	Urban	(Some Urban)	Open Terrain	Forested Terrain	Mountainous
Aid	0					
Military Assistance	5				4	1
Insurgency	9	1	(2)	3	4	1
Show-the-Flag	8			3	2	3
Raids	1			1		
Interventions	19	8	(2)	5	6	
Conventional Hostilities	5	1	(1)	4		
Evacuation/Rescue	20	17		1	2	
Small Hostage Rescue/ Anti-Terrorist Missions	13	12		1		
Police Action	5	5				
Drug Interdiction	2					2
Anti-terrorist	2	2				
Urban riots	27	27				
Prison Camp Riots	4	4				
Incidents	2	1		1		
	---	--	--	--	--	--
	122	78	(5)	19	18	7
Not Analyzed:						
Peacekeeping	39					
Not yet Classified	18					
Air	9					
Naval	8					

While 64 percent of the operations were in urban terrain, the vast majority of armor operations are not. It is insurgencies, show-the-flag, raids, interventions and conventional operations (42 cases) that make up most of the use of armor by either side (83 percent of the use of heavy tanks by intervening forces, 100 percent of the use of light tanks by intervening forces, 71 percent of the use of light armor by intervening forces, and 100 percent of all armor use by indigenous forces). Urban operations only account for 24 percent of the 42 cases (10 cases).

A close look at these 10 cases that occurred in primarily urban terrain show that they tended to be smaller operations with limited amounts of armor deployed (**Sikh Golden Temple, ELAS Insurgency, Battle of Bizerte, East African Mutinies, French Intervention in Gabon, Czechoslovakia, French Intervention in CAR, Siege of Beirut, Occupation of West Beirut** and **French Intervention in CAR 1991**). In only seven of those cases armor was present for the intervening force and in no cases did the indigenous forces have armor. In fact, in none of the 78 cases in primarily urban terrain did the indigenous forces have armor!

The seven cases where armor was present in primarily urban terrain included significant armor forces in three cases (**Czechoslovakia**, **Siege of Beirut** and **Occupation of West Beirut**). A

brigade-size armored force was present in the **ELAS Insurgency**. In the other three cases, there were limited armor forces.

There were five other cases where the operations had a considerable urban component to them (**Indian Occupation of Goa, Algerian War, Cypriot EOKA Insurgency, Grenada** and **Panama**). Armor was not a major component in the urban combat in any of these five cases.

Overall, while SSCOs in urban terrain are quite common, the threat to armor from other armor in SSCOs in urban terrain is almost non-existent. The SSCOs that use armor tend not to occur in urban terrain. Only seven of 42 (17 percent) insurgencies, show-the-flag, raids, interventions and conventional hostilities took place with armor present in and around primarily urban terrain. Armor was also present in 12 of 68 (18 percent) other urban terrain operations, primarily small numbers of APCs (and some tanks) in response to civil disorder.

Conversely, the SSCOs in urban terrain tend to not use armor, with only 22 out of 78 primarily urban operations (28 percent) having any form of intervening armor, and in only four cases (five percent), was it a brigade-size force or greater. In none of the 78 urban scenarios was indigenous armor present. The use of armor in urban operations is limited and in many SSCOs the armor was usually used for cross-country operations.

Observations

1. In none of the cases where heavy armor (medium tanks or main battle tanks) was present, did light tanks appear the preferable weapon system.

2. When tanks (of all types) are deployed in SSCOs, other light armor (Armored Cars, CFVs, IFVs or APCs) were also deployed.

3. The use of armor (heavy or light) is not the norm in SSCOs.

4. The use of armor varies widely depending on the type and nature of the SSCO.

5. Heavy armor was used in conventional hostilities, counter-insurgencies, interventions, raids and show-the-flag (maintain presence) operations.

6. The use of light armor outside of these five categories (listed above) is very limited. There are no examples of indigenous use of armor in any other scenarios outside of these five categories.

7. In none of the 122 SSCOs examined, did anyone attempt to conduct an emergency insertion with brigade-size armor forces. In those cases where less than a brigade-size armor force were inserted, the armor inserted was inadequate to successfully complete the mission only in the case of the Cuban exile invasion at the Bay of Pigs.

8. The armor threat from tanks (either heavy or light) in contingency operations is pretty much limited to those that major conventional war scenarios.

9. There is little evidence one way or the other establishing whether wheels or tracks are the preferable feature of AFVs in SSCOs.

10. Tank main guns were useful for taking out obstacles and penetrating buildings. This capability is not unique and could be replaced by weapons on CFVs, IFVs or APCs.

11. There is no evidence that heavier or lighter armor made a significant difference in any of the non-conventional war scenarios. As long as the armor was sufficient to protect against small arms, in almost all cases, it was sufficient.

12. Mines were a major threat to all types of armor in a number of scenarios. In many SSCOs it was the major cause of armored vehicle losses.

13. Vehicle weight was a limiting factor in a few cases (Panama in particular). Otherwise, there does not appear to be a particular point when an AFV was too heavy or heavy enough.

14. As the non-conventional SSCOs did not include a significant armor threat, the need for heavy armor in these scenarios was limited.

15. Mobility and vehicle speed do not appear to be a major issue in most of the SSCOs.

16. The primary terrain problem is rivers and flooded areas. It would appear that in difficult terrain, especially heavily forested terrain (areas with lots of rainfall, like jungles), a robust river crossing capability is required.

17. The robust carrying capacity offered by an APC over a tank is an advantage during many SSCOs.

18. While 64 percent of the SSCOs were in primarily urban terrain, the vast majority of operations with armor were not.

19. The threat to armor from other armor in SSCOs in urban terrain is almost non-existent.

20. The SSCOs that use armor tend to not be the ones in urban terrain.

21. Conversely, the SSCOs in urban terrain usually not use armor, with only 22 out of 78 primarily urban operations (28 percent) having any form of intervening armor, and in only four cases (5 percent), it being brigade-size forces or greater. In none of the 78 urban scenarios, was indigenous armor present. Armor use in urban operations is still limited and in many SSCOs the armor was, as usual, primarily used for cross-country operations.

22. Of 122 SSCOs, it appears that lighter armor was the armor of choice in three cases (the two Panama scenarios and Falklands War). In the case of Panama, it was because of the inability to operate heavy tanks in that environment. In the case of Falklands, it was due to weight (mobility) issues. In all the other cases where light tanks were used, it was either because of convenience, forces available, lack of armor threat or other reasons.

23. There were only two cases where light armor was deployed in the face of a heavy armor threat. This was the US initial deployment into the Gulf and the Bay of Pigs. Heavy USMC armor (M-

60s) did not arrive until more than a week after the 82nd Airborne began deployment. Over three weeks after the 82nd Airborne began deployment, US Army armor (M-1s) began to arrive. In the case of the Desert Shield, the armor threat was apparently not perceived to be too dangerous as the US forces did not bother to deploy mines. The US did have considerable heavy tank support (260+ tanks) throughout from its allies (Saudi Arabian and Kuwait). This particular scenario is discussed in some depth later, but it does not appear that the insertion of a brigade or more of medium-weight armor vehicles would have been a decisive factor in the projected or actual outcome on any of the SSCOs. In the case of the Bay of Pigs, there were no armor actions.

24. The armor threat in contingency operations consists of either significant heavy armor forces in what is basically a conventional war scenario (including maintain presence scenarios), or nothing of any particular significance. In the non-conventional war scenarios, the indigenous armor forces did not dictate a need for heavy tanks or any tanks at all. In none of the non-conventional war cases would the lack of tanks have severely hampered the operations, and CFVs, IFVs and APCs could have basically fulfilled the missions. As such, the armor threat in SSCOs that are not conventional war is not a primary driver for inserting "medium weight armor".

25. In most cases, CFVs, IFVs, and APCs met the light armor requirement. In only two cases (both in Panama) does it appear that light tanks could have been more useful than APCs, CFVs or IFVs. In all six other cases of the deployment of only light tanks (meaning exclusive of heavy tanks), APCs, CFVs or IFVs could easily have accomplished the mission. In fact, in none of the cases where the light tanks were deployed exclusively, did they encounter or engage any opposing armored threat.

26. The primary advantage of a light tank in SSCOs over an APC, CFV or IFV (as shown in Panama) appears to be the obstacle and building demolition capability of the large-caliber main gun. This capability can be easily replaced in many cases by use of AT missiles (which many CFVs, IFVs and APCs carry).

27. The two cases where it appears that the lighter tank was preferable to a heavier tank (Panama and Falklands) were not significant. CFVs and IFVs could have been substituted for a light tank in Panama. The light tanks in the Falklands were only utilized as fire support in the final assault on Port Stanley. A CFV or IFV could also have provided this fire support.

Overall, there appears to be no strong justification for ensuring an easily transportable, mobile special designed piece of medium weight armor for SSCOs. It appears that existing resources (heavy tanks, CFVs, IFVs and APCs) are sufficient to deal with almost all real-world SSCO requirements.

III. USE OF ARMOR IN AN INSURGENCY

The Use of Armor in the German Campaign in the Balkans, 1941 to 1945 (see Appendix VII)

A number of observations may be drawn from the German armor experience in the Partisan insurgency in Yugoslavia and the Balkans during World War II.

1) **With few exceptions, the German use of armor against insurgents was a matter of making use of (and making do with) whatever marginal resources were available to them.** The initial armor commitment consisted of *ad hoc* units formed locally and equipped with tanks captured from the defeated army of the nation they occupied. Like the other occupation units, the tank units were initially conceived to have a dual role, filling both security and training missions simultaneously. They were never intended to participate in conventional combat.[2]

2) **The tank losses of the German occupation force were minor, even when the intensity of the insurgency began to escalate in 1943.** Of course, given that the man-portable AT weapons available to the Partisans were only marginally effective, then this is not surprising. Significantly, but also unsurprising, the only major loss of armored vehicles known to have occurred was in the loss of 476 light-armored tracked, wheeled, and half-tracked vehicles from December 1943 through March 1944. During that same time personnel losses were 1,367 KIA, 3,696 WIA, and 833 MIA. In comparison, only three fully armored, full-tracked AFVs (assault guns) were lost in the same period. In the following four months, 24 tanks and assault guns – but only 42 more lightly armored vehicles – were lost, which was 12.94 percent of the previous AFV loss. However, personnel casualties increased dramatically, to 2,384 KIA, 7,582 WIA, and 1,849 MIA, over twice the loss of the previous period.

3) **Heavy armored vehicle and personnel losses were not incurred until the Partisan War escalated beyond insurgency into what was – for all intents and purposes – a conventional war, beginning in mid 1944.** However, most of the armored vehicles lost were apparently the more lightly armored Italian and French tanks, rather than German vehicles. It is interesting that the deployment of the Partisans first organized tank unit in late 1944 also occurred in parallel with the escalation of the conflict into conventional warfare. The breakdown of the known armor losses is as follows:

    A) **Prior to December 1943 the available records indicate that possibly as few as ten tanks – all of them lightly armored French *beutepanzer* (captured tanks) – were lost in the Balkans.** No German tanks were lost (and it appears that there were none in the theater to be lost) and there is no record of the loss of other, lightly armored

[2] A common theme in the few available condition reports of the tank units is "*infolge der Ausstattung mit ital. Gerat nur gegen Banden*" (as a result of being equipped with Italian weapons, [the unit] is only suitable for employment against bandits [Partisans]). *Panzer-Abteilung* 202 report for the month of September 1944, NARA RG242, T78, R616, F0001~.

vehicles (but, again it appears that there were few to none available in the theater to be lost).

B) **From December 1943 through June 1944 – the period of the most intense guerrilla conflict – 27 relatively heavily armored German vehicles were lost. However, in addition, 516 lightly armored vehicles were lost.** There is no indication that any of the more lightly-armored French and Italian tanks were lost during this period.

C) **From September 1944 to January 1945 – the period when the German forces were withdrawing from the region – the loss of German tanks was again zero and the loss of German lightly armored vehicles was only two.** However, 200 French and Italian tanks were lost, along with eight Italian armored cars (some of which were probably lost outside of the theater). However, it is likely that most of the *beutepanzer* lost were to abandonment in the German withdrawal from the Balkans.

D) Overall, about 27 well-armored tanks, 210 weaker armored tanks, and 526 lightly armored vehicles were lost in the four year long conflict.

4) **It appears from the evidence that German personnel casualties in the Balkans and the level of intensity of the conflict were a direct function of German decision making rather than the decisions made by the Partisan command or by the Allied armies in the Mediterranean.**[3] The initial German commitment was minimal, and confined mostly to a small area – Serbia. Early conflict between the Germans and Partisans were more similar to terrorist attacks than insurgent operations. Likewise, the initial German reactions were more akin to reprisals (summary executions of villagers) than they were to military actions. Even the early anti-Partisan offensives of 1942 were small scale, reinforced divisions at most. Then, through late 1942 and early 1943 the German reaction to the perceived Partisan threat grew steadily larger. By February-March 1943 the German operations expanded to corps-size, and became joint and combined operations (Croat and Italian forces, and German and Italian land, sea, and air forces all participated). Then, in the final phase, in late 1943 and early 1944 the operations became army-size. Throughout the early period, up to September of 1943, the Partisans were mostly occupied in surviving against the minimal forces committed by the Germans, while they simultaneously expanded their strength and capabilities. By late 1944 they were able to go over to the offensive and fielded what eventually became a conventional army.

The Use of Armor in the Vietnam War, 1965 to 1975

Upon the partition of Vietnam in 1955, the Republic of South Vietnam organized four armored regiments for its new army, one in each of the four military districts. The equipment were aging World War II-era US-manufactured M-24 light tanks, M-8 armored cars, M-3 half-tracks, M-3 scout cars, and towed howitzers, much of it inherited from the French Army in Indochina. These began to be replaced in late 1961 with more modern American vehicles, such

[3] Although not directly germane to the subject of armor use in an insurgency, the personnel loss trends in the Balkans are interesting.

as the M-41 light tank and M-113 armored personnel carrier (APC). The Vietnamese, under the tutelage of US Army armor advisors, modified the APCs to suit the conditions then prevailing in the quickly escalating insurgency. It was found that the vehicles were very suitable, especially after tactics were adapted to make use of their strengths (and compensate for their weaknesses). By early 1965, when major US ground force elements were committed to combat, the Vietnamese and their US advisors had accumulated nearly three and one-half years of experience in using armor in the varied conditions found in Vietnam.

However, despite this wealth of background knowledge and experience, the initial US commitment of armor to Vietnam was characterized mostly by hesitance to act and ignorance of the situation. This may partly be due to the general reluctance by US military and political leaders to commit armor units to Vietnam, especially in the early years of the conflict. It is notable that the first commitment of armor to Vietnam by US forces – the US Marine Corps tanks that landed with the 9th Marine Expeditionary Brigade at Da Nang on 9 March 1965 – was a mistake. The Military Assistance Command Vietnam (MACV), which had requested the Marine reinforcement, was unaware that the Marines Table of Equipment (TE) included heavy armor (M-48A3 MBTs).

Most of the reluctance to commit armor appears to have been a result of the perception that Vietnam was a 'jungle' and that armor was 'unsuitable' for use in guerrilla war. It wasn't until 1967 that a complete terrain analysis of Vietnam, titled *Mechanized and Armor Combat Operations, Vietnam*, challenged the accepted view of armor in Vietnam. The analysis rated 46 percent of the country as a whole accessible year round to armored vehicles and over 80 percent of the coastal plain, piedmont, and central plateau regions as accessible year round. The study also found that tanks could maneuver in 61 percent of the country during the dry season and 46 percent during the wet season, while APCs could maneuver freely over 65 percent of the country year round.[4] This study also confirmed what the troops in the field had already learned, the mobile firepower of tanks and APCs, when properly supported, gave US forces a decisive edge against lightly equipped Viet Cong and North Vietnamese Army forces.

Overall, the data available from Vietnam appears to indicate that the lighter AFVs had an advantage over heavier AFV in terms of maneuverability (note that in the dry season it was just a four-percent advantage to the lighter vehicles). However, in terms of vulnerability and survivability, the data is much less complete and is not as clear cut. In a survey of the vehicular loss experience of the 3rd Marine Division from July 1968 to June 1969 it was found that of 88 vehicles lost (destroyed and damaged), 63 were M-48A3 MBT (71.59 percent).[5] Of the remaining 25 lost, 10 (11.36 percent) were soft-skinned vehicles, while only 15 (17.05 percent) were light armored vehicles (M67A2 'Ontos' SP recoilless-rifles and Landing Vehicle Tracked-Personnel [LVTP]). Mines were responsible for the loss of 82 of the vehicles (93.18 percent).

[4] General Donn A. Starry, *Armoured Combat in Vietnam* (Blandford Press: Dorset, England, 1981), p. 10. The maps derived from this study that were reproduced in General Starry's book are included as Appendix XII.

[5] *The Dupuy Institute*, "The Military Consequences of a Complete Landmine Ban" (TDI: McLean, VA, June 2001). See Appendix XI for a breakdown of the losses by type of vehicle and cause.

Observations

1. **Poor planning based upon false assumptions characterized the early use of armor in Vietnam by the US.** Armored and mechanized units were deployed stripped of their armored vehicles for no other reason than 'everybody knew that Vietnam was a jungle impassable to armor' and that 'armor had no use in combating an insurgency.'

2. **In the case of the 3rd Marine Division, heavy armor did suffer higher losses than did light armor over the year surveyed.** However, the majority of losses for both types were suffered from mines – the higher losses of the heavy armor were probably due to using them to clear roadways for lighter vehicles.

IV. USE OF ARMOR IN A CONVENTIONAL WAR

The Philippines, 1941

In mid 1941, the US elected to reinforce the garrison of the Philippine Islands with a major fraction of the newly created Armor Force of the US Army (see Appendix V for a complete account of the use of armor in the Philippines). What was then the most modern armored vehicle in the US arsenal – a light tank – was sent, part of what was planned to be a massive buildup of US strength in the region. However, the Japanese surprise attack on British, Dutch, and US possessions in the Pacific in December 1941 prevented the completion of the reinforcement program. The Philippine and US forces in the Philippines were left with an incompletely organized armor force and, in any case, the participation of the Provisional Tank Group in the earliest days of the Philippines Campaign had little effect on the final outcome. Although US tank forces matched or exceeded Japanese tank forces in numbers and quality of material, they were never able to take advantage of that superiority.

It appears likely that the presence of the US tanks made little concrete difference to the outcome of the Japanese pursuit, until the last days of 1941 and the first days of 1942. In the first nine days of the campaign, while attempting to counterattack the Japanese beachhead and while covering the withdrawal, 34 US tanks were lost, only ten of which were to enemy action. Most of the rest were lost due to the lack of suitable bridges or bridging equipment, they were abandoned because they were caught on the wrong side of simple water obstacles. When the siege of Bataan began on 7 January, 17 days into the campaign, three more tanks had been lost; again to the vicissitudes of terrain rather than to enemy action. The Filipino-American forces had lost about 13,000 men, most of them to desertion. In contrast, the Japanese had lost 1,916 men as battle casualties and another 2,700 sick. In the same period, no reliable evidence for Japanese tank losses may be found. The best estimate is that perhaps eight Japanese tanks were lost.

In the early Japanese attempt to seize Bataan, casualties were much higher. From 6 January to 1 March Japanese casualties were over 2,700 killed and 4,000 wounded, with another 10,000 to 12,000 sick. However, in the second attack, from 3 to 8 April, Japanese casualties were only 227 killed and 402 wounded. It appears that only six of the 71 US tanks available were lost by American forces during the siege of Bataan.

Observations

1. **It is not apparent that the emergency insertion of US armor forces into the Philippines had either a positive *or* a negative effect on the outcome of the campaign.** An overly hasty deployment and general inexperience reduced the effectiveness of the tanks on the campaign. The officers and men had no training in, or experience with, their major weapons system, the M3 Light Tank. After arriving in Manila, there was both insufficient time and insufficient resources to correct the shortfall in training.

2. **Part of the result of the rapid insertion of the armored force was that there was insufficient means and time to familiarize officers and men with the terrain on which they would be expected to maneuver.** Route reconnaissance was almost nonexistent and even simple things like bridge capacities were unknown factors. Worse, there was not even a

rudimentary bridging capability in the theater. The result was that most of the tanks lost were abandoned when they could not negotiate simple water obstacles.

3. **The hasty insertion of the armor reinforcement adversely affected establishing command and control between the armored units and the existing headquarters in the Philippines**. There was insufficient time (and, it appears something of a lack of effort) to establish coordination between the USAFFE Headquarters and the Provisional Tank Group. Command relationships were murky – to say the least – in the early stages of the campaign. Partly as a consequence, at least 27 of the 43 tanks lost (62.79 percent) were due to command and control errors, rather than to direct enemy action.

4. **There is no evidence that the loss of tanks would have been any less if the tanks involved had been better protected or more heavily armed.** Most of the tanks lost in the early stages of the campaign were abandoned when they could not cross simple water obstacles. In effect, the load limitations of the existing bridges and the lack of bridging resources were a more critical factor than a lack of armor protection or firepower. It appears that – given the terrain and road conditions in the Philippines – more tanks would have been lost if their weight had been much greater than the 14-ton M-3 Light Tank that was actually used.

5. **On the other hand, it cannot be said that *more* tanks would have been lost if they had been of lighter weight, given the relatively few instances in which the tanks were actually heavily engaged in combat.** In that sense, *greater* lightness may have been a valuable asset to have. It is possible that if the tanks had been even lighter, then they may have been more usefully employed in the earlier stages of the campaign.[6] And yet, this again raises a paradox. If the tanks were lighter and more employable in restricted terrain, then they could be expected to have participated in more direct combat. And if they were involved in more direct combat, then the increased lightness (implying lesser protection and a lighter armament) may then have been a disadvantage.

6. **It does not appear that the use of light armor in the Philippines is an example of an emergency insertion of armor forces that the US Army should emulate. However, this example does well illustrate the conundrum that a vehicle light enough to be rapidly inserted may still not be light enough to operate in an underdeveloped or partly developed country.** At the same time that very lightness may also reduce the combat capability of the vehicle.

Normandy, D-Day 1944

On 6 June 1944, US Army forces assaulted the fortified German beach defenses in Normandy. The armor support that was available for the attacking infantry consisted of conventional medium tanks and Duplex-Drive or DD medium tanks. The DD tanks were a British adaptation designed to provide conventional tanks with an amphibious capability (see

[6] Some evidence for this may be found in the praise given to the 75mm gun-armed half-tracks in the campaign. These vehicles, which were a hasty improvisation by the Ordnance Department, were only lightly armored and were open-topped. And yet, time after time, their obsolescent 75mm gun was singled out as a decisive or near-decisive weapon in many of the battles of the campaign.

Appendix VI for a complete analysis of the use of the DD tanks in Normandy). Unfortunately, a number of factors intervened to negate the impact of the armor support on the beaches of Normandy.

Observations

1. **Innovative technical solutions did not solve difficult tactical problems.** The Duplex-Drive system was overly complex, fragile and provided only minimal mobility (when it provided any mobility at all) for the tanks in the water. Of a total of 96 DD tanks launched, at least 40 were destroyed. Most of those lost were sunk in deep water when they were swamped by the rough seas.

2. **Although the approximately 18 percent loss of medium tanks on 6 June was high, it was not necessarily much higher than any other intense day of combat in the European Theater in World War II.** And the daily average lost while establishing the US beachhead (6 June to 1 July 1944), 0.94 percent per day, was not significantly higher than during any other comparable period of conventional conflict. In fact, the highest average for the First US Army was from 13 December 1944 to 5 January 1945 (a 24 day compared to a 26 day period), when 1.27 percent of the operational medium tanks were lost per day (see Appendix X).

3. **Natural obstacles to armor are as difficult to overcome as are manmade obstacles.** The greatest obstacle after getting the armor onto the beach was getting the armor off of the beach. The Norman beaches were characterized by heavy deposits of shingle – fist-sized, smooth stones – which was almost impassable without extensive engineer preparation to all types of vehicles, including tracked vehicles. This natural barrier was combined with man-made barriers (sea walls, antitank ditches, and some minefields) that confined the armor support to the water edge.

4. **Armor may not always be capable of supporting infantry operations.** The fixed German defensive positions were designed to cover the beach exits by enfilade, which meant that the majority of these fortifications presented no aspect to the sea, rendering them almost impervious to naval gunfire. However, this also meant that they were extremely well protected against tank gunfire from the beaches. It wasn't until exits were cleared for the tanks, allowing them to advance off the beach, that they were able to provide effective gunfire support to the infantry. Of course, by that time most of the beach defenses had already been taken or destroyed, by infantry and engineers.

Task Force Smith and After, US Armor in Korea, 1950-1951

On 25 June 1950 North Korea invaded South Korea. On 27 June President Harry Truman authorized the use of US air and naval forces in support of South Korea. On 30 June the commitment of US ground forces was authorized and the first deployment of troops from Japan began. At about 0800 on 5 July, the leading element of the US 24th Infantry Division, Task Force Smith (1st Battalion, 21st Infantry), was committed at Osan (south of Seoul) to delay the North Koreans and permit the deployment of the remainder of the division. Attacked by 33 North Korean T-34 medium tanks and about 1,000 infantry, the task force held on for seven hours

before it was overrun. Task Force Smith lost 153 men KIA, WIA and MIA, and all six of the 105mm howitzers in the attached artillery battery. The North Korean losses were 42 KIA, 85 MIA and four T-34 tanks destroyed and three damaged.

The first US armor units, M-24 'Chaffee' light tanks of the 78th Tank Battalion, deployed from Japan unloaded at the port of Pusan and arrived at the frontline at Chonui on 10 July, ten days after their use was authorized and five days after Task Force Smith had been overrun. Only four M-24 tanks were immediately committed of the dozen-odd that were available. On 11 July three of the four were lost to enemy action, two by direct fire and one by infantry close assault.[7] By 12 July the positions held by the 21st Infantry (including the remnants of Task Force Smith) had become untenable and the remnants withdrew beyond the Kum River, turning over the defense to the 19th and 34th Infantry Regiments on 13 July. However, North Korean forces successfully assaulted the river on 14 and 15 July and the new position collapsed by 16 July. It appears that a number of additional M-24 tanks were abandoned when they were unable to withdraw over the roads blocked by North Korean infantry. The remnants of the 24th Division fell back again, to Taejon. On 19 and 20 July the 24th Division made its final stand before it was forced to withdraw behind the Naktong River and the newly arrived 1st Cavalry Division, ending the delaying action phase of the campaign.

From the evidence that is available it appears that the loss of M-24 light tanks in the first phase of the campaign were two total loss to tank fire, one total loss to infantry close assault, and three total loss to abandonment under 'tactical circumstances.'[8] It appears that all of the subsequent losses of M-24 Light Tanks were during the second Communist Offensive in Korea, the First Chinese Offensive of November 1950. During this campaign the US 2nd Infantry Division reported losing eight M-24 tanks (50 percent of those on hand) between 26 and 30 November during the retreat from Kunu-ri. At about the same time, between 29 November and 5 December, the US 25th Infantry Division lost two more M-24 tanks. This accounts for 16 of the total of 24 M-24 tanks 'written-off' in Korea between 10 June 1950 and 1 January 1951 (two to tank fire, one to infantry assault, four to AT guns, one to mortar fire, one to accident, and 15 abandoned).[9] The remaining eight may have been lost by the 1st Cavalry Division during the withdrawal to or during the early battles on the Pusan Perimeter, unfortunately the records do not make this clear.

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[7] Roy E. Appleman, *South to the Naktong, North to the Yalu* (US Government Printing Office: Washington, DC, 1960), p. 100 states that two were lost to 'artillery fire.' However, H. W. MacDonald, et al, *The Employment of Armor in Korea, Volume 1* (Operations Research Office, GHQ Far East Command: Tokyo, April 1951), p.32 clearly identifies the combat losses of M-24 tanks as two total loss to tank fire, one total loss to infantry assault, four total loss and three damaged by AT guns, one total loss to mortars, two damaged by mines and one damaged by artillery fire. In addition, three were abandoned and destroyed under 'tactical circumstances,' one was a total loss in an accident, five were total losses to terrain hazards, seven were unrepairable mechanical losses, and 31 suffered repairable mechanical damage. Thus, 24 were total losses (11 due to enemy action or 45.83 percent) and 37 were damaged (six due to enemy action or 16.22 percent) It appears likely that the two mentioned by Appleman were probably lost to tank fire or to antitank guns.

[8] What the 'tactical circumstances' were is not perfectly clear. Apparently the tanks were destroyed and abandoned by their crew, but were not broken down or mired. It is likely that all three of these were lost on the Kum River line. See Roy K. Flint "Task Force Smith and the 24th Division" in *America's First Battles, 1776-1965*, edited by Charles E. Heller and William A. Stofft (University Press of Kansas: Lawrence, KS, 1986).

[9] The 2nd and 25th Division losses were extracted from the unit G-3 and G-4 records and are contained in research notes for the HERO-DMSi Study "Wartime Replacement Requirements," which are currently on file *at The Dupuy Institute*.

In any case, it appears certain that at least 16 of the 24 lost were during withdrawal or delaying actions. In contrast, it is known that no medium or heavy tanks were lost in the delaying action and withdrawal to the Pusan Perimeter (none were available since the earliest landed at Pusan in August 1950). During the First Chinese Offensive between 26 and 30 November, the 2nd Division lost 54 M-4A3 (67.50 percent of those on hand), five M-26 (45.50 of those on hand), and four M-32 ARV (80 percent of those on hand).

The delaying action by the 24th Infantry Division gained approximately seven days for the US Eighth Army and Republic of Korea Army (one day at Osan, two at Chonui, three on the Kum river, and two at Taejon). It may be questioned whether or not the US armor presence had any effect on the time gained. However, it did result in a considerable number of tanks lost.

UN and North Korean Tank Losses

Overall, from 10 July 1950 until 1 January 1951, UN forces lost the following tanks (the first number is the total lost, the second is those included in the total that were destroyed):[10]

Losses To Direct Enemy Action

	Tank	Infantry	AT Guns	Mortars	Artillery	Mines
Heavy Tanks	4/2	4/4	4/2	3/0	1/1	27/3
Medium Tanks	11/7	5/5	15/11	4/0	6/4	35/15
Light Tanks	2/2	13/13	7/4	1/1	1/0	2/0

Losses to Other Causes

	Breakdown	Terrain	Abandoned	Accident
Heavy Tanks	189/57	12/9	11/11	7/4
Medium Tanks	120/42	34/32	9/9	2/2
Light Tanks	38/7	5/5	3/3	1/1

From the initial North Korean invasion to 21 October 1950, North Korean armor losses were as follows:[11]

	Tank	Infantry	Artillery	Mines	Air	Abandoned	Unknown
T-34	39	13	5	1	102	64	15
SU-76	3	4	11	1	35	16	4

Observations

1. **Light armor was inserted into the Korean conflict in a timely manner, given the restrictions of the technology in use at the time.** Only ten days elapsed from the time units in Japan were alerted for deployment to when the first armor units were engaged.

2. **That being said, the actual deployment had little or no effect on the outcome of the delaying action.** At least six of the light tanks initially deployed were lost and at least one-half of those without effectively engaging the enemy.

[10] Heavy tanks include the US M-46, M-26, M-45 and the British Centurion and Churchill. Medium tanks include the US M-4A3 and M-32 ARV, which was based upon the M-4 tank with similar protection. The light tanks include the US M-24 and the British Cromwell.

[11] The T-34 was the standard Soviet World War II medium tank design. The SU-76 was a Soviet 76.2mm SP gun based upon a light tank chassis, which had an open top and minimal armor protection.

3. **It appears that all of the North Korean tanks and SP guns destroyed during the UN withdrawal were lost to UN airpower, artillery fire, and infantry antitank weapons.** There is no evidence that the rapidly deployed US light tanks inflicted a single loss on the North Korean armored force.

4. **It is notable – although probably anomalous, given the small sample – that 100 percent of the light tanks lost to terrain as a cause were total losses.** Only the heavy and medium tanks were evidently extracted from bad terrain without becoming total losses. This calls into some question the assumption that lighter weight armored vehicles are more suitable for use in poor terrain or underdeveloped regions of the world. This parallels similar findings in the experience of US light tanks in the Philippines in 1941 and 1942.

5. **The greatest threat to UN armor of all kinds was mines.** Sixty-four of the 146 tanks lost to direct enemy action were due to mines. In this case light armor did not appear to be any more vulnerable, but probably only because of the small sample (two M-24 light tanks were damaged by mines). Just over 11 percent of the heavy tanks damaged by mines were total losses, while almost 43 percent of medium tanks damaged by mines were total losses.

6. **On the other hand, mines were a negligible factor in North Korean armor losses, inflicting only two out of 313 losses**.

The US 82nd Airborne Division in Operation DESERT SHEILD

On 2 August 1990, the Republican Guard Forces Command (RGFC) of the Iraqi Army invaded Kuwait. On 7 August President Bush approved the deployment of US combat troops to protect the Kingdom of Saudi Arabia. In the early afternoon of 8 August, the leading elements of the 2nd Brigade, 82nd Airborne Division, departed Pope Air Force Base in route for Dhahran, Saudi Arabia. By 18 August the brigade had closed in Saudi Arabia, along with 19 M-551 'Sheridan' armored reconnaissance vehicles of Headquarters and Headquarters Company and D Company of the attached 3-73 Armor. By 24 August the entire 82nd Airborne Division and all 51 Sheridan tanks of 3-73 Armor had closed in Saudi Arabia.[12]

Curiously this appears to be a very similar deployment timeline to that of the M-24 Light Tanks sent to Korea in 1950. It also took about 10 days for the first tanks to get to Korea, and it appears as if the initial number available was also about 18 or 19 as well. The reinforcement by heavy armor also followed a similar pattern. The 24th Infantry Division off-loaded the first M1A1 tanks in Saudi Arabia on 31 August (but because of a breakdown the last shipload closing the division movement did not arrive until 25 September), 24 days after the deployment was approved.[13] In Korea, the first M-4A3, M-26, and M-46 tanks arrived at Pusan on 4 August, 35 days after the deployment was approved and by 19 August 1950 over 500 medium tanks were in the Pusan Perimeter. The difference between the two cases of course is that the Sheridans of 3-73

[12] BG Robert H. Scales, Jr., *et al*, *Certain Victory, The United States Army in the Gulf War* (Office of the Chief of Staff, US Army: Washington, DC, 1993), pp. 82, 86.

[13] But this wasn't the first US heavy armor to deploy to Saudi Arabia. The US 7th Marine Expeditionary Brigade had 33 M-60A1 tanks ashore at Al-Jubayl by 18 August 1990 and the brigade closed in place there on 25 August 1990. LTC Charles H. Cureton, USMCR, *U.S. Marines in the Persian Gulf, 1990-1991, With the 1st Marine Division in Desert Shield and Desert Storm* (History and Museums Division, HQ, USMC: Washington, DC, 1993), p. 4.

Armor did not have to fight a delaying action immediately upon their arrival in theater. Furthermore, if they had been called upon to fight a delaying action, the Sheridans of 3-73 Armor would have been just a small part of a highly mobile anti-armor team. Other components available by 18 August would have been 56 (of a total of 180 by 24 August) TOW systems and 15 Apache helicopters. In addition by 18 August, the 82nd Airborne Division had the support of 96 Air Force A-10, 40 Marine Corps AV-8B, and 36 Navy F/A-18 attack aircraft, all of which were capable of delivering antitank munitions with a precision unheard of in the Korean War.[14] In addition over 260 Saudi main battle tanks were available to support the 82nd Airborne Division if the Iraqis had decided to attack.

However, that being said, it is unlikely that a continued Iraqi advance to secure the port facilities and airfields at Dhahran, Ad-Dammam, and Al-Jubayl would have had a result much different from that in the Korean War. That is, if the mass of the RGFC (approximately 1,000 T-72 main battle tanks) had been committed in an immediate attack on the 82nd, it appears likely that many of the Sheridans of 3-73 Armor would have been lost.

Observations

1. **The staging time for inserting light armor into the Persian Gulf was not significantly different from that in the Korean War.** Although the distances were significantly different and the means of entry were radically different (sea borne for Korea, airborne for the Gulf), the times were the same.

2. **The staging times for inserting heavy armor into the Persian Gulf were somewhat shorter than it was in the Korean War.** The distances were not significantly different (US West Coast to Korea versus US East Coast to Saudi Arabia), nor were the means of entry (sea borne for both).

3. **The greatest delay in the initial deployment of heavy armor to the Gulf was the breakdown of one of the ships transporting the heavy equipment of the 24th Division to the region.** The heavy equipment of the 24th Division began loading almost immediately, and the first shipment departed within two days.

4. **The greatest delay in the initial deployment of heavy armor to the Korean War was the lack of preparedness in the Army.** The five US Army tank battalions eventually organized and sent to Korea were hastily organized, equipped with whatever tanks were available (including tanks salvaged from World War II Pacific battlefields and reconditioned in Japan), and were transported into the theater as they became available.

[14] It is interesting to note that in the Korean War the most effective air delivered antitank munition was the napalm bomb, which can be said to have achieved its effect by accident. Joint Air Force and Army operations research studies of the time reveal that while pilot claims for the destruction of armor by napalm bomb attacks were only 5 percent of the total number of tanks claimed destroyed by air attack, the actual number of tanks destroyed by napalm bombs was about 71 percent of all those destroyed by air attack. See *A Study of the Effectiveness of Air Support Operations in Korea* (Operations Research Office, The Johns Hopkins University: NP, 26 September 1951) and *Preliminary Reports on Relative Combat Effectiveness of Airborne Weapons Against T-34 Tanks* (HQ Fifth Air Force: NP, 31 December 1950).

5. **There is no evidence that the light armor in the Persian Gulf would have had any greater success against the RGFC than did the light armor in Korea against the North Korean Army.** More important in the Persian Gulf was the support of indigenous heavy armor forces and the lack of political and military resolve displayed by Saddam Hussein. Saddam Hussein's objective was to hold Kuwait, not to expand the war into a general conflict with Saudi Arabia and the United States.

Conventional Conflict Against an Armor Supported or Armor Heavy Force

During World War II all of the major European combatants – Germany, the Soviet Union, Great Britain, and the United States – utilized lighter weight armored vehicles alongside heavier ones. The Germans in the early war years deployed light Pz-I and Pz-II tanks alongside medium Pz-III and Pz-IV tanks in mixed companies and battalions. However, that was more a result of production limitations than of doctrinal decisions, since the Pz-I and Pz-II were both conceived as training vehicles rather than combat tanks. As the war progressed the expedient use of the early light tanks was gradually eliminated and the German tanks became progressively heavier. The Pz-I and Pz-II tanks were quickly relegated to reconnaissance roles or were converted to self-propelled carriages for antitank guns and artillery, as was the Pz-III by late 1943. True heavy tanks also began to appear, the Pz-VIe 'Tiger I,' initially in company-strength units attached to existing panzer regiments and then later in separate battalion-size units. By early 1944 the Pz-IV had become the 'lighter' medium tank in the panzer regiment and was paired with a 'heavier' medium tank, the Pz-V 'Panther.' The lighter Pz-I, Pz-II, and Pz-III tanks had virtually disappeared, even their reconnaissance role was replaced by light wheeled and half-track armored cars.[15] And, by mid 1944 tactical reconnaissance by the battalion and regimental reconnaissance platoons was done in Pz-IV and 'Panther' tanks.

The pattern was similar for the Soviet Union, which began with large numbers of light T-26 and BT tanks – less than 2,000 of the 20,000-odd (accounts vary) Soviet tanks in inventory in June 1941 were heavier T-34 and KV types. However, by mid 1943 light tank types only made up about one-third of the total inventory and in late 1943 the production of all light tanks was switched to the production of SU-76 self-propelled antitank guns.[16] As in the German Army even reconnaissance missions were relegated to wheeled and half-track light armored vehicles.

Great Britain also began the war with a mass of light tanks, in September 1939 there were about 1,000 in inventory compared to about 77 'cruiser' (medium) tanks and 67 'Infantry' (heavy tanks). However, the dismal showing of the British light tanks in the campaign in France in 1940 brought about their rapid demise in British service. Production from September 1939 to the end of 1940 was 355, in 1941 it was 73, in 1942 it was 100, and in 1943-1944 – after which all light tank production ceased – it was 102. Furthermore, the last 279 light tanks produced were

[15] After 1 December 1942 the Pz-I was no longer reported in inventory (although a few were actually retained as command and liaison vehicles). The Pz-II declined from strength of 997 on 1 January 1943 to 399 on 1 January 1944 and was no longer reported after 1 September 1944. The Pz-III declined from a strength of 2944 on 1 January 1943 to 928 on 1 January 1944, by 10 April 1945 only 175 remained. Dr. S. Hart and Dr. R. Hart, *German Tanks of World War II* (Amber Books Ltd: London, 1998), p. 165. The strengths reflect the number operational and in repair with units and those in route as replacements.

[16] O. A. Losik (translated by the US Army Intelligence and Threat Analysis Center), *Formation and Combat Use of Soviet Tank Troops During the Years of the Great Patriotic War* (Military Publishing House [Voenizdat]: Moscow, 1979), p.14.

specialized airborne light tanks, which could be landed by glider assault.[17] In July 1941 the British began receiving US-manufactured M-3 Light Tanks (known in British service as 'Honeys' or 'Stuarts'), which were used initially as 'cruiser' tanks.[18] By mid 1943, the British – like the Germans and Soviets – had reduced the number of light tanks in their units to just 11, found in the reconnaissance troop (platoon) and intercommunications troop of the armored regiment (battalion) headquarters squadron (company).

Of these four combatants which made extensive use of armored forces during the war, only the United States maintained full-scale production and use of light tanks throughout the war. Production of the M-3 and M-5 series was 2,551 in 1941, 10,697 in 1942, 7,532 in 1943, and 1,963 in 1944. The follow-on design, the M-24 'Chaffee,' began production in 1944 when 1,930 were built. An additional 2,801 were built through August of 1945.[19] Thus, although production declined sharply during the war years, there was no cessation of production as in German, the Soviet Union and Britain.

The light tank was integrated into the structure of virtually every US armor and mechanized cavalry unit during the war, and accounted for approximately 40 percent of the US tanks in combat in the European Theater between June 1944 and May 1945. However, they did not account for 40 percent of the tanks lost by the US Army in the European Theater in World War II. Rather, light tank losses account for 850 of 4,126 tanks lost (20.60 percent).[20] This seeming 'immunity' of light tanks in the European Theater does not appear to be a function of their design, rather, it was a matter of a common sense appraisal of the light tanks strengths and weaknesses. US Army doctrine of the time considered the tank to have two diverse roles, the first as an infantry-support vehicle and the second as a means for mechanized exploitation and pursuit into the enemy rear. Within this doctrinal construct, it was considered gospel that tanks were not to engage enemy armor and that they should in fact avoid such a confrontation if possible so that specially-formed antitank units (tank destroyers) could be tasked with engaging enemy tanks. Note that within this doctrinal construct there was no real distinction drawn between the capabilities and limitations of light and medium tanks – in effect, both were considered to have similar capabilities in both roles and were considered to be complimentary to each other.

However, the commitment of US light and medium tanks in the Mediterranean Theater of Operations during late 1942 to early 1944 revealed many of the actual limitations of this doctrine. It was found that, in practical terms, the light tank was vulnerable at virtually all engagement ranges to all of the existing German antitank weapons. Furthermore, even the US medium tanks were highly vulnerable to the standard German antitank weapons at close and

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[17] Duncan Crow, "Survey of AFVs in British and Commonwealth Service during World War II," *Armoured Fighting Vehicles in Profile, Volume 3, British and Commonwealth AFVs 1940-1946* (Doubleday & Company, Inc.: Garden City, New York, 1971), p. 284.

[18] In all respects – gun power, armor, and mobility, the M-3 was the equal to the standard British 'cruiser' tanks up to the introduction of the Crusader III in May 1942. Major James Bingham, "Crusader—Cruiser Mark VI," *Armoured Fighting Vehicles*, p. 8.

[19] However, only 4,415 were produced as tanks, the remainder were completed as M-19 40mm Gun Motor Carriages, M-37 105mm Howitzer Motor Carriages, or M-41 155mm Howitzer Motor Carriages. Colonel Robert J. Icks, "M24 Chaffee Light Tank," *Armoured Fighting Vehicles in Profile, Volume 4, American AFVs of World War II*, (Doubleday & Company, Inc.: Garden City, New York, 1972), p. 110.

[20] For the US First, Third, and Ninth Army the total lost by type were 3,155 M-4 75mm & 76mm-armed Medium Tanks, 120 M-4 105mm-armed 'assault gun' Medium Tanks, one M-26 Heavy Tank, 788 M-5 Light Tanks, and 62 M-24 Light Tanks. See Appendix X for a complete breakdown of the strength and loss by type of tank in the European Theater.

medium ranges, and to the more deadly (but less common) high-velocity 75mm and 88mm guns at all ranges. Worse, it was found that against an experienced enemy the doctrinal distinction between tanks and tank destroyers could not be maintained – time after time the US tanks were forced to engage German tanks in situations where the superior German tank guns prevailed. As a result, by the time of the Normandy invasion, the light tank units in the American Army in Europe had been almost entirely relegated to security, reconnaissance, and pursuit missions.

By late 1944 the tendency to keep light tanks out of direct combat had reached such a degree that the entire concept of the light tank in US tank and mechanized units was called into question. Surveys of tank unit commanders were conducted by the 12th Army Group Armor Section to evaluate the relative use of light and medium armor. Curiously, the responses appear to have been somewhat mixed. About one-half of the tank commanders surveyed wished to replace the light tank company in the tank battalions with a medium tank company. At the same time though, about one-half of the commanders urged the retention of the light tank company, and all commanders wished to retain the light tank in the mechanized cavalry units. The overall view of tank commanders was that the primary need was a tank gun that could defeat heavy enemy armor, adequate protection was secondary, while battlefield mobility was third (but the consensus was not unanimous, see Appendix IX for extracts from the 12th Army Group Armor Section reports).

Tank Destroyers

The tank destroyer was a uniquely American armor concept that drew considerable criticism during and after the war. The tank destroyer doctrine was intimately intertwined with the overall US armor doctrine. The concept was that, since tanks were designed to support infantry or to conduct penetrations and pursuits and were to avoid enemy armor, then a specialized vehicle and organization was required specifically to defeat enemy armor. This doctrinal concept resulted in the tank destroyer, which was originally conceived as a highly mobile, self-propelled, large-caliber gun designed to hunt down and destroy enemy tanks. To preserve mobility the tank destroyers had minimal armor and were open-topped.

Proponents of the doctrine believed that the tank destroyers could be massed at will against enemy armor. In practice it was found that this was almost never achieved and that the light armor made the vehicles too vulnerable. Worse, the guns utilized in the majority of the vehicles were only marginally capable against the later generations of German armor. As a result, they were considered to have never achieved the results contemplated for them and the vehicles and the arm were quickly discarded at the end of the war.

Interestingly however, the loss patterns of the three major types of self-propelled tank destroyer used in Europe may be revealing (see Appendix X). The three types were (ignoring subtypes of the principle models):

M-10, a 3” gun mounted on what was essentially a Sherman tank chassis, with only moderate mobility
M-18, a specialized tank destroyer design, with a highly mobile chassis mounting a 76mm gun (effectively a redesigned 3” gun),
M-36, a 90mm gun mounted on the M-10 chassis, which had additional mobility limitations over the above those of the M-10 as a result of the greater weight of the gun.

As would be expected, the M-10 was the least favored of the three (it was also the oldest design and the first fielded of the three). The M-18 was considered desirable because of its great mobility and maneuverability (the M-18 was the fastest tracked production AFV in the world until the fielding of the M-1 'Abrams' in 1984). The M-36 however was the most favored since the 90mm was the only gun available in the US arsenal which could engage the heavier German tanks with a reliable chance of success.

This ranking may also be reflected by the loss statistics of the three types. The M-10 suffered an average daily loss rate of 0.23 percent, the M-18 was 0.15 percent, and the M-36 was only 0.08 percent. The comparable loss rate for light tanks – the majority of which were equipped with the puny 37mm gun – was 0.20 percent.

Note however that this ranking by gun power does not appear to hold consistently with medium tanks. In the US First Army the M-4 Medium Tank with the 76mm gun (0.37 percent per day) was apparently somewhat more survivable than the 75mm armed M-4 (0.58 percent per day). In the Third Army the position was reversed, the M-4 76mm appears to be less survivable (0.82 percent per day) than the M-4 75mm (0.39 percent per day). In the Ninth Army neither appeared more survivable, the 76mm loss rate was 0.32 percent per day and the 75mm loss rate was 0.31 percent per day.

US Mechanized Cavalry in World War II

The US Mechanized Cavalry Group consisting of two Mechanized Cavalry Squadrons, was possibly the closest analog to a 'medium-weight armor' force in World War II. The three mechanized cavalry troops in the squadron were equipped with M-8 Armored Cars, M-20 Armored Utility Cars, half-tracks, and ¼-ton Utility Vehicles (Jeeps). Supporting the three cavalry troops were an Assault Gun Troop equipped with M-8 75mm Howitzer Motor Carriages (utilizing the M-5 Light Tank chassis) and a Light Tank Company equipped with the M-5 Light Tank (and in the closing months of the war, the M-24 Light Tank). Highly mobile, the mechanized cavalry was intended primarily for reconnaissance missions. However, it is revealing perhaps of the vagaries of real as opposed to theoretical applications of doctrinal thought that in fact reconnaissance missions were only three percent of those assigned. Defensive missions accounted for fully 33 percent of those assigned, followed by 'special operations' (mobile reserve and providing for security and control of rear areas) 29 percent, security missions 25 percent, and offensive missions 10 percent.[21]

Observations

1. **The United States was the only major combatant to retain large numbers of light tanks in its organizational structure throughout the war.** This appears to have been a result of questionable doctrinal decisions and questionable analysis of the early campaigns of the war.

2. **Despite it comprising about 40 percent of the inventory fielded, the US light tanks only made up about 20 percent of those destroyed in action.** However, this seems to have been a result of commonsense adjustments of doctrine to tactical realities, rather than from some actual advantage found in light tanks.

[21] Mary L. Stubbs and Stanley R. Connor, *Armor-Cavalry Part I* (OCMH: Washington, DC, 1969) p. 73.

3. **Gun capability may have been an important factor in the survivability of light armored vehicles.** Although mobility apparently was also a factor, it does not appear to have been as significant as gun power.

4. **The advantage of a more powerful gun was less apparent in regards to survivability in heavier tanks.** However, the general consensus of users was that it was more important than mobility (but the relative merits of mobility versus protection were apparently less clear cut, see Appendix X).

Conventional Conflict Against a Primarily Infantry Force

This scenario does not appear to differ significantly in many respects from a major insurgency. In the breakout from the Pusan Perimeter, which was essentially against an all infantry force, mines accounted for about 44 tanks lost. In comparison, tank gunfire inflicted about 10 losses, antitank guns 10 losses, and artillery and mortars eight losses. It would appear that when fighting an infantry force, any armor, be it light armor, "medium weight armor" or heavy tanks is useful, but one of the primary problems is mines. As such, the heavier tank may still be the weapon of choice, although there are other ways of protecting against mines other than sheer bulk that should be further explored.

Emergency Insertion Against an Armor Supported or Armor Heavy Force

The emergency insertion of light armor in the face of enemy armor appears to be fraught with problems. A primary role for strategically mobile light armor forces may be as a blocking or delaying force designed to gain time for the deployment of conventional heavy forces in a crisis. Two modern examples of the use of blocking forces (albeit with little armor support for the blocking force) are the delaying actions after the initial commitment of Task Force Smith in the Korean War and the 82nd Airborne Division deployment to Saudi Arabia during Operation DESERT SHIELD. As has already been mentioned, these two actions, although separated by over 41 years, have interesting similarities as well as some differences. The US operations in the Philippines in 1941 also may be counted as delaying action. Significantly, in the Korean and Philippine cases the most important obstacle and limitation – aside from the enemy threat – to the deployment of the armor, was terrain. In the Philippines significant losses were incurred due to a lack of bridging assets and to a simple lack of knowledge as to the terrain. In Korea much the same experience was found. There appears to be little to substantiate the idea that light armor is more capable by virtue of its 'lightness' in marginal terrain, than is heavier armor. Effectively, neither can achieve anything approaching full effectiveness without substantial engineering and logistical support.

In the face of the marginal utility and high losses suffered by delaying forces using light armor, the question then becomes whether it is better to insert more light armor, or better lighter armor ("medium weight armor") and figure out a better way to insert heavy armor in usable quantities. For the sake of minimizing US casualties, the later is clearly the preferable choice. Inserting more light armor seems to be counterproductive, as stabilization and security of the combat zone will probably not be achieved without the insertion of heavy armor. Resources used to insert, supply and support light armor are resources not being used to insert and support heavy armor. Still, these emergency insertions (delaying actions) may be forced upon the US. This does provide an argument for some "medium force", although it appears that one still wants to move heavy armor assets into the theater as quickly as possible.

It does appear essential that when armor resources are deployed in an emergency situation, they should be provided with sufficient engineering support, in particular a bridging capability. It also appears that any deployment of US armor needs to be provided with good mine clearing capability.

Emergency Insertion Against a Primarily Infantry Force

Again, it would appear that when fighting an infantry force, any armor, be it light armor, "medium weight armor" or heavy tanks is useful. This scenario does not argue in favor of any unique force structure or equipment. The selection of forces to be used can be determined by available resources and local conditions. If sufficient light forces can be put in place, then the threat from such a scenario is minimal. Deployment of existing light armor should be sufficient with reinforcement by heavy armor as required. One of the primary problems may be mines. In that case, the heavier tank may still be the weapon of choice.

V. STUDY CONCLUSIONS

Small Scale Contingency Operations

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** It would appear that existing systems (M-2 and M-3 Bradley and M-113) can fulfill most requirements. Current plans to develop an advanced LAV-type vehicle may cover almost all other shortfalls. Mine protection is a design feature that should be emphasized.

2. **Implications for the Interim Brigade Combat Team (IBCT).** The need for armor in SSCOs that are not conventional or closely conventional in nature is limited and rarely approaches the requirements of a brigade-size armored force.

Insurgencies

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** It would appear that existing systems (M-2 and M-3 Bradley and M-113) can fulfill most requirements. The armor threat in insurgencies is very limited until the later stages if the conflict transitions to conventional war. In either case, mine protection is a design feature that may be critical.

2. **Implications for the Interim Brigade Combat Team (IBCT).** It is the nature of insurgencies that rapid deployment of armor is not essential. The armor threat in insurgencies is very limited until the later stages if the conflict transitions to a conventional war and rarely approaches the requirements of a brigade-size armored force.

Conventional Warfare

Conventional Conflict Against An Armor Supported Or Armor Heavy Force

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** It may be expected that opposing heavy armor in a conventional armor versus armor engagement could significantly overmatch the IAV. In this case the primary requirement would be for a weapon system that would allow the IAV to defeat the enemy armor before it could engage the IAV.

2. **Implications for the Interim Brigade Combat Team (IBCT).** The IBCT could substitute as an armored cavalry force in such a scenario.

Conventional Conflict Against A Primarily Infantry Force

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** This appears to be little different from those conclusions found for the use of armor in SSCOs and Insurgencies.

2. **Implications for the Interim Brigade Combat Team (IBCT).** The lack of a major armor threat will make the presence of armor useful.

Emergency Insertion Against An Armor Supported Or Armor Heavy Force

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** It appears that the IAV may be of great use in an emergency insertion. However, the caveat regarding the threat of being overmatched by conventional heavy armor mentioned above should not be ignored. In this case the primary requirement would be for a weapon system that would allow the IAV to defeat the enemy armor before it could engage the IAV.

2. **Implications for the Interim Brigade Combat Team (IBCT).** Although the theoretical utility of the IBCT in this scenario may be great it should be noted that *The Dupuy Institute* was only able to find one comparable case of such a deployment which resulted in actual conflict in US military history in the last 60 years (Korea, 1950). In this case the effect of pushing forward light tanks into the face of heavier enemy tanks was marginal.

Emergency Insertion Against A Primarily Infantry Force

1. **Implications for the Interim Armored Vehicle (IAV) Family of Vehicles.** The lack of a major armor threat in this scenario will make the presence of any armor useful. However, *The Dupuy Institute* was unable to identify the existence of any such cases in the historical record.

2. **Implications for the Interim Brigade Combat Team (IBCT).** The lack of a major armor threat will make the presence of any armor useful. However, *The Dupuy Institute* was unable to identify the existence of any such cases in the historical record.

Other Conclusions

Wheeled Vehicles

1. There is little historical evidence one way or the other establishing whether wheels or tracks are the preferable feature of AFVs.

Vehicle Design

1. In SSCOs access to a large-caliber main gun was useful for demolishing obstacles and buildings. This capability is not unique and could be replaced by AT missiles armed CFVs, IFVs and APCs.

2. Any new lighter tank-like vehicle should make its gun system the highest priority, armor secondary and mobility and maneuverability tertiary.

3. Mine protection should be emphasized. Mines were a major threat to all types of armor in many scenarios. In many SSCOs it was the major cause of armored vehicle losses.

4. The robust carrying capacity offered by an APC over a tank is an advantage during many SSCOs.

Terrain Issues

1. The use of armor in urban fighting, even in SSCOs, is still limited. The threat to armor from other armor in urban terrain during SSCOs is almost nonexistent. Most urban warfare armor needs, where armor basically serves as a support weapon, can be met with light armor (CFVs, IFVs, and APCs).

2. Vehicle weight is sometimes a limiting factor in less developed areas. In all cases where this was a problem, there was not a corresponding armor threat. As such, in almost all cases, the missions and tasks of a tank can be fulfilled with other light armor (CFVs, IFVs, or APCs).

3. The primary terrain problem is rivers and flooded areas. It would appear that in difficult terrain, especially heavily forested terrain (areas with lots of rainfall, like jungles), a robust river crossing capability is required.

Operational Factors

1. Emergency insertions and delaying actions sometimes appear to be a good way to lose lots of armor for limited gain. This tends to come about due to terrain problems, enemy infiltration and bypassing, and the general confusion prevalent in such operations. The Army should be careful not to piecemeal assets when inserting valuable armor resources into a 'hot' situation. In many cases holding back and massing the armor for defense or counter-attack may be the better option.

2. Transportability limitations have not been a major factor in the past for determining whether lighter or heavier armor were sent into a SSCO or a combat environment.

Casualty Sensitivity

1. In a SSCO or insurgency, in most cases the weight and armor of the AFVs is not critical. As such, one would not expect any significant changes in losses regardless of the type of AFV used (MBT, medium-weight armor, or light armor). However, the perception that US forces are not equipped with the best-protected vehicle may cause some domestic political problems. The US government is very casualty sensitive during SSCOs. Furthermore, the current US main battle tank particularly impressive, and may help provide some additional intimidation in SSCOs.

2. In any emergency insertion scenario or conventional war scenario, the use of lighter armor could result in higher US casualties and lesser combat effectiveness. This will certainly cause some domestic political problems and may impact army morale. However by the same token, light infantry forces, unsupported by easily deployable armor could present a worse situation.

APPENDIX I. A DESCRIPTION OF THE USE OF ARMOR IN SSCOS BY MISSION TYPE

Aid

As the *Institute* has not collected data on such operations, it is hesitant to draw conclusions from them. Still, it does not appear that armor played a major role in these operations. Furthermore, as there is usually not a well organized and threatening "opposing force," there is not an immediate need to bring massive combat power to bear on short notice (meaning transport limitations are not a major limitation). Armor in these operations is very much a matter of "show of force." The "lightness" of military forces is more a matter of cost and convenience than of military urgency. Therefore, the logistical savings gained by using light armor are not critical. Still, these missions tend to be conducted in some of the least developed areas of the world, and in many cases, when infrastructure that exits is sometimes degraded by the disaster (i.e. flooding). As such, lighter armor, especially that with a robust cross-country capability, is of great use here. As the threat of organized violence is low; the need for heavier main battles tanks is probably very limited. Armor needs could probably be fulfilled with existing APCs, CFVs and IFVs.

Military Assistance

Because of the advisory nature, or only combat support functions, of these missions, there is very little call for any armor use. In four of the five missions examined, the environment was definitely not suited for heavier armor. In the one that was in a desert environment, at the critical battle, part of the armor unit fought "dismounted". As such, it would be expected that these missions, if they needed armor, would require limited light armor, primarily designed for protecting the occupants against light weapons. As such, armor needs could probably be fulfilled with existing APCs, CFVs and IFVs.

The actual historical use of armor in these operations is limited. In the case of the advisory period of Vietnam, the US advisors did not have armor. This includes the initial US advisory period from 1956 to 1960, and the much larger period from 1961-64. The South Vietnamese had four armored regiments, each with some M-24 and later M-41 light tanks (expanded to six regiments in 1964). The NVA and VC probably had no effective armor.

In the case of Oman, the British originally maintained one troop (a platoon of around 4) of Ferret scout cars. These were four-wheeled armored cars armed with a machine gun. This was later upgraded to a full squadron (a company of around 16). Primary cause of losses was due to mines, with 80 percent of the losses being reported caused by mines. In the final assault on Jebel Akhdar, the rebel stronghold in the mountains, some of the armored troops fought "dismounted".

In the case of El Salvador and Honduras, again the US maintained no armor for its advisors. The forces they were advising did have some armor, with El Salvador having a mechanized cavalry regiment of two battalions armed with light tanks, armored cars and half-tracks. The opposing El Salvador guerrillas had no armor.

Honduras also had an armored cavalry regiment of two battalions armed with light tanks and armored cars. The case of Honduras is a little odd, for while the US was officially advising the Honduras army, part of the conflict was created by the US desire to support the guerrilla war against Nicaragua. In this case the threat was Nicaragua, they were reported in 1987-88 to have four armored battalions. This included about 130 T-54/55 Main Battle Tanks, 27 PT-76 amphibious light

tanks and some 200 or so APCs, CFVs and IFVs. The US-supported – as well as independent – Nicaraguan guerrilla forces did not have armor.

Insurgency/Counterinsurgency

In the nine cases examined, armor was used eight times by the intervening force, with tanks being used in four cases. In one of the cases, the guerrilla forces also made use of armor, including main battle tanks. Armor clearly has value in combating guerrilla wars.

The Dupuy Institute still has not properly researched the Malayan Insurgency, Cyprus EOKA Insurgency, Algerian War and Aden. As such, it was unable to make an evaluation of the use of armor in those operations. In the case of the Malayan Insurgency, the British did not bring their first armor units there until late 1949. In all four operations, there were light armor units in the form of armored cars and armored personnel carriers. It is not known to what extent tanks were employed. It is also not known the nature of the armor operations or casualties. The insurgents certainly made little or no use of armor. More could be determined with more research. As it was, it does not appear that armor played a major role in these operations.

For the ELAS Insurgency, the British already had an armored brigade in country. Still, the revolt was basically a giant bloody street brawl between the Greek factions of the left and right and the British forces before ELAS was defeated and driven out of the cities. They then retreated to the mountains in Northern Greece to re-build. It is unknown to what extent the British armored brigade was used. In the Greek Civil War that followed, the *Institute* has not been able to analyze armor operations during this conflict, but they were fairly limited.

In the case of the three Vietnam entries in the database (US Army, Australian and New Zealand), in two of the cases they made use of armor. In the case of the Australians, they had a company of medium tanks (Centurions) and a cavalry regiment in country during the peak period of their operations. They also had supporting APCs. The tank company was useful for some operations and base defense. Most of the Australian armor losses came from mines. No Centurions were totally destroyed. The New Zealand commitment, which was tied to the Australian forces, had no armor of its own.

The US Army had considerable armor in Vietnam and it was certainly the most extensive use of armor in a guerrilla war ever. The US deployed two tank battalions with the Marines in I Corps. The US Army deployed a total of three tank battalions and a tank company in Vietnam. They also deployed 10 mechanized infantry battalions and 10 armored cavalry squadrons. The two largest armor formations used was a mechanized infantry brigade operating in the I Corps area and an armored cavalry regiment operating in III Corps area. North Vietnam had an armored regiment since 1959. By 1973, they had 12 armored units of battalion to regiment size. They consisted of APCs, light tanks and main battle tanks. Until the end of 1973, North Vietnamese armor had appeared on the battlefield in only on four recorded occasions. The first North Vietnamese use of armor was at Lang Vei Special Force Camp near Khe Sanh in the I Corps area on 6 & 7 February 1968. Here NVA PT-76 light tanks were used to successfully attack the camp. North Vietnamese armor was also used in 1969 near the Ben Het Special Forces Camp in II Corps area. This was the only armor clash of the war with US forces. The US had placed one tank platoon (M-48s) to help defend the camp. A NVA PT-76 light tank advancing on the camp hit an anti-tank mine and was immobilized over a kilometer from the US tanks. There was then an exchange of tank fire with a variety of US weapons pounded the immobilized PT-76 and surrounding area. It was destroyed, along with a second PT-76 that had joined the battle and a troop carrier. US armored forces suffered two crew killed due to high explosive fire.

The next use of North Vietnamese tanks occurred against the South Vietnamese Army force that attacked into Laos in March 1971. This was the first South Vietnamese armor engagement of the war. As part of operation Lam Son 719, the South Vietnam initially committed two armored cavalry regiments armed with less than 17 M-41s (light tanks). The North Vietnamese had a tank battalion in the area and reinforced with part of a tank regiment. The ARVN also later reinforced their operations with more armor. On 19 February, an extensive fight occurred over Landing Zone 31, with the South Vietnamese claiming one T-54 destroyed by an M-41. By the end of the day, the South Vietnamese reported 6 T-54s and 16 PT-76s were destroyed, without any losses of their own M-41s. After six days of fighting, Landing Zone 31 was overrun and the South Vietnamese were forced to retreat. The armored cavalry was again attacked on the 27th of February. It was well supported by tactical air, and claimed 12 PT-76s and 3 T-54 for the loss of three cavalry vehicles (M-113s). On March 1, they were attacked again, claiming 15 NVA tanks destroyed, but lost 6 of their cavalry vehicles (M-113s). The South Vietnamese continued to withdraw under pressure with one armored unit abandoning 4 M-41s in the middle of a stream. During the withdrawal, the South Vietnamese forces lost about 60 percent of its vehicles.

In the spring offensive of 1972, the North Vietnamese made extensive use of tank companies. The NVA used two tank regiments in its attacks in I Corps. On April 2, the newly formed ARVN 20th Tank Regiment was committed to its first action as it was completing its training. It was their only tank regiment and had 44 operational M-48A3s. In defensive position around Dong Ha, they engaged an NVA tank column at 2,500 to 3,000 meters, claiming nine PT-76s and 2 T-54s. The NVA retreated. The next tank engagement occurred on the 9th of April, with the ARVN tank regiment claiming 16 T-54s and capturing a T-59 (an APC), without any armor losses to themselves. On 27 April, another serious tank engagement occurred that resulted in the loss of three M-48s and at least five T-54s claimed. By early morning 28 April, the 20th Tank Regiment was reduced to 18 operational tanks. The ARVN then retreated, leaving seven vehicles stranded due to a damaged bridge collapsing, and two tanks were lost fording a river. The ARVN regiment was suffering from a lack of bridging equipment. By 2 May, when the regiment had finished its withdrawal, all of its tanks were lost, with only cavalry assault vehicles remaining.

The threat to armor in Vietnam was greatly increased in 1972 with the addition of Sagger AT missiles to the NVA and VC inventory, and the addition of M-72s (LAWs, a hand-held rocket propelled AT weapon) and TOWs (AT Missiles) to the US inventory. In region two, on 23 April, 1972 South Vietnamese armor forces (M-41s) at Dak To II were gutted by NVA Sagger missiles. The NVA attacks on the 24th, supported by a reported 18 tanks, took Tan Canh and Dak To II. The NVA were able to capture several M-41s. NVA tanks also supported other operations during this offensive.

After the US forces left Vietnam in January 1973, the North Vietnamese continued to build up their armor, with an estimated 300 tanks in 1973. Armor was extensively employed in 1974 and 1975, but this has not been researched.

Other armor in Vietnam by US allies included the Republic of the Philippines bringing 17 APCs and two M-41s, Thailand bringing an M-113 platoon and a cavalry reconnaissance troop (platoon). This was eventually increased to three cavalry troops. The Koreans borrowed M-113s from the US for their operations.

Show-the-Flag (including "Maintain Presence" and "Show-of-Force")

The "show-the-flag" operations in the database are mostly "maintain presence" operations, meaning there are a significant deployment with a long-term presence. Three are from the US deployment in Korea from 1953 to 1984 and as such, the US has maintained at least an infantry division in Korea that has considerable armor assets (at least two MBT Tank Battalions and 4 Battalions of mechanized infantry). In support of that is the South Korean armor, which 1974 consisted of two armored brigades, 1,000 medium and MBTs (M-4s, M-47s, M-48s and M-60s) and 400 APCs (M-113s and M-577s). Opposing them was considerable North Korean armor, including in 1974 a motorized division and 7 independent armored brigades. This force was estimated to have 400 medium and MBTs (T-34s, T-54/55s and Chinese T-59s), 130 light tanks (PT-76s and Chinese T-62s), 200 self-propelled guns (SU-76s and SU-100s) and 200 APCs and Armored Cars (BA-64s, BTR-40s, BTR-60s and BTR-152s). By 1987, the US was down to six maneuver battalions (two tank battalions). The allied South Koreans had two mechanized infantry divisions and considerable armor support (usually a tank battalion) in their 19 infantry divisions, totaling some 1,300 MBTs (M-47s and M-48A5s) and 650 light armor vehicles (KIFVs, M-113s, Fiat 6614/KM-900/-901). The opposing North Koreans were estimated to have in 1987 two armored divisions and 8 independent armored brigades with some 2,700 MBTs (T-34s, T-54s, T-55s, T-62s, T-59s (Chinese): with many in reserve units) and 300 light tanks (T-62s and T-63s, both Chinese tanks), 1,690 light armor vehicles (BA-64s, BMP-1s, BTR-40s, BTR-50s, BTR-60s, BTR-152s, Chinese T-531s and North Korean types).

This deployment of readied opposing forces has existed for 48 years and is a "maintain presence" type operations and effectively is a conventional war-like scenario. As such, heavier armor tends to be preferred.

The US build up in the Gulf War started small, with initially only the 82nd Airborne Division arriving with one battalion of light armor (Sheridan tanks). Still, they were backstopped with 260 coalition (Saudi and Kuwaiti) MBTs. Within a month, considerable US heavy armor had arrived, and over the six months, the armor had built up to significant levels. The opposing Iraqi's were heavy forces. This was a military build up in preparation of a conventional war (and hopefully serving as a "show-of-force") and was a conventional war-like scenario.

The US presence in Panama has existed in some form for 90 or so years. The scenario in the database covers only the US presence during the period of instability in Panama in the two years before Operation Just Cause. As such, even though additional US forces were being added in preparations of Operation Just Cause, it was fundamentally a "maintain presence" type operation. Light tanks were brought is as the bridges were not able to support the US M-1s.

The UK mission to Kuwait was, like desert storm, in response to Iraqi threats, in this case an armored brigade. The British sent minimal armor (8 or more MBTs), but this was sufficient for this "show-of-force". This is a scenario where a "medium weight" force may be of some use.

The other two operations did not include any armor (or opposing forces for that matter) and were show-of-force type operations. Except for the raiding and limited skirmishing along the Korea DMZ in the three Korea cases, no significant combat occurred in any of these operations.

It is these four “show-of-force” type operations in the database (Desert Shield, Jordan in 1958, Kuwait in 1961 and Honduras in 1988) that help create an argument in favor of a medium weight force. In the case of Desert Shield, the Iraqi armor threat was considerable. In the case of the UK Mission to Kuwait, there was clearly a brigade-size armor threat that resulted in the rapid deployment of troops. In the case of the UK Mission to Jordan, there was not a specific military threat, but the UK did deploy a brigade-size infantry force there. In the case of Operation Golden

Pheasant, there was a brigade-size Nicaraguan incursion into Honduras that generated this airborne operation, but at the time of the operation, there were no direct opposing forces.

Still none of these four forces saw action. In the case of Kuwait, they already had medium tanks in the region, which were off-loaded from ships. In the case of the early days of Desert Shield, after the initial force deployments, the US Army was interested in moving heavy armor to the region. In the case of Jordan and Honduras, the show-of-force was successful and no clear threat materialized. Having armor would not have changed the situation.

One of the uses of medium weight armor would be in such show-of-force missions. Still, the intent of these missions is to defer attack from the local threat. In all four cases, they succeeded. Having additional mobile armor with the forces may have made them more credible, but to date, not being able to rapidly deploy armor as part of a show-of-force type mission has not resulted in a show-of-force mission failing.

Raids

This miscellaneous type category includes three operations. Two are single events that did not include armor. One is a large conventional military raid into Southern Lebanon that utilized six brigades (primarily armored or mechanized) for the purpose of clearing out the various militia, guerrilla and terrorist forces that had collected in this area along the Israeli border. The local Muslim forces may have had some light armor, but it was insignificant.

Interventions

Interventions are the "classic" SSCO, when a stronger nation is actually conducting an operation within another country for the sake of changing policy or correcting a situation. Interventions sometimes develop into conventional conflicts and are often on short notice at a locale a distance form the home base of the intervening force. Interventions are scenarios where one could make use of medium weight armor.

In the case of Musketeer the rather large (22,000 men) UK and French invasion force came in with a full mix of weapons with insertion by para-drop, helicopter and sea. They landed 4,400 vehicles, including probably around 32 Centurions by the UK and certainly some lighter vehicles. The French also committed the 7th Light Mechanized Regiment. Its composition is not known. The Egyptians were reported to have at least 4 T-34s in the area, which British air claimed two killed. Even though it was a large intervention, only a small portion of the troops saw combat mostly the paratroopers. It does not appear that armor played any significant role.

In the case of the Battle of Bizerte, the local garrison (some 2,400 troops, 7,400 total) had some light tanks that were used in their operations. The Tunisians did not appear to employ any armor.

In the case of the Bay of Pigs, the invading Cuban exiles did have five M-41s in one tank platoon. Nothing is known of the details of its operations. The Cuban armed forces certainly had tanks. The extent that the M-41s and lighter vehicles were used is unknown, but there are some reports of their use.

The two operations in Malaysia, Borneo and Brunei were fundamentally interventions to protect against an outside power from taking control of these areas, although the Borneo operations included considerable small actions and guerrilla war. In the case of Brunei, it does not appear that the British employed any armor. In the case of the Indonesian Confrontation, Saladin armored cars were used, along with other light armor. There appears to have been no opposing armor employed.

A number of small interventions saw little to no use of armor. Ferret armored cars were unloaded (by sea) during the East African Mutiny but saw no action. The French operation in Gabon was by airborne troops. The two French interventions in CAR were also done by airborne troops, so again no armor. The CAR was reported in 1980 to have had 10 Ferret armored cars and in 1989 four T-55s (probably unserviceable), 10 Ferrets, four BTR-152s and 35 or more other APCs As there was no action, these did not see combat.

The database records four Israeli interventions, but they are all distinct stages of the same initial intervention. The first intervention (Peace for Galilee) ended in the sharp conventional conflict with Syria that results in some people labeling this the fifth Arab-Israeli War. As such, it could easily have been coded as a conventional war and displays many of the characteristics of a conventional war, including the extensive use of heavy armor forces by both sides. Neither side made use of light tanks, which is typical of Middle Eastern conflict. The next phase consisted of a siege of PLO forces in Beirut. This was not "classic" conventional warfare and was clearly a SSCO by nature. The Israeli forces already in the area had armor. The opposing PLO had little or no armor. The Syrians, who remained in country but did not directly oppose Israeli operations, had considerable armor. The Lebanese army had armored cars and APCs, and it is not known to what extent the various warring Christian and Moslem militia had access to this armor. It was a complex scenario with over one-half dozen major factions in country. The third and fourth phases of the operation still saw the presence of considerable Israeli armor forces, but the factions in the areas they were occupying, conducting operations against, or maintaining the peace had little to no armor of any type. The primary armor threat to Israel was from renewed conflict with Syria, which maintained conventional forces in Lebanon throughout this intervention. There was probably no armor conflict. The third phase of the intervention was a very biased "peace-keeping" type operation from Beirut to the south. The fourth phase was primarily about building a buffer zone and creating a local friendly government in the most southern part of Lebanon.

The *Institute* also records one Soviet invention, which was Czechoslovakia in 1968. In this case, the Soviet Union used considerable armor forces with 12 Soviet divisions (some 500,000 troops) along with 100,000 Warsaw Pact allies (Poles, Hungarians, East Germans and Bulgarians). The leader of Czechoslovakia decided not to resist and the Czechoslovakian army stayed in their barracks. In 1974, the Czechoslovakian army was reported to have 5 tank divisions, 5 motorized rifle divisions with some 3,500 main battle tanks (T-54s, T-55, T-62s) and considerable armored cars and APCs. There were civilian protests and street fighting, particularly in Prague, so these operations took on the characteristic of a "civil disturbance" or occupation. As such, the indigenous forces are considered not to have armor and the operation was primarily in urban terrain. As it was, the Soviet forces did make use of armor to break down barriers and try to intimidate the crowd. Some Soviet armor (at least one) was lost to Molotov cocktails.

There are five US interventions recorded. By the nature of US forces and strong logistical support, they all included some armor on the part of the US. The US did bring in light tanks into the Dominican Republic. Reports indicate that they were used in combat on one occasion. There was no armor threat to the US.

Grenada actually involved the use of armor by both sides. The Grenadian BTR-60s did cause problems for US infantry forces and SEAL teams. They were eventually taken care of with existing mobile AT assets and aircraft. There was no armor conflict, and the US use of armor was limited.

Panama, on the other hand provides the one clear case of the M-1 Abrams being unable to be used and the US forces using lighter armor instead. The XVIII Corps historian states in his notes

that the M-1 was not sent because although it could cross the Bridge of Americas, there was not other bridge or culvert in Panama that could hold the weight of an M-1. An M-1 platoon from the 24th Infantry was placed on standby, but this standby was canceled on 22 December. Still, the armor threat from the Panamanian Defense Forces was low, with APCs and armored cars. The US did commit two platoons to an airdrop and four Sheridans to supporting the 193rd Infantry Brigades advance. In the case of the 10 Sheridans that were air dropped, two were irreparably damaged on the drop and the "Heavy drop problems delayed planned rapid movement of M-551s and HMMWVs to support air assault on Fort Comarron." Still the airdropped Sheridans were able to provide useful fire support with their main gun, machine guns and flechette rounds in support of the Airborne troops. The four Sheridan tanks with Task Force Bayonet were used for overwatch fire support, and their 152mm guns were of effect in this infantry support role. The US also deployed one battalion of mechanized infantry armed with M-113s. These were useful for blocking and interdicting intersections. They also provide fire support on one occasion with their .50 caliber machine-guns. They were useful in being able to carry additional equipment and supply, required no resupply during the operation, and had building busting capabilities with their AT4 AT missiles (which 6 were carried in each M-113 along with 6 LAWs). This battalion suffered three casualties (1 KIA and 2 WIA) due to snipers.

In Haiti, the US forces initially employed armor, including Sheridans. After six months in country, the Haitian operation devolved into what TDI categorizes as a "police action". In that role, all US armor was withdrawn and the quick reaction force that the US kept in place (including elements of the 2nd Armored Cavalry Regiment) was mounted in HMMWV.

Conventional Hostilities

In the five cases examined, armor was used four times by the intervening forces, but was only significant in two of the cases, Desert Storm (the build-up) and the actual Gulf War. It was also used four times by the opposing forces; again it was only significant in the two Gulf War scenarios.

In the case of the Indian invasion of Goa, there was an armored cavalry regiment armed with WWII era Stuart light tanks leading one light infantry battalion and there was a mechanized column for another infantry division. Some of the invasion columns were held up by rivers and had to cross in boats and by swimming. The Indian armor was forced to halt before they got to Goa due to the tidal estuaries. The Portuguese had about a dozen armored cars in Goa. It does not appear that the Indian armor saw any significant action and there were no armor engagements.

In the case of the Falklands war, both sides had light armor, with the British committing 8 light tanks and the Argentines committing 12 armored cars. The British armor was used to provide fire support in the final assault on Port Stanley. One British tank was destroyed by a mine.

In the case of the Indian attack on the Sikh Golden Temple, at least 6 main battle tanks, 8 IFVs and 3 APCs participated. As they were attacking a religious compound of historical significance, the armor was originally limited to providing machine-gun fire and searchlights during the night fighting. As the fighting continued into the morning, the tanks were allowed to shell the compound with HESH rounds from their 105mm guns. One APC was lost to an RPG-7. The Indians were surprised that the force they were facing had even this degree of anti-tank capability. The defenders had no armor.

The two Gulf War scenarios, being the largest armor battle since World War II, of course made extensive used of heavy tanks, as would be the case of a conventional war in open terrain. All US units, whether Marines, light infantry or heavy divisions performed well against the Iraqis, but the heavy divisions were very much the dominant elements on the battlefield.

Evacuation/Rescue

These operations by their very nature do not involve the use of armor. Often the threat is disorder, and as such the threatening forces are often poorly armed rioters.

In none of the 20 cases of evacuations and rescues did the intervening force employ armor. This was primarily due to the insertion means and type of forces employed. In two of the cases, the initial rescuing forces parachuted in. In six of the cases, they came in by aircraft to an airfield and the evacuees were pulled out through the airfields (and also by ship in one case). In 10 of the cases they used helicopters for their primary insertion. In four of those cases, the helicopters came in over the sea in an USMC "amphibious" type operation. As such, the USMC did have light armored vehicles available with their amphibious assault vehicles, but these were not used in any of the cases that were examined. In one case, the rescuing force was inserted by boat. In one case, the evacuees entered the US Embassy by foot and were evacuated by helicopter (Siege of US Embassy in Liberia).

While no armor appears with the opposing forces, some of these nations where the evacuation was conducted from did potentially have armor available. Sierra Leone, the site of three evacuations/rescues, is reported in 1992 to have had 10 Piranha APCs and 4 Saracen APCs. Liberia, also the site of three evacuations, was reported in 1989 to have 10 Piranha APCs. As these countries were in civil disorder and civil war, it is unknown if they were operational armored vehicles.

Other countries where evacuations and rescues were conducted in did have considerable armor assets, and some armor may have been operational at the time of the evacuation. Guinea-Bissau was reported in 1997 to have 10 T-34s (WWII era medium tanks), 20 PT-76s, 10 BRDM-2s and 55 other Soviet made APCs. Albania was reported in 1997 to have 138 T-34s, 721 T-59s (a Chinese T-55), 35 T-62s (a Chinese light tank), 15 BRDM-1s and 103 Chinese APCs. Somalia was reported to have considerable armor in 1989, including 293 main battle tanks, 10 light tanks and 519 APCs and armored cars. The Congo was reported in 1992 to have 25 T-54/55s, 15 T-59s, 10 T-62s (Chinese light tanks), 3 PT-76s, 25 BRDM-1/2 and 80 or more APCs.

The hostage rescue missions to Iran (1980), Lebanon (1974) and Vietnam and Saigon (1975) could have faced functioning armor. It is unknown what was the extent of the potential armor threat in Samara (Eritrea). In five of the evacuation/rescue scenarios, there was no conceivable armor threat as there was no force in the area with any armor (Limbang Raid, Operation Dragoon Rouge, Evacuation of Cambodia, Mayaguez Rescue Mission and Congo Rescue - Kolwezi). Still, with a theoretical threat of armor in 15 out of the 20 cases, in none of the cases, has armor appeared during an evacuation or rescue operation.

Small Hostage Rescue/Anti-terrorist Missions

As these tend to be small special forces type operation, by their nature, they do not involve the use of armor. In these cases, the threat is usually a small band of terrorists (usually less than a dozen). In some cases the threat is expanded by support from forces in the country where the hostages are being held. The rescuing forces came under fire from indigenous armed forces in three of the 13 cases. In one of these cases, it resulted in significant losses to the rescuing force (Cyprus Hijacking).

In one of the 13 cases, the rescuing force made use of armor. At Entebbe, a total of four APCs were flown in for the purpose of supporting the Israeli withdrawal and destroying the Ugandan MIGs. In no cases, did the terrorists have armor.

In the three cases where the country where the rescue was conducted in was hostile, the countries did have armor, although it was not involved. In the case of Uganda (Entebbe), in 1975 the Uganda government was reported to have 15 T-54s/55s, 12 M-4 (US WWII medium tanks and about 115 APCs and armored cars. In the case of Somalia (Somali School Bus Hijacking), the Somalis were reported in 1975 to have considerable armor, including 250 main battle tanks and 310 APCs. In the case of Cyprus (Cyprus Hijacking), the Republic of Cyprus was reported in 1987 to have 8 T-34s in a "static defense" role, 172 armored cars and 139+ APCs.

Overall, it does not appear that there is any significant armor threats when conducting hostage rescue operations.

Police Action

The various "Police Actions" by the nature do not involve armor, and in those cases where armor is present, it is not critical to operations and does not appear in significant numbers.

In the case of US operations in Haiti, the US left a battalion-strength quick reaction force armed with HMMWVs (an off-road capable truck) and a special forces group. The rest of the multi-national force present were police, aid and support personnel.

For fairly obvious reasons there was no armor use by the intervening or indigenous forces in the drug interventions operations.

The two "anti-terrorists" operations were both ambushes by the British of active Irish Republican Army (IRA) terrorist groups.

The twenty-seven different urban riots and four prison riots sometimes made use of armor. This is particularly true when the US National Guard deployed or the US Army deployed in response to rioting. In some cases, especially the more recent riots, the local police departments also had access to one or more wheeled armored vehicles. In all the US cases, any tanks or light armor deployed did not use their weaponry, and were primarily used for show of force and force protection.

This restraint is not always the case with other nations use of armor vehicles in civil disturbances. In the two riots in Mexico, the Mexican Army also deployed armor and suppressed the rioting in a more brutal manner that is the US usually does. The same was true for Czechoslovakia in 1968 (listed as an intervention).

Still, the use of armor in civil disturbances can be best met by using the lightest and most available AFVs. Any APC will do the job.

Not Analyzed

Due to time and budget constraints, a number of operations in the SSCO were not analyzed. This includes 39 peacekeeping operations, 18 operations "not yet classified" (almost all are peacekeeping or police actions) and primarily air and naval operations.

APPENDIX II. ARMOR USAGE IN CONTINGENCIES

	Intervening Force		APCs, ACs	Opposing Indigenous Forces:		APCs, ACs
ASSIST (Military Assistance)	**Main Battles Tanks**	**Light Tanks**	**IFVs & CFVs**	**Main Battle Tanks**	**Light Tanks**	**IFVs & CFVs**
US MAAG Vietnam I	None	None	None ?	None	None	None
ARVN	None	Moderate `	Moderate (4 Rgts)			
UK Mission to Oman	None	None	Some (16)	None	None	None
US MAAG Vietnam II	None	None	None ?	None	None	None
ARVN	None	Moderate	Moderate (4 Rgts)			
El Salvador Advisory Mission	None	None	None	None	None	None
El Salvador Army	None	Some (12)	Moderate (104)			
US Support for Honduras	None	None	None	No opposing indigenous forces		
Honduras Army	None	Some (15)	Moderate (82)			
US Supported Contras	None	None	None			
Nicaraguan Army				Moderate (130)	Some (27)	Moderate (200)
CONV (Conventional Hostilities)						
Indian Occupation of GOA	None	Moderate (Rgt+)	Moderate ?	None	None	Some (12)
Falklands War	None	Some (8)	None	None	None	Some (12)
Sikh Golden Temple	Some (6+)	None ?	Some (11+)	None	None	None
Desert Storm	Considerable	Moderate	Considerable	Considerable	Moderate	Considerable
Gulf War: The 100 Hour War	Considerable	Moderate	Considerable	Considerable	Moderate	Considerable
INSG (Insurgency/Counterinsurgency)						
ELAS Insurgency	Moderate (Bde)	Some ?	Some ?	None	None	None
Greek Civil War	Moderate	Some ?	Some ?	None	None	None
Malayan Insurrection	??	??	Some	None	None	None
Algerian War	??	??	Some	None	None ?	None ?
Cypriot EOKA Insurgency	??	??	Some	None	None	None
Australian Army in Vietnam	Some (26)	None	Some (Co)	None	None	None
British Operations in Aden	??	??	Some	None	None	None
New Zealand Army in Vietnam	None	None	None	None	None	None
Vietnam: The US War	Moderate (Bde)	Moderate (Rgt+)	Considerable	Moderate	Moderate	Moderate

	Intervening Force		APCs, ACs	Opposing Indigenous Forces:		APCs, ACs
INTRV (Intervention)	**Main Battles Tanks**	**Light Tanks**	**IFVs & CFVs**	**Main Battle Tanks**	**Light Tanks**	**IFVs & CFVs**
Musketeer	Some (32+)	Some ?	Some	Some (4+)	None ?	Some ?
Battle of Bizerte	None	Some	Some ?	None	None	None
Bay of Pigs	None	Some (5)	None	Some ?	Some ?	Some ?
Brunei	None	None	None	None	None	None
Indonesian Confrontation	None	None ?	Moderate (Rgt?)	None	None ?	Some ?
East African Mutinies	None	None	Some	None	None	None
French Intervention in Gabon	None	None	None	None	None	None
Dominican Republic	None	Some (Co.)	Some	None	None	None
Czechoslovakia	Considerable	Moderate	Considerable	None	None	None
French Intervention in CAR	None	None	None	None	None	Some (10)
Peace for Galilee	Considerable (500)	None	Considerable	Considerable (300+)	None ?	Considerable
Siege of Beirut	Considerable (500)	None	Considerable	None ?	None ?	None ?
Occupation of West Beirut	Considerable	None	Considerable	None ?	None ?	None ?
Occupation of Southern Lebanon	Considerable	None	Considerable	None ?	None ?	None ?
Grenada	Some (5)	None	Some (13 AAVs)	None	None	Some (6)
Panama	None	Some (14)	Some (93+)	None	None	Some (38+)
French Intervention in CAR	None	None	None	None ?	None	Some (49)
Haiti (UNMIH I)	None	None	None	None	None	Some (11)
Haiti (MNF)	None	Some (24)	Some (100+)	None	None	Some (11)
EVAC/RESC (Evacuation/Rescue)						
Limbang Raid	None	None	None	None	None	None
Operation Dragon Rouge	None	None	None	None	None	None
Evacuation of Lebanon	None	None	None	None	None	None
Evacuation of Cambodia	None	None	None	None	None	None
Evacuation of Saigon	None	None	None	None	None	None
Evacuation of Vietnam	None	None	None	None	None	None
Mayaguez Rescue Mission	None	None	None	None	None	None
Congo Rescue (Kolwezi)	None	None	None	None	None	None
Iranian Hostage Rescue	None	None	None	None	None	None
Evacuation of Monrovia	None	None	None	None	None	None
Evacuation of Mogadishu	None	None	None	None	None	None
Evacuation of Kinshasa	None	None	None	None	None	None
Evacuation of Freetown	None	None	None	None	None	None
Evacuation of Monrovia	None	None	None	None	None	None
Evacuation of Sierra Leone	None	None	None	None	None	None
Evacuation of Tirana	None	None	None	None	None	None
Evacuation of Asmara	None	None	None	None	None	None
Evacuation of Guinea-Bissau	None	None	None	None	None	None
Siege of US Embassy in Liberia	None	None	None	None	None	None
Operation Barras	None	None	None	None	None	None

	Intervening Force		APCs, ACs	Opposing Indigenous Forces:		APCs, ACs
	Main Battles Tanks	**Light Tanks**	**IFVs & CFVs**	**Main Battle Tanks**	**Light Tanks**	**IFVs & CFVs**
Small Hostage Rescue/Anti-terrorist Missions:						
Munich Olympic Massacre	None	None	None	None	None	None
Entebbe (Operation Jonathan)	None	None	Some (4)	None	None	None
Somali School Bus Hijacking	None	None	None	None	None	None
De Punt Train Hijacking	None	None	None	None	None	None
Lufthansa 737	None	None	None	None	None	None
Cyprus Hijacking	None	None	None	None	None	None
Operation Nimrod	None	None	None	None	None	None
Flight GA 206	None	None	None	None	None	None
Operation Winter Harvest	None	None	None	None	None	None
Assault at Marseilles Airport	None	None	None	None	None	None
Japanese Ambassador's Residence	None	None	None	None	None	None
Thai Hospital Rescue	None	None	None	None	None	None
Hijack of Vnokovo Airlines Tu-154	None	None	None	None	None	None
POLACT (Police Action)						
Haiti (UNMIH II)	None	None	None ?	None	None	None
Haiti (UNSMIH)	None	None	None ?	None	None	None
Haiti (UNTMIH)	None	None	None ?	None	None	None
Haiti (MIPONUH)	None	None	None ?	None	None	None
Croatia (UNPSG)	None	None	None	None	None	None
Drug Interdiction:						
Anti-Drug Operations in Bolivia	None	None	None	None	None	None
Andean Initiative in War on Drugs	None	None	None	None	None	None
Anti-terrorist:						
Loughall Station	None	None	None	None	None	None
Operation Flavius	None	None	None	None	None	None
Urban Riots:						
Canal Zone Riot	None ?	None ?	None ?	None	None	None
University of Mississippi	None	None	None	None	None	None
Canal Zone Riot	None ?	None ?	None ?	None	None	None
Harlem Riot	None	None	None	None	None	None
Northeastern Riots	None	None	None	None	None	None
Watts Riot	None	None	None	None	None	None
Urban Rioting 1966	None	None	None ?	None	None	None
Newark Riot of 1967	None	None	None	None	None	None
Detroit Riot of 1967	Some	None	Some	None	None	None
Urban Rioting 1967	None	None	None ?	None	None	None
Pentagon Protests	None ?	None	Some ?	None	None	None
Urban Rioting 1968	None	None	Some ?	None	None	None
Columbia University	None	None	None	None	None	None

	Intervening Force		APCs, ACs	Opposing Indigenous Forces:		APCs, ACs
	Main Battles Tanks	**Light Tanks**	**IFVs & CFVs**	**Main Battle Tanks**	**Light Tanks**	**IFVs & CFVs**
Mexican Student Riots	Some ?	None	Some	None	None	None
Chicago Convention	None ?	None	Some ?	None	None	None
National University	Some ?	None	Some	None	None	None
Student Protests 1969	None	None	None ?	None	None	None
Urban Rioting 1969	None	None	None ?	None	None	None
Days of Rage	None	None	None	None	None	None
Kent State University	None	None	None	None	None	None
Student Protests 1970	None	None	None ?	None	None	None
Augusta Riot	None	None	None	None	None	None
Urban Rioting 1970	None	None	None ?	None	None	None
Urban Terrorism	None	None	None	None	None	None
May Day Protest	None ?	None	Some	None	None	None
Miami Riot of 1980	None	None	Some ?	None	None	None
Los Angeles Riot of 1992	None	None	Some	None	None	None
Prison Riots:						
Prison Camp Riot on Koje-do I	None	None	None	None	None	None
Prison Camp Riot on Koje-do II	Some (22)	None	Some ?	None	None	None
Attica	None	None	Some ?	None	None	None
New Mexico State Penitentiary Riot	None	None	None	None	None	None
RAID (Raid/Incident)						
Raid:						
Israeli Litani Operation	Considerable (6 Bdes)	None	Considerable	None	None	Some ?
Incident:						
Action at Mirbat	None	None	None	None	None	None
Car Bombing of US Embassy	None	None	None	None	None	None
STF (Show the Flag, maintain presence, gather intelligence)						
Korean DMZ post-war	Considerable	Moderate	Considerable	Considerable	Moderate	Considerable
UK Mission to Jordan	None	None	None	No opposing forces		
UK Mission to Kuwait	Some (8+)	None	Some	Moderate (Bde)	None ?	Moderate
Korean DMZ Skirmishes	Considerable	None	Considerable	Considerable	Moderate	Considerable
Korean DMZ Incidents	Considerable	None	Considerable	Considerable	Moderate	Considerable
Instability in Panama	None	Some (4)	Some (63)	None	None	Some (38)
Operation Golden Pheasant	None	None	None	No opposing forces		
Desert Shield	Considerable	Some	Considerable	Considerable	Moderate	Considerable

APPENDIX III. LIST OF SMALL SCALE CONTINGENCY OPERATIONS BY TYPE

AID (Aid)

ASSIST (Military Assistance)		
US MAAG Vietnam I	1956	1,709 days duration
UK Mission to Oman	1957	539
US MAAG Vietnam II	1961	1,461
El Salvador Advisory Mission	1979	5,114
US Support for Honduras	1983	2,376

CONV (Conventional Hostilities)		
Indian Occupation of GOA	1961	3
Falklands War	1982	75
Sikh Golden Temple	1984	2
Desert Storm	1991	38
Gulf War: The 100 Hour War	1991	5

EVAC/RESC (Evacuation/Rescue)		
Limbang Raid	1962	1
Operation Dragon Rouge	1964	3
Evacuation of Lebanon	1974	2
Evacuation of Cambodia	1975	10
Evacuation of Saigon	1975	2
Evacuation of Vietnam	1975	28
Mayaguez Rescue Mission	1975	1
Congo Rescue (Kolwezi)	1978	7
Iranian Hostage Rescue	1980	2
Evacuation of Monrovia	1990	1
Evacuation of Mogadishu	1991	--
Evacuation of Kinshasa	1991	--
Evacuation of Freetown	1992	1
Evacuation of Monrovia	1996	1
Evacuation of Sierra Leone	1997	5
Evacuation of Tirana	1997	14
Evacuation of Asmara	1998	1
Evacuation of Guinea-Bissau	1998	4
Siege of US Embassy in Liberia	1998	20
Operation Barras	2000	17

Small Hostage Rescue/Anti-terrorist Missions:		
Munich Olympic Massacre	1972	1
Entebbe (Operation Jonathan)	1976	2
Somali School Bus Hijacking	1976	1
De Punt Train Hijacking	1977	1
Lufthansa 737	1977	1
Cyprus Hijacking	1978	5
Operation Nimrod	1980	1
Flight GA 206	1981	1
Operation Winter Harvest	1982	1
Assault at Marseilles Airport	1994	1

Japanese Ambassador's Residence	1996	1
Thai Hospital Rescue	2000	1
Hijack of Vnokovo Airlines Tu-154	2001	1

INSG (Insurgency/Counterinsurgency)

ELAS Insurgency	1944	44
Greek Civil War	1946	1,343
Malayan Insurrection	1948	4,429
Algerian War	1954	2,691
Cypriot EOKA Insurgency	1954	1,635
Australian Army in Vietnam	1962	3,829
British Operations in Aden	1963	1,451
New Zealand Army in Vietnam	1964	3,128
Vietnam: The US War	1965	2,949

INTRV (Intervention)

Musketeer	1956	8
Battle of Bizerte	1961	4
Bay of Pigs	1961	6
Brunei	1962	175
Indonesian Confrontation	1963	1,147
East African Mutinies	1964	8
French Intervention in Gabon	1964	2
Dominican Republic	1965	513
Czechoslovakia	1968	165
French Intervention in CAR	1979	2
Peace for Galilee	1982	10
Siege of Beirut	1982	67
Occupation of West Beirut	1982	377
Occupation of Southern Lebanon	1983	667
Grenada	1983	10
Panama	1989	56
French Intervention in CAR	1991	--
Haiti (UNMIH I)	1993	376
Haiti (MNF)	1994	194

PKPG (Peacekeeping)

Middle East (UNTSO)	1948	19,207
India/Pakistan (UNMOGIP)	1949	18,993
Middle East (UNEF I)	1956	3,894
Lebanon I	1958	--
Cyprus (UNFICYP)	1964	13,425
India/Pakistan (UNIPOM)	1965	212
Middle East (UNEF II)	1973	2,130
Golan Heights (UNDOF)	1974	9,711
Lebanon MNF (US 1)	1982	17
Lebanon MNF (US 2)	1982	516
Lebanon MNF (France 1)	1982	21
Lebanon MNF (France 2)	1982	555
Lebanon MNF (Italy)	1982	513
MNF and Observer in the Sinai	1982	6,826
Iran/Iraq (UNIIMOG)	1988	942
Angola (UNIVEM I)	1989	911

Central America (ONUCA)	1989	822
Angola (UNIVEM II)	1991	1,369
Cambodia (UNAMIC)	1991	183
El Salvador (ONUSAL)	1991	1,400
Iraq/Kuwait (UNIKOM)	1991	3,563
Western Sahara (MINURSO)	1991	3,563
Somalia I (UNISOM I)	1992	162
Somalia II (UNITAF)	1992	147
Yugoslavia (UNPROFOR)	1992	1,401
Liberia (UNOMIL)	1993	1,491
Georgia (UNOMIG)	1993	2,680
Macedonia	1993	2,733
Somalia III (UNISOM II)	1993	329
Rwanda (UNAMIR)	1993	487
Rwanda/Uganda (UNIMUR)	1993	913
Chad/Libya (UNASOG)	1994	61
Somalia IV (UNISOM II continued)	1994	340
Tajikistan (UNMOT)	1994	1,993
Angola (UNIVEM III)	1995	881
Croatia (UNCRO)	1995	337
Macedonia (UNPREDEP)	1995	1,461
Croatia (UNMOP)	1996	1,827
Ethiopia & Eritrea (UNMEE)	2000	154
POLACT (Police Action)		
Haiti (UNMIH II)	1995	458
Haiti (UNSMIH)	1996	396
Haiti (UNTMIH)	1997	122
Haiti (MIPONUH)	1997	836
Croatia (UNPSG)	1998	304
Drug Interdiction:		
Anti-Drug Operations in Bolivia	1986	123
Andean Initiative in War on Drugs	1989	---
Anti-terrorist:		
Loughall Station	1986	1
Operation Flavius	1988	1
Urban Riots:		
Canal Zone Riot	1959	1
University of Mississippi	1962	1
Canal Zone Riot	1964	5
Harlem Riot	1964	6
Northeastern Riots	1964	43
Watts Riot	1965	6
Urban Rioting 1966	1966	92
Newark Riot of 1967	1967	6
Detroit Riot of 1967	1967	8
Urban Rioting 1967	1967	92
Pentagon Protests	1967	1
Urban Rioting 1968	1968	27
Columbia University	1968	1
Mexican Student Riots	1968	31
Chicago Convention	1968	4

National University	1968	15
Student Protests 1969	1969	181
Urban Rioting	1969	92
Days of Rage	1969	4
Kent State University	1970	1
Student Protests 1970	1970	28
Augusta Riot	1970	1
Urban Rioting 1970	1970	92
Urban Terrorism	1970	2,020
May Day Protest	1971	8
Miami Riot of 1980	1980	4
Los Angeles Riot of 1992	1992	6
Prison Riots:		
Prison Camp Riot on Koje-do I	1953	1
Prison Camp Riot on Koje-do II	1953	1
Attica	1971	5
New Mexico State Penitentiary Riot	1980	2
RAID (Raid/Incident)		
Raid:		
Israeli Litani Operation	1978	8
Incident:		
Action at Mirbat	1972	1
Car Bombing of US Embassy	1984	1
STF (show-the-flag, maintain presence, show-of-force)		
Korean DMZ post-war	1953	4,541
UK Mission to Jordan	1958	105
UK Mission to Kuwait	1961	830
Korean DMZ Skirmishes	1966	1,157
Korean DMZ Incidents	1974	3,657
Instability in Panama	1988	645
Operation Golden Pheasant	1988	1
Desert Shield	1990	162

Not yet classified (incomplete in the data base, most are peacekeeping operations, some are police actions or aid missions):

Congo (ONUC)	1960	1,447
West New Guinea (UNSF)	1962	212
Yemen (UNYOM)	1963	458
Lebanon (UNIFIL)	1978	8,324
Afghanistan/Pakistan (UNGOMAP)	1988	730
Namibia (UNTAG)	1989	365
Cambodia (UNTAC)	1992	609
Mozambique (ONUMOZ)	1992	761
Bosnia (UNMIBH)	1995	1,858
Croatia (UNTAES)	1996	762
Angola (MONUA)	1997	608
Guatemala (MINUGUA)	1997	151
CAR (MINURCA)	1998	699
Sierra Leone (UNOMSIL)	1998	488

Congo (MONUC)		1999	427
East Timor (UNTAET)		1999	458
Kosovo (UNMIK)		1999	580
Sierra Leone (UNAMSIL)		1999	458
AIR			
Berlin Airlift	EVAC/RESC	1948	325
Downing of Airplane	RAID (Incident)	1969	1
Chad	INTRV	1983	--
Persian Gulf Interception	POLACT	1984	1
Interception of Egyptian Airliner	POLACT	1985	1
US Air Strike on Libya	RAID	1986	2
Philippine Coup	INTRV	1989	1
Patrol of No-Fly Zone	POLACT	1991	3,592
Kosovo	INTRV	1998	--
NAVAL			
Cuban Missile Crisis	INTRV	1962	--
Attack on USS Liberty	RAID	1967	1
Seizure of Pueblo	RAID	1968	1
First Gulf of Sidre Clash	STF	1981	1
Second Gulf of Sidre Clash	STF	1986	2
Strike of USS Stark	STF	1987	1
Persian Gulf Tanker Escort	PKPG	1987	412
Third Gulf of Sidre Clash	STF	1989	1

APPENDIX IV. RATING OF TERRAIN IN SSCOs

US MAAG Vietnam I	Forested
UK Mission to Oman	Mountainous
US MAAG Vietnam II	Forested
El Salvador Advisory Mission	Forested
US Support for Honduras	Forested

CONV (Conventional Hostilities)

Indian Occupation of GOA	Open/Some Urban
Falklands War	Open
Sikh Golden Temple	Urban
Desert Storm	Open
Gulf War: The 100 Hour War	Open

INSG (Insurgency/Counterinsurgency)

ELAS Insurgency	Urban
Greek Civil War	Mountainous
Malayan Insurrection	Forested
Algerian War	Open/Some Urban (also mountainous)
Cypriot EOKA Insurgency	Open/Some Urban
Australian Army in Vietnam	Forested
British Operations in Aden	Open
New Zealand Army in Vietnam	Forested
Vietnam: The US War	Forested

INTRV (Intervention)

Musketeer	Open
Battle of Bizerte	Urban
Bay of Pigs	Open
Brunei	Forested
Indonesian Confrontation	Forested
East African Mutinies	Urban
French Intervention in Gabon	Urban
Dominican Republic	Forested
Czechoslovakia	Urban
French Intervention in CAR	Urban
Peace for Galilee	Open
Siege of Beirut	Urban
Occupation of West Beirut	Urban
Occupation of Southern Lebanon	Open
Grenada	Open/Some Urban (mixed terrain)
Panama	Forested/Some Urban
French Intervention in CAR	Urban
Haiti (UNMIH I)	Forested
Haiti (MNF)	Forested

EVAC/RESC (Evacuation/Rescue)

Limbang Raid	Urban
Operation Dragon Rouge	Urban
Evacuation of Lebanon	Urban
Evacuation of Cambodia	Urban

Evacuation of Saigon	Urban
Evacuation of Vietnam	Urban
Mayaguez Rescue Mission	Forested
Congo Rescue (Kolwezi)	Urban
Iranian Hostage Rescue	Open (was supposed to be Urban)
Evacuation of Monrovia	Urban
Evacuation of Mogadishu	Urban
Evacuation of Kinshasa	Urban
Evacuation of Freetown	Urban
Evacuation of Monrovia	Urban
Evacuation of Sierra Leone	Urban
Evacuation of Tirana	Urban
Evacuation of Asmara	Urban
Evacuation of Guinea-Bissau	Urban
Siege of US Embassy in Liberia	Urban
Operation Barras	Forested
Small Hostage Rescue/Anti-terrorist Missions:	
Munich Olympic Massacre	Urban
Entebbe (Operation Jonathan)	Urban
Somali School Bus Hijacking	Open
De Punt Train Hijacking	Urban
Lufthansa 737	Urban
Cyprus Hijacking	Urban
Operation Nimrod	Urban
Flight GA 206	Urban
Operation Winter Harvest	Urban
Assault at Marseilles Airport	Urban
Japanese Ambassador's Residence	Urban
Thai Hospital Rescue	Urban
Hijack of Vnokovo Airlines Tu-154	Urban
POLACT (Police Action)	
Haiti (UNMIH II)	Urban
Haiti (UNSMIH)	Urban
Haiti (UNTMIH)	Urban
Haiti (MIPONUH)	Urban
Croatia (UNPSG)	Urban
Drug Interdiction:	
Anti-Drug Operations in Bolivia	Mountainous
Andean Initiative in War on Drugs	Mountainous
Anti-terrorist:	
Loughall Station	Urban
Operation Flavius	Urban
Urban Riots:	
Canal Zone Riot	Urban
University of Mississippi	Urban
Canal Zone Riot	Urban
Harlem Riot	Urban
Northeastern Riots	Urban
Watts Riot	Urban
Urban Rioting 1966	Urban

Newark Riot of 1967	Urban
Detroit Riot of 1967	Urban
Urban Rioting 1967	Urban
Pentagon Protests	Urban
Urban Rioting 1968	Urban
Columbia University	Urban
Mexican Student Riots	Urban
Chicago Convention	Urban
National University	Urban
Student Protests 1969	Urban
Urban Rioting 1969	Urban
Days of Rage	Urban
Kent State University	Urban
Student Protests 1970	Urban
Augusta Riot	Urban
Urban Rioting 1970	Urban
Urban Terrorism	Urban
May Day Protest	Urban
Miami Riot of 1980	Urban
Los Angeles Riot of 1992	Urban

Prison Riots:

Prison Camp Riot on Koje-do I	Urban
Prison Camp Riot on Koje-do II	Urban
Attica	Urban
New Mexico State Penitentiary Riot	Urban

RAID (Raid/Incident)

Raid:

Israeli Litani Operation	Open

Incident:

Action at Mirbat	Open
Car Bombing of US Embassy	Urban

STF (show-the-flag, maintain presence, show-of-force)

Korean DMZ post-war	Mountainous
UK Mission to Jordan	Open
UK Mission to Kuwait	Open
Korean DMZ Skirmishes	Mountainous
Korean DMZ Incidents	Mountainous
Instability in Panama	Forested
Operation Golden Pheasant	Forested
Desert Shield	Open

APPENDIX V. CASE STUDY: THE PHILIPPINES 1941-1942

Introduction

On 1 September 1939, when war in Europe broke out, the US Army consisted of just six divisions, five of infantry and one of cavalry.[22] Only one Regular Army unit, the 7th Cavalry Brigade (Mechanized) could be considered fully mechanized. The total US Army armor inventory consisted of about 240 machine gun-armed, M1 and M2 Light Tanks and 'Combat Cars' built between 1933 and 1939, and a single 37mm-armed M2 Medium Tank prototype.[23] In addition, each of the 18 National Guard Divisions nominally included a tank company; all were equipped with obsolete World War I-era designed tanks. In comparison, by September 1939, Germany had manufactured 3,469 tanks, of which 1,669 were equipped with 20mm, 37mm, or 75mm guns, and had acquired another 368 gun-armed tanks in the occupation of Czechoslovakia. By the end of June 1940, the US Army had accepted delivery of 45 M2A4 Light Tanks with a 37mm gun and 17 additional M2 Medium Tanks.

Organization and Deployment to the Philippines

In 1940, with a war in Europe raging and tensions in the Pacific rising, the US Army began a rapid expansion and modernization. By the end of the year a total of 23 divisions, including 10 Federalized National Guard Divisions, were active. On 20 December 1940, the 192nd Tank Battalion (Light) was organized at Fort Knox by the Federalization of four National Guard divisional tank companies. The 32nd Wisconsin formed A Company, the 33rd Illinois B Company, the 37th Ohio C Company, and the 38th Kentucky D Company. On 12 March 1941, the 194th Tank Battalion (Light) was organized at Fort Lewis in a like manner, from the 34th Minnesota (A), 35th Missouri (B), and 40th California (C). The two battalions were first equipped with M2A4 Light Tanks, 17 per company in three-five tank platoons and a two-tank headquarters section, and a three-tank battalion headquarters section.[24] Brand-new M3 Light Tanks replaced the M2A4 Tanks just prior to embarkation for the Philippines.[25] The M3 Light Tank was armed with a 37mm gun and five .30 caliber machine guns (one mounted on the turret roof for antiaircraft defense, one flexible mount in the bow, one coaxial with the 37mm, and two fixed in side sponsons that were fired remotely by the driver).[26] In addition, the two battalions shared with the group headquarters approximately 46 half-tracked armored vehicles, each of which were armed with either a .30 or .50 caliber machine gun.

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[22] They were the 1st, 2nd, 3rd, Hawaiian, Philippine (consisting of over two-thirds Filipino personnel) Infantry Divisions, and the 1st Cavalry Division.

[23] The tanks by doctrine were meant solely for infantry support and had fixed turrets. The 'Combat Car' was the same vehicle with a rotating turret that equipped cavalry units. The designation 'Combat Car' was used to circumvent a Congressional stricture that forbade equipping cavalry units with tanks.

[24] The absolute paucity of US tank strength at this time may be seen when it is realized that in March 1941, these two battalions possessed 36 percent of the *total* inventory of modern US tanks.

[25] A total of 365 M2A4 tanks were completed prior to M3 Light Tank production beginning in March 1941.

[26] At the time the M3 Light Tank was one of two modern tanks in US inventory, see Chris Ellis and Peter Chamberlain. "Light Tanks M1-M5, " *Armoured Fighting Vehicles in Profile, AFVs of the World Series, Volume 4, American AFV's of World War II* (London: Profile Publications Limited, 1972) p. 8. The other modern tank was the M3 Medium, which began production in July 1941, and which should not to be confused with the M3 Light.

During the spring and early summer of 1941, Japanese expansion along the Pacific Rim continued, culminating on 22 July with the occupation of French Indochina. As a result, on 26 July 1941 the US War Department, acting on the orders of President Roosevelt to bring into US service the armed forces of the Philippines, recalled General Douglas MacArthur from retirement and appointed him commander of US Army Forces in the Far East (USAFFE). MacArthur immediately proposed that US Army forces in the Philippines be substantially reinforced with troops and modern weapons, including tanks. The War Department approved and on 16 August issued orders dispatching the 194th Tank Battalion to the Philippines. The battalion (less Company B, which was sent to reinforce the garrison of Hawaii), with 36 officers, 374 noncommissioned officers and enlisted men, and 54 tanks, departed San Francisco 5 September 1941 and arrived in Manila on 26 September. On 12 September it was decided to further reinforce the Philippines with the 192nd Tank Battalion. The 192nd departed San Francisco on 27 October 1941 with 36 officers, 552 noncommissioned officers and enlisted men, and 54 tanks, arriving in Manila on 20 November. The two battalions, along with the 17th Ordnance Company (Armored) were organized on 21 November as the Provisional Tank Group under command of Colonel (later Brigadier General) James R. N. Weaver, and were stationed at Fort Stotsenburg. On arrival, D/192nd Tank Battalion was attached to the 194th (in most accounts of the campaign it was identified as "D/194th Battalion") giving each battalion three companies.

In terms of modern deployment times, the movement of the Provisional Tank Group does not appear to have been that rapid. However, given the limitations of air transport, the movement may be considered to have been as rapid as was possible at that time. The 194th Tank Battalion required 42 days to arrive at Manila from the time that the movement order was given, 22 of those days were spent at sea. The 192nd Tank Battalion required 69 days for its movement, with 24 of them spent at sea.

It is unlikely that the "lightness" of the M3 tank contributed to the decision to deploy the two battalions to the Philippines. Of course, it might reasonably be expected that the limitations of the terrain, and especially the road net in the Philippines would have been a factor. However, there is absolutely no evidence beyond conjecture for that viewpoint. Rather, it appears that, quite simply, once the decision was made to reinforce the Philippines tanks were considered to be an appropriate weapons system to deploy. It then followed that, because only light tanks were readily available, light tanks were the type that would be shipped.

There were simply few active armored units to choose from at the time the decision was made to send tanks to the Philippines. The 1st and 2nd Armored Divisions had been activated in July 1940, and the 3rd and 4th Armored Divisions in April 1941. Each on paper consisted of two three-battalion light tank regiments and one two-battalion medium tank regiment with a total of 273 light and 111 medium tanks. However, none of the armored divisions could be considered deployable. Nevertheless, General MacArthur did request assignment of one of the armored divisions to the Philippines, a request that the War Department sensibly denied.

In addition to the armored division, the Armored Force consisted of one Regular Army Tank Battalion (Separate), the 70th, and four National Guard Tank Battalions (Separate), the 191st, 192nd, 193rd, and 194th, all of which were available for deployment. All of the Separate Tank Battalions were equipped with the M2A4 or M3 Light Tank. By August 1941, when the decision to deploy tanks to the Philippines was made, the number of medium tanks built (as opposed to delivered) was just 26 M3, not even *six percent* of the 444 required to equip the four

armored divisions.[27] The situation was scarcely better regarding light tanks, 365 M2A4 and 813 M3 had been built, sufficient to equip about 90 percent of the light tank battalions then organized. Remarkably, the two battalions sent to the Philippines comprised 40 percent of the Separate Tank Battalions that were organized and almost 13 percent of the total 'modern' (M3 Light and M3 Medium) tank inventory of the US Army.

The Opposing Forces

On 30 November 1941, US Army troops in the Philippines totaled 31,095 officers and men. Of the total, 5,225 garrisoned the harbor defenses, 5,609 were in Army Air Corps units, 4,256 were in service organizations, 671 were in headquarters organizations, and 15,334 were in ground combat units, principally in the Philippine Division and the 26th Cavalry Regiment, Philippine Scouts (PS). Philippine Scouts (Filipinos enlisted into US service) made up 11,957 of the total. The Philippine Army (PA) proper consisted of a single Regular Army Division, ten reserve divisions, and a division-size constabulary force. General MacArthur had begun mobilization on 1 September; the Army would have completed mobilizing on 15 December. About 120,000 troops were available, but they lacked arms, clothing, equipment, supplies, and training, and proved to have limited combat effectiveness.

The Japanese Army forces assembled for the invasion of the Philippines were organized as the 14th Army, with two infantry divisions and supporting troops. Included were two tank regiments totaling 80 to 100 tanks, evenly distributed between 'light' and 'heavy' types. The Japanese 'light' tank was only machine gun armed, while the 'heavy' tank mounted a 37mm gun and was in the same class as the US M3 Light Tank. The troops landed initially were just 41,856 strong, plus 3,621 Army Air Force personnel. Later, in February and March 1942, an additional 25,000 or more troops were sent as replacements and reinforcements.

The Japanese Attack on the Philippines

On 27 November 1941 the War Department dispatched a strong message to Hawaii and the Philippines, stating that, "…hostile action [was] possible at any moment." An even stronger message was sent by the Navy Department to its Pacific commanders declaring that "This dispatch is to be considered a war warning…an aggressive move by Japan is expected within the next few days."[28] On 30 November General Weaver ordered Post Ordnance at Fort Stotsenburg to issue ammunition to the Tank Group and they then took up battle positions guarding Stotsenburg and the nearby Army Air Corps base at Clark Field. At this point neither battalion had had the opportunity of shooting-in their guns or familiarizing themselves with their new tanks. Furthermore, the initial issue of gasoline given to the battalions on arrival in the Philippines had been insufficient to conduct driver training and had severely restricted the route reconnaissance executed. Knowledge of the surrounding countryside, road conditions, and bridge capacities were very limited within the Tank Group prior to the Japanese attack.[29]

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[27] There were also 114 obsolete M2 and M2A1, which were only suitable for training.

[28] Louis Morton, *The Fall of the Philippines* (Washington, DC: US Army Center of Military History, 1989, reprint of 1953 edition) p. 71.

[29] Neither the 192nd nor 194th had the opportunity of training with the M3 tank prior to embarkation to the Philippines and 35 percent of the men had had no training in tanks of any sort. The initial issue of fuel was 40,000 gallons on 26 September, sufficient for less than 200 miles of operations by the two battalions. On 12 December, a second issue was made of 60,000 gallons, see BG James R. N. Weaver, *Operations of the Provisional Tank Group*

At 0750 local time, 7 December 1941 (0220 8 December, Philippines time), Japanese Naval Air Forces attacked the US Pacific Fleet at Pearl Harbor. At 0230 Philippine time on the 8th, a radio operator at the Cavite Naval Station, Manila intercepted the famous message, "Air Raid on Pearl Harbor. This is no drill" issued by Admiral Kimmel. Later, shortly after 0330, Major General Richard K. Sutherland, Chief of Staff USAFFE, received the news from commercial radio broadcasts and notified General MacArthur. Despite these warnings at 1220 Philippines time – nearly nine hours later – a breakdown in communications meant that the initial Japanese air attacks on Army Air Corps and Navy installations around Manila met with complete success.

The Armor Group had a ringside seat for the air attacks from its positions around Clark Field. Extensive use was made of their antiaircraft machine guns and one Japanese fighter plane was claimed shot down. One enlisted man, Private Brooks of Company D/192nd Tank Battalion, was killed and one officer was wounded, they were the first Armored Force casualties of World War II. Additional attacks by Japanese air forces occurred on 10 and 13 December, in the latter one half-track was destroyed and two men were wounded. By 13 December US Army Air Corps aircraft strength had been reduced to negligible effectiveness, and the Japanese landings on the north coast of Luzon began.

During the air attacks, the Tank Group was dispersed to defend Clark and O'Donnell Airfields from airborne landing and A/192nd Battalion was sent east to Dau to guard the railway and highway. On 12 December the 194th Battalion was dispatched to south Luzon to defend against an expected landing. Group Headquarters moved to Manila on 15 December. Soon after, the Tank Group commander was directed to take in hand 40 Bren gun carriers that were on a British ship in Manila.[30] Fifteen were eventually allotted to each battalion and ten were given to the Group Headquarters. They were manned by Filipino volunteers and grounded Air Corps personnel and proved to be a valuable asset as a supply vehicle and for reconnaissance of doubtful terrain.

Another armored reinforcement for the USAFFE was created from 50 self-propelled 75mm guns that had been shipped to the Philippines in October. Three battalions of four 4-gun batteries were formed in the week following the initial Japanese attack. Personnel were drawn from the Philippine Scouts and Philippine Army reservists, with officers mostly drawn from the all-American 200th Coast Artillery Regiment.[31] The SPM (self-propelled mount) battalions were to prove to be a valuable, mobile supplement to the tank battalions. The mounts 75mm gun was especially valued for its range and high-explosive capability, both of which were lacking in the M3 tank. However, the guns were mounted on a vulnerable, lightly armored and open-topped half-track chassis, which sometimes limited their use.

The Japanese Landings

Late on the evening of 21 December a warning was given to expect Japanese landings momentarily on the north coast. The 192nd (less A Company) was to move the following day to Lingayen Gulf on the northwest coast to reinforce the defenses of Major General Jonathon

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(NP, ND, US Army Center of Military History). This document was the primary source for this account of the operations of the Provisional Tank Group.

[30] The Bren gun carrier was a British-built, full-tracked, open-top, armored carrier meant for general-purpose duties. The carriers (also known as Universal carriers or Carden-Lloyd carriers) were a shipment that had been intended for Canadian troops garrisoning Hong Kong.

[31] Morton, p. 120.

Wainwright's North Luzon Force. Unfortunately, the battalion was placed in support and was not under his command. A/192nd Battalion was ordered to move overnight to La Union, further north on the coast, to meet the landing anticipated there at daybreak. Then, on 22 December, the Japanese main landings were successfully executed at Lingayen Gulf.

On 22 December, General Wainwright requested that a tank company be sent to counterattack the Japanese beachhead before it could be consolidated. Unfortunately, the imperfect command arraignment and inexperience meant that B Company, leading the 192nd Battalion, had run short of fuel, some 16 kilometers short of its objective. However, the remaining gasoline was hurriedly pooled, enabling a platoon of five tanks to advance. Near the town of Agoo they encountered Japanese tanks and antitank guns and engaged in the first tank versus tank action by US armored forces in World War II. This first encounter did not result in a victory for the fledgling US Armored Command. The platoon commander's tank was knocked out and destroyed, and the other four were all damaged and fell back, rejoining the company near Rosario. All four of the damaged tanks were then destroyed by air attacks or in "mishaps during salvage" later that day.[32]

Also later on 22 December, sufficient gasoline finally arrived to enable C/192nd to advance to support the 26th Cavalry, (PS) and 71st Division, (PA). However, the imperfect command structure continued to bedevil American fortunes. In a confusion of orders and counter-orders, the tankers withdrew and the entire Filipino-American defense line began to collapse.[33] General MacArthur then ordered a delaying action be executed to cover the withdrawal of USAFFE into defensive positions on the Bataan Peninsula.

The Japanese Pursuit

A new line was established on 23 December, north of the Agno River, covering the main routes to Manila. Despite his protests, the commander of the 192nd was ordered by General Wainwright to place all three of his companies north of the river, with only two passable bridges to his rear. When the decision was made to withdraw behind the river to the next Phase Line on the night of 24-25 December, congestion forced A/192nd to make a detour to the western bridge. In the confusion it appears that another four tanks were lost, probably to breakdowns. Also at this time, the 194th Battalion arrived from south Luzon with A Company and D/192nd Tank Battalion (C/194th remained attached to South Luzon Force).

Disaster ensued when the North Luzon Force withdrew to the next Phase Line (the Gerona Line) on the night of 26-27 December. A Japanese force infiltrated the Filipino-American lines and established a roadblock, cutting off the withdrawal of the 194th. One platoon of A/194th broke through, losing two tanks and three men, and the rest of the company managed to find an escape route, losing two more tanks. However, D/194th was trapped on an unfordable stream and 15 tanks were abandoned. Also during this withdrawal, the 192nd Battalion was forced to destroy 44,000 gallons of gasoline that could not be taken out.

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[32] *Ibid.*, as well as being the first tank versus tank action, the engagement at Agoo witnessed the death of the first US tanker lost in a tank versus tank battle, Private Henry Deckert of Chicago.

[33] Various accounts are given of these events. Morton, p. 135, states that C Company withdrew on orders of General Weaver. General Weaver's account makes it clear that he understood that his mission was to delay the enemy and cover the withdrawal of the 26th Cavalry and 71st Division. In another incident later on 22 December, it appears that the Executive Officer of the 26th Cavalry actually gave direct orders to the 192nd's commander to withdraw again because the tanks "would clutter up [the 26th Cavalry] action."

Meanwhile, on 26 December 2/C/194th of South Luzon Force was ordered to execute an attack without prior reconnaissance. They were caught in an antitank ambush, two were destroyed and the other three were disabled and abandoned. On 30 December a tank of A/192nd was lost to a Japanese antitank gun. Another five tanks, apparently of the 194th Battalion, were lost when attempting to cross a stream. Thus, by the evening of 30 December, at least 34 tanks had been lost, but only ten of them can be directly attributed to Japanese action.

Covering the Final Withdrawal into the Bataan Peninsula

At this time, the Tank Group was called upon to cover the final withdrawal into Bataan. The line was successfully held on 31 December and 1 January, the US tankers claimed eight Japanese tanks knocked out for no loss. Finally, on 2 January 1942, the Tank Group withdrew into the Bataan position. A/192nd lost three more tanks while moving cross-country, covering the withdrawal.

By the night of 6-7 January all USAFFE units had successfully withdrawn into Bataan. By this time it appears that the Tank Group had lost a total of 37 of 108 tanks.[34] The 194th Battalion, having lost at least 24 tanks, was reorganized with its platoons reduced to three tanks each, making ten-tank companies. Apparently the HHC only retained its half-tracks and Bren carriers and had no tanks. The 192nd still had at least 41 tanks; it appears that the companies were reorganized with four-tank platoons. The headquarters sections of the three companies and the Battalion HHC probably shared the remaining five tanks.

The Siege of Bataan

During the siege of Bataan the Tank Group acted as a "fire brigade" reinforcing defenses as needed. Less information is known on Group losses during this period.[35] About 15 January, a bomb exploded near one of the tanks of A/192nd on beach defense on the east coast. The radio operator who was outside the tank was killed, but the tank was only slightly damaged.[36] On 22 January a platoon of C/194th was tasked to counterattack a Japanese roadblock that had infiltrated behind the western defenses. The attack failed and mines damaged two of the three tanks. Later, on the night of 25-26 January, the two were abandoned after the failure to destroy the Japanese roadblock forced a general withdrawal in that sector. From 23 January to 1 February C/192nd assisted in eliminating a series of Japanese amphibious landings on the southwest coast of Bataan. These actions were known collectively as the "Battle of the Points." One tank was lost. The rest of the 192nd meanwhile participated in a series of counterattacks on a Japanese breakthrough of early February that became known as the "Battle of the Pockets." Three of four tanks in one platoon of A Company were lost on 2 and 3 February, but one was later salvaged. A total of five tanks were lost in the first Japanese attempt to seize Bataan.

It does not appear that any tanks were lost after these actions of January and February. The remainder of February and all of March were spent quietly by the Japanese in reinforcing and reorganizing their troops for a final offensive to eliminate the defenders of Bataan. During

[34] A careful reading of Morton, *Ibid.*, and General Weaver's account indicates that 37 were lost. Weaver states that when the Group reorganized after 8 January, it was found that the 194th had lost 26 and the 192nd "about" 10 tanks. However, it appears that the losses were actually 13 in the 192nd and 24 in the 194th.

[35] Morton and Weaver, *Ibid.*, are the primary sources for this period.

[36] Letter from Forrest Knox, former member of 192nd Tank Battalion, to the Historical Evaluation and Research Organization, 19 June 1978, in the files of *The Dupuy Institute*. Mr. Knox's letter also confirmed details found in other sources on the loss of three other tanks.

those final weeks hunger and disease made greater inroads on the defenders strength than did Japanese attacks. The final assault began on 3 April and succeeded in breaking through the weakened Filipino-American lines. On 7 April the final American tank attack was made. Four tanks of C/194th supported an attempt by the 45th Infantry, PS, to reinforce the 57th Infantry, PS. Japanese antitank guns knocked out one tank and the attempt failed. During 8 April General Weaver attempted to mass the remnants of the Tank Group for a counterattack, but at 1830 he was notified to prepare for the surrender of his command. At 0700 on 9 April, troops began to destroy their arms and resistance on Bataan ceased.

Thus, it appears that only six of the 71 tanks available on 7 January can be accounted for as lost in combat. However, the difficult terrain, lack of fuel and maintenance, and the sickness of the troops – at one time 56 percent of the men were ill with dengue and malaria – meant that those tanks that were left could not be effectively used. Total Japanese air superiority made moving any vehicles by day extremely hazardous. Given the circumstances, it is unlikely that the tanks had any material effect on the final days of the campaign.

Conclusions

The participation of the Provisional Tank Group in the earliest days of the Philippines Campaign had little effect on the final outcome. Although US tank forces matched or exceeded Japanese tank forces in numbers and quality of material, they were never able to take advantage of that superiority.

It appears likely that the presence of the US tanks made little concrete difference to the outcome of the Japanese pursuit, until the last days of 1941 and the first days of 1942. In the first nine days of the campaign, while attempting to counterattack the Japanese beachhead and while covering the withdrawal, 34 US tanks were lost, only ten of which were to enemy action. When the siege of Bataan began on 7 January, 17 days into the campaign, three more tanks had been lost; again to the vicissitudes of terrain rather than to enemy action. The Filipino-American forces had lost about 13,000 men, most of them to desertion. In contrast, the Japanese had lost 1,916 men as battle casualties and another 2,700 sick. In the same period, no reliable evidence for Japanese tank losses may be found. The best estimate is that perhaps eight Japanese tanks were lost.

In the early Japanese attempt to seize Bataan, casualties were much higher. From 6 January to 1 March Japanese casualties were over 2,700 killed and 4,000 wounded, with another 10,000 to 12,000 sick. However, in the second attack, from 3 to 8 April, Japanese casualties were only 227 killed and 402 wounded. It appears that only six of the 71 US tanks available were lost by American forces during the siege of Bataan.

All US defense efforts in the Philippines were complicated by MacArthur's insistence on attempting to defend against the initial Japanese landings instead of executing the systematic withdrawal to Bataan that was mandated by US war plans. The Japanese seized 2,348,812 liters (167,779 gallons) of fuel, 844 trucks, 74 field pieces, and 427,383 rounds of artillery ammunition up to 20 February, mostly during the pursuit. It is likely that a timely evacuation of this materiel would have had a much greater effect on the outcome of the campaign than did the employment of the armored forces in the withdrawal.

Overall, it is not apparent that the emergency insertion of US armor forces into the Philippines had either a positive *or* negative effect on the outcome of the campaign. An overly hasty deployment and general inexperience reduced the effectiveness of the tanks on the campaign. The officers and men had no training in, or experience with, their major weapons

system, the M3 Light Tank. After arriving in Manila, there was both insufficient time and insufficient resources to correct the shortfall in training.

There was also insufficient means and time for the Provisional Tank Group officers to familiarize themselves with the terrain on which they would be expected to maneuver. Route reconnaissance was almost nonexistent and even simple things like bridge capacities were unknown factors. Finally, there was insufficient time (and, it appears something of a lack of effort) to establish coordination between the USAFFE Headquarters and the Provisional Tank Group. Command relationships were murky to say the least. The result was that during the campaign at least 27 of the 43 tanks lost (62.79 percent) were not due to direct enemy action.

Furthermore, there is no evidence that the loss would have been any less if the tanks involved had been heavier. Rather, it appears that – given the terrain and road conditions in the Philippines – more tanks would have been lost if they had been heavier. On the other hand, it cannot be said that *more* tanks would have been lost if they had been lighter, given the relatively few instances in which the tanks were actually heavily engaged in combat. In that sense, *greater* lightness may have been a valuable asset to have. It is possible that if the tanks had been even lighter, then they may have been more usefully employed in the earlier stages of the campaign.[37] And yet, this again raises a paradox, because if the tanks were lighter and more employable in the restricted terrain, then they could be expected to have participated in more direct combat, in which case the increased lightness (implying lesser protection) may then have been a disadvantage.

In general, it does not appear that the use of light armor in the Philippines is an example of an emergency insertion of armor forces that the US Army should emulate. However, this example does well illustrate the conundrum that the vehicle light enough to be rapidly inserted may still not be light enough to operate in an underdeveloped or partly-developed country. At the same time that very lightness may also reduce the combat capability of the vehicle.

[37] Some evidence for this may be found in the praise given to the 75mm gun-armed half-tracks in the campaign. These vehicles, which were a hasty improvisation by the Ordnance Department, were only lightly armored and were open-topped. And yet, time after time, their obsolescent 75mm gun was singled out as a decisive or near-decisive weapon in many of the battles of the campaign.

APPENDIX VI. CASE STUDY: NORMANDY 1944

On 6 June 1944, the US Army and Commonwealth Forces executed what has become probably the best known – but least understood – amphibious operation of World War II. D-Day, the invasion of Europe, now appears to have been a certain success. However, it was anything but certain in the early months of 1944 when planning for Operation OVERLORD began to take shape. One of the greatest uncertainties and greatest worries for the planners was the expected reaction by the opposing German armed forces. The German Army was expert in defensive warfare, but was premier in armored maneuver. German tank designs were some of the best in the world. And, waiting in France for the expected Allied invasion were ten German mechanized divisions.[38] It was expected that within a week of the landings, the Germans would be capable of deploying four or more of these divisions against the Allied beachhead. How to get armor, and – most importantly – battle-worthy armor and antitank guns into the lodgment area, was a major planning concern for the staffs of 21st Army Group and the subordinate First US Army and Second British Army.

DD Tanks

One method of rapidly getting tanks across the beaches was the Duplex-Drive or DD tank. The British engineer Nicholas Straussler developed the DD tank concept in early 1941. He tested an early version on a British Tetrarch light tank in June 1941 and later with a heavier Valentine tank in early 1942. In April 1943, the equipment was adapted to fit the standard Allied medium tank the US-built M4 'Sherman.'

The Duplex-Drive system consisted of a collapsible canvas screen that was fixed to a boat-shaped platform of mild steel, which was in turn welded to the hull of the tank. The screen was erected by 36 rubber air-tubes filled from compressed air cylinders carried on the deck of the tank, and were held in place by lightweight jointed struts. When in the water a properly rigged screen brought the turret level with the water and provided three feet (just under one meter) of freeboard.

The DD tank was driven through the water at four miles-per-hour (6.4 kilometers-per-hour) by two propellers that drew power through a simple transfer box from the tracks. Steering was via a hydraulic system that swiveled the propellers and through an auxiliary rudder controlled by the tank commander through a simple manual tiller. The tank commander had visibility over the screens, while the driver was restricted to a periscope extension to the normal periscope mounted on his hatch.

The advantage of the DD-system was that it could be adapted to practically any tank design. By using the DD-system there was no need to design, prototype, test, and manufacture a purpose-designed amphibious tank. However, there were also many disadvantages to the system, the worst of which was its extreme vulnerability. Puncturing just a few of the air-tubes or even

[38] The divisions were the 1st, 2nd, and 12th SS-Panzer, the 2nd, 9th, 11th, 21st, 116th, and Lehr Panzer, all of which were armored divisions, and the 17th SS-Panzergrenadier, which was a mechanized infantry division. All were eventually committed against the Allied Armies in Normandy, except for the 11th Panzer, which was sent to oppose the Allied landings in Southern France in August 1944. In addition, two more divisions, the 9th and 10th SS-Panzer, were committed later in the summer from the German strategic reserve.

just a simple tear in the canvas skirt, would result in the DD tank taking on water and, given the tenuous buoyancy of the vessel, just a minor loss of flotation was sufficient to sink it. Testing of the DD tanks prior to D-Day proved that – in anything rougher than a moderate sea state – the fragile contraption would sink like a stone. Waves greater than 3-foot would break over the skirt and easily swamp the DD. The final recommendation was that they not be launched in greater than 3-foot seas, and no more than 4,000 yards from the beach.

The Landing Plan

On the two US-designated beaches, OMAHA and UTAH, it was decided that the DD tank launching would be timed so that they would land at H-5 (5 minutes before H-Hour) just before the initial landing boat waves. They were then to provide covering fire for the landing of conventional medium tanks at H-Hour[39] and for the first waves of infantry and engineers at H+01 and H+03. Follow-on waves were not scheduled to appear until H+30.

On a typical regimental landing team front – for instance, that of the 116th Infantry on the right (western) side of OMAHA Beach – this plan meant that the troops landed in the first thirty minutes of the invasion would make the actual assault on the German defenses. The assault team thus consisted of four infantry companies (A, E, F, and G of the 116th Infantry), three medium tank companies (A, B [DD], and C [DD] of the 743rd Tank Battalion), one attached infantry company (C, 2nd Rangers), and 12 demolition teams from the Special Engineer Task Force. [40] All told, there were about 780 infantry, 32 DD tanks, 16 medium tanks, two bulldozer-equipped medium tanks, and 480 Army engineers and Navy demolition men.

The plan on the left (eastern) side of OMAHA Beach was similar, 32 DD tanks were to be launched by two medium companies of the 741st Tank Battalion and one medium company was to be landed conventionally. Finally, at UTAH Beach, the 70th Tank Battalion also planned to land two medium companies with DD tanks and one medium company conventionally. A total of 96 DD tanks, 48 conventional medium tanks, and six bulldozer tanks were landed in the assault echelons in the first 30 minutes of the invasion at UTAH and OMAHA.

The Results of the Employment of DD Tanks

Severe weather conditions in the Channel came close to causing the cancellation of the invasion (and which did cause the postponement of the invasion from 5 to 6 June) and also had a major effect on the use of the DD tanks on D-Day. The four to eight foot swells caused problems with the smaller landing craft, swamping and sinking a number. The effect on the DD tanks was worse.

The 741st Tank Battalion at OMAHA Beach launched as scheduled 4,000 yards offshore. Some of the DD's sank immediately as they exited their landing craft, others advanced a few yards and then foundered. Of the 32 that were launched, 27 sank before reaching shore.

Further west at OMAHA the 743rd Tank Battalion made the sensible decision to scrap the planned deployment of the DD tanks and launched them conventionally. Nevertheless, they lost

[39] Just why it was felt that the DD tanks were necessary in this plan has never been adequately explained. It may have been hoped that the DD's were such an unknown and inoffensive appearing object (looking much like a life raft) that the Germans would not fire upon them, giving the DD's the advantage of tactical surprise. In retrospect, it is apparent that it was a forlorn hope.

[40] The Special Engineer Task Force was formed from both Navy and Army personnel. Each 41-man demolition team comprised five men from the Navy Combat Demolition Unit, three other Navy personnel, 31 Army engineers, and an Army medic, all under the command of an Army engineer officer.

eight tanks within minutes, four when a sea mine sank the LCT carrying them and four to German antitank guns.

At UTAH Beach, the 70th Tank Battalion lost five DD tanks of the 32 launched. It is believed that all were lost to swamping, but that remains unconfirmed. Finally, it is known that at least six of 18 DD tanks of the Canadian 1st Hussars were lost to swamping at Juno Beach.

Results of Using DD Tanks

Other medium and light tanks, in addition to the DD tanks and conventionally waterproofed medium tanks of the 70th, 741st and 743rd Tank Battalions, were landed on the Normandy Beaches on D-Day. At Omaha Beach, congestion prevented the landing of D Company (the light tanks) of the 741st and 743rd Battalions until 7 June. However, the 745th Tank Battalion landed its battalion commander, reconnaissance platoon, and B Company (medium tanks) on 6 June. At UTAH Beach, D Company of the 70th Tank Battalion landed on the afternoon of 6 June and was attached to the 101st Airborne Division, which it joined on 7 June. Also the 746th Tank Battalion landed all of its medium and light tanks on D-Day. By the end of the day, it appears that at least 103 medium and 34 light tanks were ashore at UTAH Beach. And, despite the dreadful losses suffered by some of the DD tank units, about 90 medium tanks were ashore at OMAHA Beach.

Thus, on the two US beaches, 193 medium and 34 light tanks were ashore by the evening of 6 June. A total of at least 40 medium tanks had been lost, or 17.17 percent of the total of 233 mediums committed on that day. These also accounted for 21.39 percent of the 187 medium tanks lost by the US First Army from 6 June to 1 July 1944. Put in another way, the daily average of medium tanks lost for the 26-day period was 0.94 percent of those operational, the loss on D-Day was 18.27 times the daily average. During the same time period, 10.84 percent of the operational First Army light tanks were lost – 0.42 percent per day – although apparently none were lost on D-Day.

The results obtained by the use of the DD tanks on D-Day do not appear to have justified the extensive research, development, and training that went into deploying them. The DD tanks did not provide the needed fire support that was required by the first landing waves, and their fragile construction resulted in the needless loss of well-trained tank crews. In practice it was found that landing tanks directly on the beach from specialized landing craft was probably a more effective and safer means of entry than was the use of an amphibious tank.

There appears little doubt that a lighter and less well protected vehicle would have been virtually useless in the circumstances that pertained on the Normandy beaches (and especially at OMAHA Beach). The fortified defense positions were such that only direct infantry assault or direct fire from a large-caliber weapon could have had any effect upon them. Furthermore, the weapons available to the defenders were fully capable of knocking out any lightly armored vehicle committed against them.

However, it may be that modern technology and the character of conflict in the modern world have to a large extent negated the advantages of fixed beach defenses that were characteristic of World War II. The German Army in France engaged in a year and a half of desultory fortification of the French coastline, followed by six months of frantic activity improving their positions, before the Allies landed. The closest modern parallel was the Gulf War of 1991, where Iraqi forces heavily fortified the Kuwaiti coast against a landing by US Marines that never occurred.

The Buildup of Allied and German Armor in Normandy

The major rationale for the use of the DD tanks in Normandy was to provide armored fire support at the waters-edge for the assaulting infantry and engineers. However, a secondary concern that was only partly met by the deployment of the DD tanks, was the very real possibility of a German armored counterattack of the Allied assault forces.

However, in the end this concern was unfounded. Allied air interdiction of the battle area prevented the Germans from sending timely reinforcements into the battle area. On 31 May 1944 there were a total of 1,562 operational tanks and assault guns available to the Germans in OB-West. In addition, another 249 were undergoing maintenance and 472 had been allocated and were in route to units from the factory. About 122 German tanks and assault guns were immediately available to units near the Allied beaches in Normandy.

However, the Allies were able to quickly build up a significant armored force in the beachhead. By 18 July 1944 the Allies had 3,752 medium tanks ashore in Normandy (and nearly 6,000 fully tracked AFV of all types). In comparison, by 19 July the Germans had committed a total of 1,662 tanks and assault guns to the battle. The disparity continued to grow as German armored battle losses – which were always difficult for them to replace – increased and as the Allies continued to build up their armored forces. By 12 August the Germans had committed about 2,248 tanks and assault guns while the Allied armored forces had an organizational strength of well over 8,000 fully tracked AFV of all types.[41]

[41] See Niklas Zetterling, *Normandy 1944, German Military Organization, Combat Power and Organizational Effectiveness* (J.J. Fedorowicz Publishing, Inc.: Winnipeg, Canada, 2000), pp. 412-417, 422 and 425 gives highly accurate accounts of German armor strengths by day during the campaign, as well as some slightly less accurate Allied TE armor strength. See Appendix X of this report for additional sources for Allied armor strength during the Normandy Campaign.

APPENDIX VII. THE GERMAN CAMPAIGN IN THE BALKANS

Background

On 28 October 1941 a Fascist Italian army of 10 divisions – attacking from Albania – invaded Greece, sparking a conflict in the Balkans that would eventually consume over a million lives.[42] However, the invasion quickly bogged down against determined Greek resistance and, on 22 November, the Greeks began a counteroffensive pushing the Italians back into Albania. In December the Greek offensive stalled in turn as bad weather and limited logistics put an end to the fighting. Then, on 7 March, British troops began to arrive in Greece to support the Greeks in a renewed offensive against Italy. Also in the early spring of 1941 Nazi Germany, under the leadership of Adolf Hitler, was preparing for a massive campaign to destroy the Soviet Union. Hitler was determined to bring a united coalition of Hungary, Rumania, Bulgaria, and Yugoslavia under his control to secure the German southern flank during the invasion and eliminate the Greek and British threat. On 25 March 1941 Yugoslavia's Prince Regent Paul agreed to join the Axis alliance.

However, on 27 March a coup by anti-German elements of the Yugoslav Army deposed Prince Paul, established a new government, and rejected the alliance. Hitler flew into a rage at the Yugoslav 'treachery' and resolved to crush Yugoslavia. The German Twelfth Army and First Panzer Group, which were in Hungary and Rumania preparatory to the invasion of the Soviet Union, were shifted southwest into Rumania and Bulgaria opposite the eastern Yugoslav frontier.[43] The German Second Army was organized in Austria and Hungary facing northern Yugoslavia with the Hungarian Third Army in support. Finally, the Italian Second Army prepared to attack from the west out of Istria. In just nine days, in a masterful display of coordination and logistical expertise, the Germans preparations were completed.

On 6 April the invasion began with a massive aerial bombardment of Belgrade. The Twelfth Army swept rapidly through northern Yugoslavia (Zagreb fell on 10 April, Sarajevo on 15 April), while the First Panzer Group enveloped and seized Belgrade on 12 April. The Yugoslav Army was destroyed as it attempted to mobilize, and on 17 April resistance ended in

[42] Italy had annexed Albania on 7 April 1939. Incomplete records indicate that losses due to military action (including civilians killed) in the Balkans were:

Greece – 276,749
Yugoslavia – 893,000
Italy – 12,389
Germany – 22,370
Albanians – 18,000
Jews – 57,000
Others (Gypsies, Turks, Hungarians, and Rumanians) – 24,000

Most of the sources for losses in the Balkans have not been published in English. However, the best estimates from Yugoslav histories have been compiled and posted on the Internet by Ivan Bajlo at http://www.wargamer.com/sp/ww2/yugoslavia. Although a wargamer site, the section on Yugoslavia provides a wealth of background information on the Partisan War that would otherwise be unavailable in English.

[43] The Panzer Group was effectively an army – it consisted of three corps – but the headquarters was organized from the staff and services of a motorized corps headquarters. In October 1941 they were renamed Panzer Armies. During the Yugoslav and Greek Campaigns First Panzer Group was under the administrative command of Twelfth Army (which recorded its casualties), while it was under the operational command of the *Oberkommando des Heeres* (OKH – the High Command of the Army).

unconditional surrender. Meanwhile, the Twelfth Army had penetrated Greek defenses in Salonika and enveloped the Greek Second Army, which surrendered. Elements of the First Panzer Group struck south from Skoplje and enveloped the Greek First Army facing the Italians in Albania. The newly arrived British Commonwealth forces were caught unprepared and, after a brief but unsuccessful stand at Thermopolayae, withdrew south to the Pelopponese and southern Attica. The Royal Navy evacuated 50,700 British and Greek troops (about 58,000 British had been committed to the adventure – most of their equipment was abandoned in the evacuation) from southern Greek ports to the island of Crete. By 27 April the campaign in Greece ended.

German casualties in the invasion were 183 killed-in-action (KIA), 460 wounded-in-action (WIA), and 16 missing-in-action (MIA) in the Twelfth Army (engaged in Yugoslavia) and 749 KIA, 3,313 WIA, and 241 MIA in the Second Army and First Panzer Group (engaged in Greece, but also partly engaged in Yugoslavia).[44] Italian casualties totaled 3,324 in April (the breakdown of KIA, WIA, and MIA is unknown). Bulgarian losses are not known, but were probably minimal (the Bulgarian Army followed up First Panzer Group into Macedonia and acted as an occupation force). Hungarian losses are unknown, but were probably also minor.

Incomplete reports of German AFV losses include one Pz-IV tank, two Pz-III tanks, five Pz-II tanks, two assault guns, one half-track ammunition carrier, three half-track observation vehicles, and one unknown vehicle destroyed and one unknown vehicle damaged.[45]

Losses for the Allies are incomplete and unclear. Yugoslavian losses for all of 1941 are given as 18,896 KIA, 29,300 WIA (evidently including 3,127 died-of-wounds [DOW]), and 3,800 MIA.[46] However, it is unknown how many of these were military losses in April and how many were Partisans lost in the desultory guerrilla operations that began almost immediately after the surrender. In addition, 84,625 Yugoslavs were taken prisoner by German forces. Greek losses are also difficult to pin down. Military losses for the entire war (October 1940 to October 1944) are given as 16,327 KIA, 49,933 WIA, and 1,986 MIA, 23,364 were in PW camps and an estimated 119,760 had been processed and released by the Germans as 'demobilized.'[47] Commonwealth losses are given as 11,840, of which 10,474 were taken prisoner.[48]

Apparently all of the 30-odd World War I-era, French-built FT-17 light tanks of the Yugoslav Army were captured intact by the German Army (see below). Of 176 British and Greek tanks (mostly British), all but nine that were evacuated to Crete were lost in Greece.

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[44] Casualty reports for the German forces in the invasion may be found in National Archives and Records Administration (NARA) Microfilm Publication, Record Group (RG) 242, T312, Roll (R) 444, Frame (F) 0268~ (Twelfth Army and First Panzer Group) and T312, Roll 1122, Frame 3106 (Second Army).

[45] NARA RG242, T312, R444, F0319, F0369 and T312, R445, F0955. The Pz-II was a light tank, weighing nine to 10 tons depending on the model, and mounting a 20mm gun and a machine-gun. The Pz-III and Pz-IV were medium tanks, weighing 19.5 to 27 tons depending on the model (both were progressively up-armored and up-gunned during the war), and mounting a 37mm, 50mm, or 75mm gun and three machine-guns. The assault gun was a turret-less AFV based on the Pz-III chassis that was intended for close support of infantry (later it was extensively used as a SP antitank gun). The half-tracks (and most of the SP antitank guns mentioned later) were open-topped and lightly armored vehicles that were used for a number of purposes.

[46] Ivan Bajlo, *ibid.*

[47] As of 27 April, 24,799 Yugoslavs were in German PW camps in Bulgaria, 14,230 in PW camps in Yugoslavia, 6,281 were in Bulgarian hands, 1,303 in Italian hands, and 38,012 had been deported to labor camps in Germany, Poland, and – eventually – as far away as Norway. Twelfth Army PW Report, NARA RG 242, T312, R444, F0398.

[48] Brigadier I. S. O. Playfair, *et al*, *The Mediterranean and Middle East, Volume II*. (Her Majesty's Stationary Office: London, 1966). PW Report of the Twelfth Army as of 9 May 1941. NARA RG 242, T312, R444, F425.

German Occupation Forces in Yugoslavia 1941-1945

The German units engaged in the occupation of the Balkans suffered from a distinct lack of a suitable doctrine for rear area security and anti-partisan operations. Under German doctrine, all combat other than that conducted by organized, uniformed armed forces using conventional tactics were termed *Bandenkrieg* or bandit warfare. Known or suspected partisans were treated as common criminals and were often dealt with in a rough-and-ready (and usually fatal) fashion. Unfortunately, the harsh measures utilized often resulted in greater alienation of the civilian population, which in turn generated a steady stream of volunteers for the partisan bands. It was a conundrum that besets all conventional armed forces engaged in an insurgency, but the reaction of the German Army in World War II is quite possibly the best example in history of how not to solve the problem.

The German Army compounded this doctrinal shortcoming by failing to organize and train units specifically for security and anti-partisan duties. The only 'Special Forces' units organized by the German Army were the *Brandenburg Regiment z.b.V.* (regiment for special duties) and the late-war *SS-Fallschirmjäger Batallion* 500. The first was trained and equipped to spearhead attacks by seizing bridges, communications and critical transportation choke points, and by executing deep-reconnaissance and sabotage missions that targeted headquarters, transportation and communications assets behind enemy lines. The second was a specialized airborne commando unit formed late in the war by SS-Colonel Otto Skorzeny. In addition to *Brandenburg Regiment*-style operations, Skorzeny's commandos also were engaged heavily in the *Bandenkrieg* in Yugoslavia. However, the *Brandenburgers* were a small and highly specialized unit, with no anti-partisan mission at the start of the war, [49] and Skorzeny's unit wasn't formed until 1943. Until then, German rear area security was based on the utilization of "Reserve" and "Security" formations.

Reserve divisions were formations of the German *Ersatz-Heer* (Replacement Army) whose primary function was inducting and training replacements. However, many of the reserve divisions were deployed from their bases in Germany to German-occupied territories during the war where they then filled a secondary security mission. Reserve division organization mirrored that of the regular field divisions; they normally consisted of a division headquarters and a number of training regiments and battalions. These units contained a cadre of officers and NCOs who staffed officer and NCO candidate schools and the replacement-training units. Often the officers and NCOs were recovering from wounds or illness that prevented them from immediately returning to the field. Security operations were very much a secondary role for the reserve divisions. Indeed, security operations by a reserve division disrupted training and threatened the cohesion of the German replacement system (a system that helped foster the excellent combat performance of the German Army).

Sicherungs (security) units proper were formed in 1939 as part of the general German Army mobilization. The typical security unit was the *Landessschützen-Bataillon.* They were formed, as separate infantry battalions comprised of three to eight companies each. The *Landessschützen* were manned by personnel over the age of 40, often men who had served in World War I, and many had minor disabilities that prevented them from serving in the field. The

[49] Nominally a regiment, the *Brandenburgers* were approximately battalion-sized at the beginning of the war. By 1943 the regiment had been expanded into a nominal 'division,' but its responsibilities extended across the entire German front-line and over all of Nazi occupied Europe. As the war progressed and Allied partisan-style warfare increased – particularly in the East – the *Brandenburgers* were increasingly utilized for anti-partisan warfare. Both units were probably more akin to modern US Army Rangers than they were to Special Forces.

battalions were only marginally mobile and were capable only for traffic control and static base defense. They proved to have minimal utility in anti-partisan operations.

Command of the *Landessschützen* was typically exercised in occupied territories by attaching them to a *KoRück* or *Kommandeur rückwärtiges Gebiet* (commander of rear areas), which was a simple administrative staff without troops.[50] Normally there was one or more *Landessschützen* battalion assigned to each *KoRück* In many cases *Ordungspolizei* (Army military police), *Geheim-Feldpolizei,* or GFP (Army secret police), *SS-Polizei,* and *Sicherheitsdienst,* or SD (SS security service) units were also attached.

The Balkans proved to be an excellent example of the shortcomings of the German security and anti-partisan capability. The swift campaigns of April and May of 1941 that conquered the Balkans cost the Germans minimal casualties. By late May and June 1941 most of the more capable German formations were hurriedly re-deployed to participate in the invasion of the Soviet Union.

Those units that remained in the Balkans were under the command of *Generalfeldmarschall* Wilhelm List of the Twelfth Army. He also served as *Wehrmachtsbefehlshaber* (Military Commander) Southeast (until September 1941, when the command was given to General Walter Kuntze), and commander of *Heeresgruppe* (Army Group [AG]) E, which was the second major component of OB Southeast. At first AG E commanded all forces in the Balkans and Greece, but after August 1943 it only controlled forces in Greece and the Aegean Islands, while AG F took over control of the Balkans.[51] The Twelfth Army headquarters was in Athens. The German-occupied zones in Croatia, Bosnia, and Serbia were initially under the operational command of the *Höheres Kommando (HK) z.b.V.* (High Command for Special Duties) 65 with four reserve infantry divisions under its command, while the *Militärbefehlshaber Serbien* (Military Commander Serbia) had command of civil administration and security operations with four *KoRück* and nine *Landessschützen* battalions under its command.

The occupation forces included the 41. *Infantrie* (infantry) Division, the 22. *Luftland* (airportable) Division and the 7. *Fallschirm* (airborne) Division and the 5. *Gebirgs* (mountain infantry) Division in Greece and the Aegean, and three reserve divisions (704., 717., and 718.) in Serbia and Croatia. The fourth reserve division (714.) arrived in Serbia during November 1941. Of these, the 7. *Fallschirm* was nearly destroyed in the air assault on Crete in May 1941. The 5. *Gebirgs* Division had also been badly mauled on Crete.

Through the second half of 1941 and during 1942 these deployments remained fairly static. With the assistance of the German-created puppet Republic of Croatia as well as Italian Army units,[52] the Germans conducted a number of minor operations designed to eliminate the threat posed by the partisans to German communications routes through Yugoslavia. These included operations against the Uzice Partisan 'Republic' (27 Sep – 15 Oct 1941), Bosnia (17 – 23 Jan 1942), Kozara (1942), Neretva (20 Jan – 28 Feb 1943), and Sutjeska (15 May – 15 Jun 1943). However, the results of these operations were less than satisfactory and German and

[50] A similar rear area command headquarters was the *Feldkommandanteur* (field command area) or FK.

[51] From 25 March to 22 April 1945 AG E was again named OB Southeast after AG F was disbanded. On 22 April OB Southeast was discontinued and AG E was placed under the command of OB South until 8 May 1945.

[52] The Italian Army deployed a large number of units – 32 divisions by mid 1943 – in the occupation of the Balkans and Greece. However, with the collapse and surrender of the Fascist government of Italy on 8 September 1943, most of these units were disbanded or interned by the Germans, however some were reformed as Fascist units under German command.

German-Allied losses were increasing. For example, in the three operations against partisans in Neretva (*Fall Weiss* 1 [Operation White], *Weiss* 2, and *Mostar*) German casualties were 385 KIA, 1,001 WIA, and 102 MIA, while the casualties of their Croation ally were 48 KIA, 110 WIA, and 29 MIA. Overall, to 31 October 1943, casualties of AG E amounted to 2,775 KIA, 7,067 WIA, and 1,938 MIA for a total of 11,780.

By May 1943 German and German-Allied units in the Balkans had increased to 11 divisions (*SS-Prinz Eugen*, 187., 704., 714., 717., and 718. *Reserve-Infantrie*, 369. and 373. Croat, and the Bulgarian Occupation Corps with the 7., 9., and 21. Divisions). They were subordinated to two area commands, one in Serbia (*Militärbefehlshaber Serbien*) and one in Croatia (*Befehlshaber der deutschen Truppen in Kroatien* – German Troop Command in Croatia). In addition, the Fifth Bulgarian Army (the 6., 14., 15., and 17. Divisions and two infantry and two cavalry regiments) were occupying southeastern Serbia and Macedonia. Greece (the Peloponnese, Attica, Salonika, and the Aegean Islands) was occupied by the 11. *Luftwaffe-Feld* Division, the 22. *Luftlande* Division, and two Croatian infantry brigades.[53]

However, it had become obvious that the reserve divisions in the Balkans were inadequate for operations against the rapidly growing partisan threat. Furthermore, even the regular army and SS units rotating into the Balkans from Russia for rest and refitting were proving incapable of handling the security threat. Thus, by the fall of 1943 the decision was made to greatly increase the commitment of forces to the Balkans. Another locally raised, Croatian-manned, infantry division (371.), four infantry divisions (100. Jäger [light], 162., 254., and 297.), two reserve divisions (173. and 187.), three SS-divisions (*Prinz Eugen Gebirgs*, *Maria Theresa Kavallarie* [horse cavalry], and *Nordland Panzergrenadier* [motorized]), and the 1. *Kossak-Kavallarie* Division were added.[54] The 11 new divisions increased the total in the Balkans (Croatia and Serbia) to seventeen divisions (although the *SS-Nordland Panzergrenadier* was transferred to the Eastern Front in November). In addition, the four reserve divisions already assigned to OB-Southeast (704., 714., 717., and 718.) were converted in April 1943, becoming two-regiment jäger divisions (renamed the 104., 114., 117., and 118. respectively) eliminating their replacement-training role completely. Most of these were placed under the command of the Second Panzer Army, which arrived in August 1943 from service on the Russian Front.

It should be noted that the majority of German occupation forces were leg-infantry divisions with minimal motorized transportation capability. In addition, much of the road network in the Balkans varied from primitive to non-existent, except in the few urbanized areas of the country. Most long-haul transportation was done by rail, which indeed was most of the justification for the continued German presence in the region –to protect the rail lines. Air support was minimal or non-existent – most air assets available to the German armed forces were allocated to the Russian Front, Italy or to the air defense of Germany. In the major anti-partisan offensives beginning in August 1943, 15 bombers and 15 ground attack aircraft were the total air assets available for German forces in the Balkans.

Three of the divisions assigned to Second *Panzer* Army in 1943 were composed of Croatian enlisted personnel and German NCOs and officers. Many of the other units were also non-German or included large numbers of non-Germans. They included Russians (the 1. *Kossak*

[53] The 41., 7. *Fallschirm*, and 5. *Gebirgs* divisions had all been transferred out of OB Southeast, the 22. Luftlande was garrisoning the island of Crete and controlled the smaller Aegean Island garrisons as well.

[54] The *Kossak* (Cossack) Division was formed from Soviet nationals who had volunteered to serve with the Germans against the Communist regime. Many of the NCOs were ethnic-German and most of the officers were German.

Division), Scandinavians (the *SS-Division Nederland*), ethnic-Germans from the Balkans and Hungary (the *SS-Gebirgsjäger-Division Prinz Eugen* and *SS-Kavallarie-Division Maria Theresa*) and ethnic-Moslems from Soviet territories (the 162. *Infantrie*-Division). Many of the missing-in-action reported by Second *Panzer* Army were quite likely deserters from these units.

German Use of Armor in Yugoslavia During World War II

During World War II the German Army made extensive use of armor in their attempt to suppress the Yugoslav Partisan insurgency. However, given the reality that they were simultaneously engaged in a huge, conventional, mechanized war with the Soviet Union and the Western Allies, the resources that were allocated to the anti-partisan war were a distinct hodgepodge. The armor units were no different; for the most part they were comprised of *ad hoc* provisional units and second line reserve and training units, equipped with *beutepanzer* (captured tanks – the literal translation is 'booty' armor).

The first armor forces committed by Germany in Yugoslavia were six provisional tank platoons formed by the occupation forces in June and July 1941. They were equipped with antiquated World War I-era designs – approximately 30 French Renault FT-17 light tanks that had been captured from the Yugoslav Royal Army. Five other platoons were formed in 1941 and were equipped with French Renault R-35 and Hotchkiss light tanks as well as FT-17 tanks.[55] The other five platoons were initially stationed in Greece, but apparently were employed in operations in the Balkans as well.[56] Other major tank units that fought in the anti-Partisan war in Yugoslavia included the following:

*Panzer Kompanie z.b.V.*12 (Armor Company for Special Duties 12) was organized in June 1941 and was also equipped with captured French tanks (albeit somewhat more modern designs), initially Hotchkiss light tanks and later a mixture of Renault R-35 light tanks and Somua S-35 medium tanks.[57] In April 1944 the company was reorganized and expanded – evidently it absorbed most of the independent tank platoons – to a full *Abteilung* (battalion) with four companies equipped with a mixture of French and Italian tanks. On 1 February 1945, after it was withdrawn from the Balkans, it was re-designated as *II./Panzer-Regiment Brandenburg* and was assigned to *Panzer-Grenadier-Division Brandenburg*.

I./Panzer-Regiment 202 was organized with three companies in February 1941 as part of a two-battalion regiment equipped with French S-35 medium and Hotchkiss light tanks. In September 1941 it was sent to Yugoslavia (the rest of the regiment remained in France). In January 1943 it was re-designated as *Panzer-Abteilung 202*. In February 1944 it was re-equipped with Italian Fiat M-15 tanks.[58]

SS-Panzer-Abteilung Prinz Eugen was originally organized in May 1942 as a separate company equipped with captured French Renault Char B-1 tanks, including some that had been

[55] The FT-17 weighed seven tons and normally mounted a single machine-gun. The R-35 weighed 10 tons and mounted a 37mm gun and a machine-gun. The Hotchkiss light tank was produced in three models, the H-35, H-38, and H39, which were the same basic vehicle with slight variations of engine and armament. They all weighed 12 tons and were equipped with a 37mm gun and a machine-gun. In German service the sub-models were not distinguished and they were simply identified as 'Hotchkiss' tanks. That format will be used in this analysis.

[56] By the 'Balkans' we include Yugoslavia (Slovenia, Croatia, and Serbia), Albania, Montenegro, and Salonika, as well as the parts of northern Greece bordering Albania and Montenegro.

[57] The S-35 weighed 20 tons and mounted a 47mm gun and a machine-gun.

[58] The M-15 weighed 14.7 tons and mounted a 47mm gun and three machine-guns.

modified to mount flame-throwers.[59] In October 1943 it was re-designated as *SS-Panzer-Abteilung* 5 and was re-equipped with Italian tanks. In June 1944 it was converted to a self-propelled antitank battalion and was again re-designated as *SS-Panzerjäger-Abteilung Skanderbeg*.

German Tank Strengths and Losses in Yugoslavia 1941-1945

Data on German tank strength and losses in Yugoslavia vary. On 6 April 1941 the German Army Group invading Yugoslavia included six panzer divisions with over 2,000 tanks. However, as the campaign in the Balkans and Greece concluded in late April, the bulk of the panzer forces were transferred to participate in the invasion of Russia that began on 22 June. By the end of June 1941 it appears that the only armor available to the German occupation forces in the Balkans were the 30-odd Renault *beutepanzer* of the provisional tank platoons that were forming.

On 15 October 1941, the German Twelfth Army reported the armor units and strengths available in the Balkans. *Panzer-Abteilung z.b.V* 12 had 45 Hotchkiss tanks and *I./Panzer-Regiment* 202 had 18 S-35 and 41 Hotchkiss tanks. An unknown number of these were probably undergoing repairs. The independent platoons had a total of 31 FT-17, 14 R-35, and 10 Hotchkiss light tanks, with 15 more FT-17 in platoons that were still forming and eight R-35 in base repair, a total of 78.[60] Thus, 182 tanks were available to German forces in the Balkans. On 10 December 1941, it was reported that a total of 78 *beutepanzer* were available. However, it appears that this report only included those tanks in the independent platoons. If true, that would indicate that the independent platoons had not lost any tanks up to December 1941.

However, complete data on tanks lost in the Balkans is scarce. Furthermore, the tanks reported lost in the Balkans were almost certainly total losses (the German term – *totalausfälle* – actually means 'total loss') and includes those vehicles destroyed, damaged beyond repair, and abandoned without subsequent recovery. But, given the German penchant for recovering all battle-damaged equipment, it is just as certain that the actual armor loss was much higher. Many vehicles 'in repair' were effectively not repairable (or would probably be considered to be 'not economically repairable' by most other nations). In general, it appears that only about 10 percent of the total German AFV 'loss' were counted as 'destroyed,' meaning that the total 'lost' would have been ten times higher.[61]

In 1942, *I./Panzer-Regiment* 202 reported two Hotchkiss lost to enemy action for the period 15 May to 15 June 1942. Personnel losses were one WIA and two MIA. It was also reported that the battalion was short a total of six Hotchkiss (presumably including the two lost) and two S-35s. Since the battalion had evidently arrived in the Balkans at full strength in September 1941 and was still at full strength in October 1941, then it appears that six tanks (four

[59] The Char B-1 weighed 32 tons (34 tons in the flame-thrower version) and mounted a 75mm howitzer (in the hull), a 47mm gun (in the turret), and a machine-gun.

[60] The number of independent platoons is difficult to establish. The organizational chart for 15 October 1941 shows eight platoons of four or five tanks each, and a 'half-platoon' of two tanks, as well as ten other 'temporary' platoons of two tanks each. Overall, it appears that there were seven platoons of FT-17 with three more forming, four platoons of R-35, and two platoons of Hotchkiss tanks in the independent tank platoons in the Balkans by the end of 1941.

[61] In comparison most other nations in World War II typically reported about 50 percent of their total AFV 'loss' as 'destroyed.'

Hotchkiss and two S-35) were lost between 15 October 1941 and 15 May 1942. Thus, over a period of seven months, the battalion lost an average of less than one tank per month.

Reports of *SS-Division-Prinz Eugen* and Partisan accounts both describe the loss of two Hotchkiss tanks during *Fall Weiss* I in February 1943. One was ditched during an unsuccessful German attack on 5 February and was captured and used by the Partisans, the other was destroyed in an action a few days later. Both of these were either from the independent platoons or from *I./Panzer-Regiment* 202, more likely the former.

On 31 May 1943, OB Southeast reported that *I./Panzer-Regiment* 202 had eight S-35 and 28 Hotchkiss tanks operational and eight S-35 and 13 Hotchkiss in repair. *Panzer-Kompanie z.b.V.* 12 had 21 S-35 and 30 Hotchkiss operational, one S-35 and 6 Hotchkiss in repair and four Hotchkiss in route as replacements. SS-Division *Prinz Eugen* had 16 Renault B-2 operational and two in repair. There was no report of tanks in separate tank platoons and it appears that all of the separate platoons had been disbanded, absorbed into the panzer battalions, or were utilized as *ad hoc* armored train cars. The 1. *Panzer-Division* was also stationed at this time in the northern Balkans, reorganizing after combat on the Russian Front. It had a total of 79 tanks operational with six in repair, but would only play a peripheral role in the anti-Partisan actions of that year. Thus, a total of 216 tanks were available to German forces in the Balkans.

On 20 November 1943, *SS-Division-Prinz Eugen* reported eight assault guns operational and one in repair.[62] They had evidently just arrived since, as late as 31 October, they were still being reported as 'in route' (an indication of the parlous state of the supply of German armored vehicles is that they were first reported as 'in route' to the division on 30 June 1943). On 30 November seven were operational and two were in repair. On 10 December six were operational and three were in repair with *Prinz Eugen.* In addition, two were reported operational and five in repair with the 100. *Jäger-Division*, which apparently had also just recently arrived (although this was the first report of assault guns with the 100. *Jäger-Division*, the division itself had actually arrived in the Balkans in August 1943). These numbers remained unchanged through the end of the year, when the available reports end. Also on 31 December 1943, *Panzer-Kompanie z.b.V.* 12 reported 12 Italian L6/47 assault guns operational and four in repair. Evidently this was soon after these vehicles were first issued, since they do not appear in earlier reports.

Five months, later, on 31 May 1944, OB Southeast reported the following availability of German tanks in units under its command.[63] Nineteen Pz-II, 12 Pz-III, 25 Pz-IV, and 165 assault guns were operational, nine Pz-II and 47 assault guns were in repair. Thus, 56 tanks and 165 assault guns were available to German forces in the Balkans. Unfortunately, these reports do not account for the *beutepanzer* in the Balkans of which there was probably still a fairly large number.[64]

On 1 September 1944, *Panzer-Abteilung z.b.V.* 12 had 94 tanks on hand. The assortment included 20 Italian M-15 tanks and nine L6/47 assault guns and 11 French R-35 and 21 Hotchkiss operational. Nine M-15, three L6/47, one R-35, and four Hotchkiss were in short-term

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[62] The reports of assault guns strength in the Wehrmacht from 14 April 1943 to 3 January 1944 may be found in NARA RG242, T78, R620, F0093~.

[63] The Office of the Inspector General of Armored Troops collected these reports by theater and unit every ten days. They give the total number operational, in repair and in route to the theater (BAMA RH10/352 and NARA RG242, T78, R620). The reports were also summarized bimonthly in reports of the Quartermaster General of the General Staff of the Army (NARA RG242, T78, R725).

[64] It appears that by this time all of the remaining obsolete FT-17 tanks had been either retired or mounted on railway flatcars as *ad hoc* armored train cars.

repair. Five M-15, three L6/47, four R-35, and four Hotchkiss were in long term repair. *Panzer-Abteilung* 202 had 36 Italian M-15 tanks operational, six in short-term, and seven in long term repair. In addition, on 15 September it was reported that there were four Pz-II, three Pz-III, 15 Pz-IV, and 78 assault guns operational in the Balkans, with 11 assault guns in repair. Thus, about 150 tanks and 104 assault guns were available in the Balkans during September 1944.

One month later, on 1 October 1944, *Panzer-Abteilung z.b.V.* 12 had 82 tanks and assault guns on hand. Thirty-three M-15, 18 Hotchkiss, six R-35, and four L6/47 were operational, five M-15, one R-35, and two L6/47 were in short term repair, and five M-15, one Hotchkiss, four R-35, and 3 L6/47 were in long term repair. *Panzer-Abteilung* 202 had 28 M-15 tanks operational and 9 in short-term repair (it was noted that none had been lost, so it must be assumed that five more had gone into long-term repair). On 30 September it was also reported that four Pz-II, 14 Pz-IV and 37 assault guns were operational in the Balkans, with 10 more assault guns in repair. Thus, about 133 tanks and 56 assault guns were available in the Balkans during October 1944.

The battalion monthly reports for *I./Panzer-Regiment* 202 and *Panzer-Abteilung z.b.V.* 12 for the period after October 1944 have not been found. However, the bimonthly theater reports for the number of German tanks and assault guns do still exist in part. On 31 October 1944 it was reported that there were no German tanks available, but 54 assault guns were operational and 14 were in repair. On 15 November 1944, there were 18 Pz-III, 8 Pz-IV and 40 assault guns operational, and one Pz-IV and 16 assault guns in repair. On 30 November there were only three Pz-II reported operational and two in repair, with 35 assault guns operational and nine in repair. On 15 December 1944 there were no tanks available, and 15 assault guns operational and 13 in repair. On 30 December 1944 there were no tanks available, 16 assault guns operational, and eight in repair. On 15 January 1945 there were still no tanks available, 17 assault guns operational and eight in repair. On 15 March 1945, there were five Pz-II, 31 Pz-III, and 9 Pz-IV operational and seven Pz-III and one Pz-IV in repair and 13 Italian L6/47 and 16 German assault guns were operational and nine L6/47 were in repair.[65] Finally, in the last report available, on 15 April 1945 there were no tanks with OB Southeast, but there were 34 assault guns operational and 10 in repair.

The losses of German tanks in OB Southeast are better documented for December 1943 to December 1944.[66] Unfortunately, the reports only include the losses of German vehicles; *beutepanzer* losses are not included. From December 1943 through March 1944 no tanks and only three assault guns were lost. However, a large number of other lightly armored vehicles were lost, an indication of the intense anti-Partisan operations that the Second Panzer Army was engaged in at the time (see below for an analysis of the personnel casualties during this period). Three full-track, lightly armored, self-propelled antitank guns (*Pak 7.62cm auf Pz. 38 (t)*), three machine-gun-armed light armored cars, one 75mm infantry gun-armed light armored car, 84 light armored half-tracks,[67] 381 medium armored half-tracks,[68] and four full-track armored ammunition carriers were lost. In April 1944 two Pz-III, 20 Pz-IV, and one assault gun were

[65] As an example of the vagaries of the theater reports, all of the German assault guns were part of the garrison of the Aegean Islands and were not actually present in the Balkans.
[66] NARA RG242, T78, R145, F5886~.
[67] The light half-tracks included 59 general-purpose variants armed with machine-guns, 16 reconnaissance variants armed with 20mm guns, and nine support variants armed with 37mm antitank guns.
[68] The medium half-tracks included 312 general purpose variants armed with machine-guns, 55 support variants armed with 75mm infantry guns, 11 close assault variants armed with twin flame-throwers, and three support variants armed with 37mm antitank guns.

recorded as lost, but the losses of lightly armored vehicles dropped precipitously, to just 14 of all types (seven SP antitank guns, two light armored cars, four light half-tracks, and one medium half-track). In May 1944 only one (47mm) SP antitank gun and one light armored car (20mm-armed) were lost. In June 1944 the numbers climbed again, one assault gun, 14 light armored cars (nine with 20mm guns), 11 heavy armored cars (five 20mm-armed, nine 75mm-armed, and three radio vehicles), and one light half-track were lost. The only other losses recorded up to the end of November 1944 were one 20mm-armed heavy armored car and one light half-track, both of which were lost in September.

Finally, a few consolidated reports of losses exist for *beutepanzer* from September 1944 to February 1945. Unfortunately, these reports were for the Wehrmacht as a whole, rather than just OB Southeast In the reports, 115 French tanks (probably 101 Hotchkiss or FT-17 and 14 S-35 or B-2) and 55 Italian M-15 tanks or L6/47 assault guns were listed as lost in September. There was no report of *beutepanzer* losses for October 1944.

During this period, 30 August to 2 November, the German garrisons in the Aegean and Greece began to withdraw to Germany, including *Panzer-Abteilung* 212, one of the last major users of the French *beutepanzer*.[69] Most of the personnel of the battalion (four officers, four civilian technicians, 77 NCOs, and 155 men, only five officers – including the battalion commander and the battalion executive officer – 38 NCOs, and 99 men, remained on Crete with 129 Italian 'volunteers') were evacuated by air from Crete by 6 October. However, all of the German (three Pz-I, 10 Pz-II, six Pz-III, and 10 Pz-IV) and French (five S-35 and 15 Hotchkiss) tanks were left behind with the remaining garrison of the Greek Islands.[70] It appears likely that many of the *beutepanzer* 'lost' were simply abandoned as the German garrisons also began to retreat from Bulgaria (which declared war on Germany on 8 September), Serbia, and Macedonia into western Croatia and Slovenia during October and November 1944.

Twenty-two more French tanks (probably 20 Hotchkiss or FT-17 and two S-35 or B-2) and one Italian M-15 or L6/47 were lost in November 1944.[71] Only one Italian armored car was lost in December 1944. Seven more Italian armored cars and seven M-15 or L6/47 were lost in January 1945. No *beutepanzer* losses were recorded for February 1945 when the records cease.

Some reports of the strength of light armored vehicles (wheeled armored cars and half-track armored personnel carriers) in OB Southeast also exist. On 31 May 1944 the light armored vehicles available included 119 armored cars, 40 light half-tracks, and 12 medium half-tracks operational and 40 armored cars, 12 light half-tracks, and one medium half-track in repair. On 31 July there were 133 armored cars, 26 light half-tracks, and 13 medium half-tracks operational and 51 armored cars, 22 light half-tracks, and one medium half-track in repair. On 31 October there were only 32 armored cars, three light half-tracks, and no medium half-tracks operational and 11 armored cars and five light half-tracks in repair. On 30 November there were 28 armored cars and eight light half-tracks operational and eight armored cars and two light half-tracks in

[69] The other major French *beutepanzer* users (not including those in the Balkans) were *Panzer-Abteilung* 205 and 206, of which 206 had been destroyed in Normandy in June 1944 and 205 had lost all of its vehicles in the retreat from France in August 1944. It is very likely that most of the losses counted in October include these two units, which totaled 10 B-2, 20 S-35, and 56 Hotchkiss.

[70] Amendment to the situation report of *Panzer-Abteilung* 212 for August 1944. NARA RG242, T78, R616, F0001~.

[71] These reports only specify the weapon lost, not the vehicle and, since different vehicles were armed with the same weapon, some assumptions must be made regarding which vehicle was actually lost. It is barely possible that the '2cm Kw.K. (i)' lost in December and January were mounted in Italian CV-35 tankettes, but it appears unlikely given the relative numbers employed by the Germans.

repair. On 30 December there were 32 armored cars, seven light half-tracks, and one medium half-track operational and 13 armored cars and one medium half-track in repair.

Partisan Armored Forces

In late 1944 as the intensity of the fighting in Yugoslavia increased (and assumed more and more of the characteristics of conventional conflict, rather than an insurgency), the Yugoslavian Partisans – with the assistance of the Western Allies and Soviets – deployed two tank brigades against the Germans.

The first was formed in Carovigno Italy in early 1944 as a motorized infantry battalion. Most of the personnel were Croatian and Slovenes liberated from Italian PW camps. From March to May 1944 the battalion was moved to Egypt where Canadians of Yugoslav origin trained it and by British officers. On 16 July 1944 the battalion was expanded to a brigade of 2,003 men and moved back to Italy where they received American-manufactured M-3 Light Tanks. The brigade was organized with three two-company tank battalions, a mechanized battalion, and service units. It had 56 M-3 tanks and 24 armored half-tracks and scout cars.

The 1st Tank Brigade was initially deployed to protect Tito's headquarters on Vis at the beginning of September 1944. Elements were landed on the mainland during the night of 23/24 November and took part in actions around Knin at the end of the month. The detachment lost four of 25 tanks and one of 11 armored vehicles deployed in the battle. A second detachment was also landed at Dubrovnik and participated in battles around Mostar in November and December 1944. In March 1945 the brigade expanded, forming a fourth, independent tank battalion, for a total of 75 M-3 Light Tanks. At least seven of the tanks were modified as SP antitank vehicles, mounting captured German 75mm guns, as SP AA vehicles, mounting captured German quad-20mm AA guns, or carriers for the Soviet supplied 82mm mortar.

From 20 March 1945 the 1st Tank Brigade was part of the Fourth Yugoslav Army. It participated in the final battles against the Germans in Yugoslavia and participated in the capture of Trieste at the end of April 1945.

The brigade suffered total losses of 93 KIA and 195 WIA. It lost 33 tanks destroyed and 31 damaged, five other armored vehicles were destroyed and two were damaged.

The 2nd Yugoslav Tank Brigade was organized from the training cadre of the 1st Brigade (about 600 men) which was transferred to Tula in the USSR in early 1945. The brigade was formed on 8 March 1945 and was organized as a Soviet Army Tank Brigade with three, two-company tank battalions, a support company, workshop company, and an antiaircraft battery. It had 1,150 men, 65 T-34/85 medium tanks, and 3 BA-64 armored cars.

On 12 April 1945 the 2nd Brigade, as part of the First Yugoslav Army, participated in the offensive that liberated Vukovar and Vinkovci. Fourteen T-34/85 tanks and one BA-64 were destroyed and nine tanks were damaged. At the end of the war the 2nd Brigade joined the 1st Brigade at Trieste.[72]

German Casualties in the Balkans

The personnel records for German forces in the Balkans in World War II are fairly complete. (See above for the casualties reported in the initial invasion.) The reports include personnel casualties for the occupation forces for every ten-day period from 22 June to 20 December 1941. Irregular periodic casualty reports of the German occupation forces in the

[72] Ivan Bajlo, *ibid.*

Balkans and Greece from 15 January to 21 October 1942 and 20 January to 28 February 1943 are also extant. Finally, ten-day reports for the Second *Panzer* Army from September 1943 when it began anti-Partisan operation in the Balkans under command of AG F, to December 1944 when it was reassigned to the direct control of OKH are available.[73] From these reports it is possible to recreate the greater part of the German loss experience in anti-partisan operations in the Balkans.

The initial German casualties, incurred in the invasion of Yugoslavia and Greece between 6 and 27 April 1941 were 932 KIA, 3,773 WIA, and 257 MIA.[74] Then from 28 April to 22 June the occupation forces recorded no casualties. However, severe losses were incurred in the airborne assault on the island of Crete (20 – 31 May 1941). German losses were: *Luftwaffe* 1,032 KIA, 1,632 WIA, 2,097 MIA; Army (5. *Gebirgs-Division*) 321 KIA, 488 WIA, 324 MIA. The 5,894 lost in the battle for Crete accounted for 54.29 percent of the Germans total loss in the campaign.[75]

From 22 June to 31 August 1941 German casualties were 67 KIA and 112 WIA, and average of just over 2.6 casualties per day. During this period popular uprisings erupted sporadically in areas occupied by the Axis forces – 7 July in Serbia, 13 July in Montenegro, 22 July in Slovenia, and 27 July in Croatia, Bosnia, and Herzegovina. All of these uprisings were suppressed with savage force. However, by early September 1941 the Partisan movement had taken strong hold in western Serbia and established its headquarters in Uzice (thus it was known as the 'Uzice Republic'). The first major German anti-Partisan offensive, spearheaded by the 342. *Infanterie-Division* drawn from France, was directed against the Uzice Republic and lasted from about 1 September 1941 to 20 December 1941. On 29 November the Germans captured Uzice, and the Partisans withdrew to northeastern Montenegro and then to eastern Bosnia. German casualties totaled 149 KIA, 325 WIA, and 194 MIA, an increase to an average of nearly six casualties per day.

After a short lull the German offensive resumed. From 15 to 29 January 1942 the 342. and 718. Divisions, reinforced by Croatian troops, attacked Partisan positions in Bosnia. They lost 25 KIA, 131 WIA and 1 MIA (about 10.5 casualties per day), but again forced the Partisans to retreat, this time further south to Foca. Secondary operations in Bosnia continued from 16 February to 20 March, resulting in another 37 KIA, 67 WIA, and 45 MIA (about 4.5 casualties per day).

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[73] From December 1941 OKH was assigned responsibility for all of the forces fighting on the Eastern Front against the Soviet Union. The casualty reports for 22 June to 20 December 1941 and 15 January to 21 October 1942 may be found in the records of the Twelfth Army, *Tätigkeitsberichte* (Activity reports) in NARA RG242, T312, R462, F0379-0402 and R465, F3239~, R466, and R467, ~F3707. Second Panzer Army losses may be found in T313, R196, F2602~. Losses by theater and army from 10 July 1943 to the end of the war may also be found in NARA RG 242, T78, R414, *Der Heeresartz im Oberkommando des Heeres* (Surgeon General of the High Command of the Army).

[74] This total includes the reported losses of the Second and Twelfth Army. A later report of the Twelfth Army appears to contradict its earlier figures, however the increase was apparently caused by adding the losses of the 5. *Gebirgs-Division* on Crete.

[75] Many different counts of German losses exist and there is some dispute as to exactly how many were suffered in the assault on Crete. The figures given here are from an analysis of the operations of the Twelfth Army prepared for the German Army General Staff and may be found in NARA RG242, T312, R469, F8671 and F8681. It appears that the *Luftwaffe* losses on Crete include flying personnel as well as the parachute infantry (who were part of the *Luftwaffe* rather than the *Heer*). Christopher Shores, *et al, Air War for Yugoslavia, Greece and Crete 1940-41* (Grub Street: London, 1987) state that *Luftwaffe* aircrew losses were 75 KIA, 127 WIA, and 236 MIA.

Then, from 21 March to 21 October 1942, the Germans and their Allies continued to harry the Partisans, driving them from one enclave to another. Although the Partisans had some successes, usually against the German Croatian, Bulgarian, or Italian Allies, they continued to suffer heavy casualties. Partisan losses for 1942 have been estimated as 24,700 KIA, 31,200 MIA (including 4,194 DOW), and 6,300 MIA. The Germans also reported counting 45,692 Partisans or suspected Partisans killed (including executed prisoners) from 22 June 1941 to 23 July 1942.[76] German losses to the end of the year were 295 KIA, 596 WIA, and 45 MIA, for a total of 320 KIA, 727 WIA, and 46 MIA for the year. German casualties in anti-Partisan operations through the end of 1942 were 573 KIA, 1,231 WIA, and 291 MIA, a pinprick compared to the losses on the Eastern Front (according to different sources, the *Wehrmacht* KIA on the Eastern Front, through the end of summer 1942, were between 376,290 and 501,884).[77]

Another short lull occurred as both the Partisans and the Axis forces paused to recover and consolidate. Then, from 20 January to 28 February 1943, the Germans began an all-out effort to eliminate the Partisan forces in *Fall Weiss I*. Four German and Allied *divisions (SS-Prinz Eugen*, 369. Croat, 717., and 718.), with the support of the two available armored battalions in the Balkans, seized Partisan positions in western Bosnia and Croatia, and forced the partisans to withdraw south again to Montenegro. German losses were 385 KIA, 1,001 WIA, and 102 MIA, a major increase (an average of 39.7 casualties per day) over similar periods in 1942.

Casualties for the period from 1 March to 1 September 1943 have not been discovered. However, it is possible to derive a reasonable estimate of what those casualties must have been by subtracting the total known losses suffered by OB-Southeast (AG E) in the Balkans as of 28 February 1943 (2,211 KIA, 6,493 WIA, 974 MIA) from the losses of AG E as given up to 31 October 1943 (2,775 KIA, 7,067 WIA, and 1,938 MIA and another 15 KIA and 74 WIA in the recapture of Cos and Samos in October). The result – 549 KIA, 500 WIA, and 964 MIA for an aggregate total of 2,013 – is probably close to the actual losses incurred. Given that *Fall Weiss* 1 was immediately followed by *Weiss* 2 and *Schwartz* (Black), which lasted until the end of June, an additional 2,000 or more casualties could easily have been incurred at only one-half of the daily average rate found in *Weiss* 1 (39.7 casualties per day over 122 days would have been over 4,800 casualties). However, the distribution of the KIA, WIA, and MIA is more difficult to explain, but is likely a result of various casualty recalculations and redistributions that were a normal part of the statistical compilations of the *Wehrmacht*, as well as the brutal nature of the anti-Partisan war itself.

In any case, it appears that the first eight months of 1943 represented a major increase in the German casualties in the Balkans. After losing fewer than 3,700 men in the 16 months of anti-Partisan operations from the end of June 1941 to the end of October 1942, the Germans lost nearly the same number of casualties (3,590) in the first eight months of 1943. However, the intensity of the Partisan War in the Balkans had only begun to increase.

In September 1943 the Second Panzer Army took over command of anti-Partisan operations in the Balkans. Intense fighting occurred during September and October, especially after the capitulation of Italian forces to the Allies on 8 September 1943. German, Bulgarian and Croatian forces took over the former Italian territories in the Balkans. Some of the Italian forces

[76] NARA RG242, T312, R465, F3379.

[77] See NARA RG242, T77, R826, F2114~, *Zentralststistik der Menschenverluste im Kriege*, 30 August 1944, which compares the KIA figures accumulated by the *Heeresartz* versus those of the *Wehrersatzdienststellen* (Military Replacement Office).

went over to the Partisans and some went over to the Axis, but the majority was disarmed and interned by the Germans, most of those who resisted disarmament were executed. By the end of the year the German Second Panzer Army had incurred a further 1,622 KIA, 4,807 WIA, and 928 MIA, doubling the losses of the first eight months of 1943 in just four months at the end of the year. Units under the direct command of AG F lost an additional 6 KIA, 20 WIA, and 8 MIA. Partisan losses for 1943 were 48,378 KIA, 61,730 WIA (including 7,923 DOW) and 5,423 MIA.

The intensity of operations remained high in the early part of 1944. From 1 January to 20 May the losses of the Second Panzer Army were 1,899 KIA, 5,218 WIA, and 3,985 MIA. Units under AG F lost 145 KIA, 276 WIA, and 43 MIA in the same period. Then, the last major German attempt to crush the Partisans occurred on 25-27 May 1944 when a combined airborne and armored assault, code-named *Fall Rösselsprung* (Operation Knight's Move) was directed on the village of Drvar. The Germans were attempting to decapitate the Partisan command by capturing or killing Tito (Josip Broz) the commander of the General Staff of the National Liberation Partisan Detachments of Yugoslavia. The total of the Second Panzer Army losses in the operation, its preliminaries and aftermath (the period from 21 May to 10 June) were 620 KIA, 1,869 WIA, and 285 MIA. Partisan casualties are unknown, but were severe as well. However, Tito made good his escape and established a new headquarters on the island of Vis in the Adriatic Sea. Losses in AG F units were 30 KIA, 74 WIA, and 6 MIA.

From 11 June to 30 November 1944, when the German Second Panzer Army was transferred from the command of OB Southeast and AG F to OKH and AG XXXX, it lost an additional 2,384 KIA, 8,181 WIA, and 3,110 MIA in battles with the Partisans. AG F losses from 11 June to the end of 1944 were 377 KIA, 1,193 WIA, and 554 MIA. Losses suffered by AG E in the withdrawal from Greece, 1 October to 31 December 1944 were 2,876 KIA, 9,637 WIA, and 3,823 MIA.[78] Overall, it appears that the German losses in the anti-Partisan War in the Balkans in 1944 were 8,331 KIA, 26,448 WIA, and 11,806 MIA. Partisan losses for the year were 80,650 KIA, 147,650 WIA (including 8,066 DOW), and 5,600 MIA.

German losses in OB Southeast from 1 January to 20 April 1945 were 5,678 KIA, 20,110 WIA, and 8,638 MIA. Partisan losses in 1945 were 72,925 KIA, 130,000 WIA (including 7,800 DOW), and 7,800 MIA. However, it may be correct to say that the Partisan War in the Balkans ceased to be an insurgency sometime in September and October of 1944. From that time it assumed more and more of the attributes of a conventional conflict – indeed, in November 1944 the Partisans fielded the first of two armored brigades against the Germans (see above).

Consolidated reports on German losses in the Balkans from April 1941 to May 1945 may also be found. One states that casualties in the Balkans from the invasion of Yugoslavia to the end of the war included 24,267 KIA, and 12,050 MIA.[79] Another (found in the same document) states that casualties in OB Southeast (*i.e.*, the Balkans including Greece) were 19,235 KIA, 55,069 WIA, and 14,805 MIA for a total of 89,109.[80] No reason was given for the discrepancy between these two figures. However, the *Heeresartz* made a more precise count, reporting that as of 20 April

[78] Overall losses of AG E in the occupation of Greece, Crete, and the Aegean Islands are difficult to assess since they overlap in part with the losses incurred in the Balkans prior to 31 October 1943. However, from 31 October 1943 to 30 September 1944 they were 1,932 KIA, 4,414 WIA, and 1,671 MIA. It appears likely that these include the losses incurred in retaking the island of Leros from the British and Italians in November 1943 – 242 KIA, 660 WIA, and 155 MIA.

[79] Major Percy Schramm, *Foreign Military Studies, MS# P-011, German Statistical Systems*, (Historical Division: HQ US Army, Europe, ND). p.118

[80] *Ibid*., p. 131.

1945, a total of 22,370 KIA, 70,064 WIA, and 24,620 MIA (a total of 117,054) had been lost in OB Southeast. That would mean that the 43,422 casualties incurred by the Second Panzer Army from 1 September 1943 to 30 November 1944 accounted for 34 percent of all of the casualties incurred by OB Southeast for the entire war.

APPENDIX VIII. THE USE OF ARMOR IN VIETNAM

Curiously, it appears that there is much less known about the loss experience of the US Army and Marine Corps and Army of the Republic of Vietnam armor units, than there is of the losses of German Army armor units in the Balkans. This may partly be due to the general reluctance by US military and political leaders to commit armor units to Vietnam, especially in the early years of the conflict. It is notable that the first commitment of armor to Vietnam by US forces – the US Marine Corps tanks that landed with the 9th Marine Expeditionary Brigade at Da Nang on 9 March 1965 – was a mistake. The Military Assistance Command Vietnam (MACV), which had requested the Marine reinforcement, was unaware that the Marines Table of Equipment (TE) included heavy armor (M-48A3 MBTs). However, the Marine Corps tanks proved to be of value almost immediately. By mid August 1965 the entire 3rd Marine Tank Battalion was in place in Vietnam and in Operation STARLITE it supported an attack on Viet Cong positions. Three Marine infantry battalions, each supported by a tank platoon, inflicted casualties of over 700 killed on the Viet Cong. Seven tanks were damaged, one so badly that it was destroyed in place by a Marine demolition team.[81]

At the same time the US Army was still agonizing over whether or not they should deploy tanks in the 'jungle' of Vietnam. In discussing the deployment of the 1st Infantry Division to Vietnam on 3 July 1965, Army Chief of Staff General Harold K. Johnson overruled a proposal that one of the divisions' two tank battalions be retained. He then went on to say that the divisional cavalry could keep its M-48 tanks to test the effectiveness of armor in Vietnam. General William Westmoreland, MACV commander, probably typified the viewpoint held by the Army when he agreed with General Johnson, saying that "except for a few coastal areas, most notably in the I Corps area, Vietnam is no place for either tank or mechanized infantry units."[82] The prejudice against armor was so pervasive that even mechanized infantry units were reconfigured as 'leg'-infantry and were deprived of their M-113 armored personnel carriers (APCs).

The first engagement of US Army armored forces in Vietnam was at Ap Bau Bang on 11-12 November 1965. M-113 APCs of A/1-4 Cavalry, along with the dismounted infantry of A/2-2 Mech, and the artillerymen of C/2-33 Artillery of the 1st Division were attacked in their defensive positions by Viet Cong forces. The firepower and mobility of the APCs proved decisive in beating back the attackers. Troop A lost seven KIA, 35 WIA, five APCs destroyed (two M-113 and three M-106 mortar carriers), and three M-113 damaged. Perhaps coincidentally, the only other loss was two artillerymen KIA and four WIA when the infantry line was penetrated.

It wasn't until 1967 that a complete terrain analysis of Vietnam, titled *Mechanized and Armor Combat Operations, Vietnam*, challenged the accepted view of armor in Vietnam. The analysis rated 46 percent of the country as a whole accessible year round to armored vehicles and over 80 percent of the coastal plain, piedmont, and central plateau regions as accessible year round. The study also found that tanks could maneuver in 61 percent of the country during the

[81] General Donn A. Starry, *Armoured Combat in Vietnam* (Blandford Press: Dorset, England, 1981), p. 54.

[82] Starry, p.56. Also, Simon Dunstan, *Vietnam Tracks* (Arms and Armour Press: London, 1982), p. 62, quotes the US Ambassador of Vietnam at the time saying that tanks were "not appropriate for counter-insurgency operations."

dry season and 46 percent during the wet season, while APCs could maneuver freely over 65 percent of the country year round.[83] But, this study simply confirmed what the troops in the field had already learned, the mobile firepower of tanks and APCs, when properly supported, gave US forces a decisive edge against lightly equipped Viet Cong and North Vietnamese Army forces.

[83] Starry, p. 10.

APPENDIX IX. USER COMMENTS ON THE USE OF LIGHT ARMOR IN CONVENTIONAL CONFLICTS

The following comments were extracted from the records of the Armored Fighting Vehicle and Weapons (AFV&W) Section, US Army Forces, European Theater (USAFET) and the Armor Section, 12th US Army Group. The extracts retain the original format of the reports.[84]

Comments on the relative merit of guns versus armor and the effectiveness of light tanks.

6 October 1944
Subject: Visit to XII Corps Armored Units.
7. a. We visited Lt Col Abrams,[85] C.O. 37th Tank Bn, 4th A.D. on 3 October. Col. Abrams stated that his battalion thought very highly of the 76mm gun. They felt the HE was as good or better than the 75mm and apparently had more blast effect…
b. Col Abrams does not believe in using extra sand bags on the front of tanks and carries extra track blocks for use as spares only…
9. a. Visited Lt Col F.M. Kroschel, C.O., 737th Tank Bn, on 4 October.
d. …He complained of lack of time for rest and maintenance. The Infantry C.O. does not realize the amount of time required for maintenance of armored vehicles…
f. … ***He felt that light tanks were not much use to the infantry as they could not take the slugging that they had to take as they were too thinly armored.***
h. …He would like to have additional 105mm How tanks with power traverse and stabilizer to replace 75mm gun tanks up to one company in the Battalion.

10 October 1944
Subject: Visit to Ninth Army Armored Units.
2. Tactical employment of separate tank battalions:
d. Light tanks have been used in much the same manner as medium tanks and with the same mission…
2. [sic] Weapons and Gunnery.
a. The 105mm tank is well liked for its fire power. Battalion C.O. 741st Tank Battalion would like one platoon per company (with power traverse)…

14 October 1944
Subject: Visit to Armored Units XII Corps.
2. Organization. The 6th Armored Division likes the organization of the division generally but have the following suggestions.
a. More armored infantry is desired in the Armored Division…
3. Equipment.

[84] NARA RG331, Armored Section 12 AG, Special Staff Correspondence File, Box 1 and 2, Executive Branch Correspondence File, Box 3 and 16, and RG492, USAFET, AFV&W Section, Box 8.
[85] Creighton Williams Abrams, Jr. (1914-1974), later General and Chief of Staff of the Army.

a. *The 6th Armored Division has received no 76mm tanks and have no great desire for them…*

b. The 105mm tank is liked very much. Would like them in proportion of one platoon per medium tank company.

c. The M24 light tank is wanted at the earliest possible date.

4. Tactics…

a. SOP to always attach a company of TDs to each combat command. Never send infantry in without close TD support. This support makes the 57mm AT gun unnecessary.

11. 702nd Tank Battalion attached to 80th Infantry Division.

12. Organization.

a. Battalion does not use the light tank company on normal missions because the gun is too light and armor too thin. Would recommend changing light tank company to self-propelled 90mm gun or 105mm Howitzer tank.

24 October 1944

Subject: Visit to Armored Units of the XX Corps.

3. 735th & 712th Tank Battalions.

d. Light Tank Company. – Co, 735th Tank Battalion feels that the Light Tank Co has very little application in support of infantry divisions and that in the interest of simplifying the Separate Battalion organization the Light Tank Company could well be omitted. CO, 712th Tank Battalion has found the Light Tank Company extremely useful on special missions, particularly for pursuit, and would be reluctant to give it up.

7 December 1944

Subject: Visit to Ninth Army Area.

4. Tanks: Tank units [743rd and 747th Tank Battalions] have lost confidence in the 75mm tank gun as it cannot do the job it is called upon to do. ***Among tank requirements, the gun comes first. Tankers desperately desire a gun capable of knocking out enemy tanks and bunkers. Armor protection is secondary but is considered of far more importance than was formerly the case. All other considerations are minor and are considered as mere refinements and gadgetry.*** *The M4A3E2 is very well liked and the two battalions prefer to be equipped 100 percent with this tank. The 76mm should be standard with this tank. Neither battalion now has any 76mm guns.*

9. Added protection by tracks: The 747th has tested steel track lengths fastened on the front and sides of tanks and found that this expedient protects the tank against bazooka fire. Rubber tracks were also tried and found to be not nearly so effective.

1 February 1945

Subject: Visit to Armored Units XX and XII Corps.

2.d. The [778th] battalion has mostly M4A3 tanks. It has 9 76mm tanks and 4 M4A3E2 Assault Tanks. The M4A3E2 tanks are liked by the Bn for their armor protection…The battalion likes the 76mm over the 75mm especially in attacking concrete pill boxes. ***The Bn Commander would prefer to have a medium tank company instead of the present light company.***

6.d. The [737th] Battalion has 39 medium tanks of which three were M4A3E2. ***This tank has been the most satisfactory for their type of combat but needs a heavier gun. Would prefer 90mm.***

13 February 1945
Subject: Visit to Armored Units.
2. 6th Armored Division.

a. *Equipment: -* ***Present tanks are entirely unsatisfactory, due to lack of a satisfactory gun and lack of flotation.***

Another revealing set of comments – this time alluding to the utility of wheeled armored vehicles – may be found in a series of correspondence between the Ordnance Officer of the First US Army, the Ordnance Section US 12th Army Group, and the AFV&W Section ETOUSA beginning on 27 February 1945.

27 February 1945
From: HQ First US Army, Office of the Ordnance Officer
To: Chief Ordnance Officer, Hq ETOUSA
Subject: Tank Light M5A1
3. Consideration is currently being given to a substitution of 3 Light Tanks, M5A1 for 3 Car Armored Light M8 in each Cavalry Reconnaissance Troop.

The evident rationale for this request was that the M-8 Armored Car, a wheeled vehicle, had insufficient cross-country mobility. It was intended that the M5A1 tanks would be modified as reconnaissance vehicles by removal of the turret, which would lighten the vehicle and improve its flotation and mobility. Although the idea received endorsement by the Armored Section of 12th Army Group it was never implemented due to the end of the war in Europe. This idea is also mentioned in a report of a visit to the 11th Armored Division by members of the Armored Section 12th Army Group on 15 February 1945.

APPENDIX X. LOSS DATA FOR AFVS IN CONVENTIONAL CONFLICT

The following two sets of data present similar strength and loss data for different types of armored vehicles in World War II. Both were drawn from the records of the AFV&W Section, US Army Forces, European Theater (USAFET – also known as European Theater of Operations, US Army, ETOUSA).[86]

The first set is titled **Monthly ETO Loss Reports of AFVs by Type**. These were completed on a monthly basis from the 20th of one month to the 20th of the next (but the first period was 6 to 20 June 1944). It does not appear that the reports were prepared after 20 February 1945, and for the period 20 January to 20 February 1945 no entries were made for M4 75mm & 76mm medium tanks or M-20 Armored Utility Cars. The entry for 'Total Loss Reported 6 Jun 44-12 May 45' was extracted from the second set of reports and was unavailable for all items of equipment.

The second set of reports is titled **Periodic Tank Losses in the ETO**. These were actually in two parts, the first of which gave daily operational AFV strengths by army and unit for the US First, Third, and Ninth Army, from 2 July 1944 to 8 May 1945.[87] The second part of the reports gave operational losses – nominally by week, but the period actually varied from four to 26 days – by army for the period. It should be noted that these losses were 'totally destroyed' and do not include damaged vehicles.[88]

[86] NARA RG492, USAFET, AFV&W Section, Box 8 and 16.

[87] Not all armies reported on every day, there are many missing days in July, and the Third Army only reported irregularly in August. The US Fifteenth Army is not included in our analysis, since they did not incur any armor loss in their short operational history.

[88] See ETOUSA Outgoing Classified Message, dated Sept 201023Z '44, from Lee (MG J. C. H. Lee, commander of COM-Z) signed Eisenhower, to AGWAR (Adjutant General's Office, War Department), which explicitly states that, *"Tanks reported on the material status report as losses are total loss, and none can be reclaimed."* However, some later loss reports do seem to indicate that occasionally tanks reported as losses were later recovered and may have been repaired.

APPENDIX XI. US MARINE CORPS VEHICLE LOSSES

The following three tables show the vehicle losses of the 3rd Marine Division Fleet Marine Force (-) (REIN) during the course of a year in Vietnam (July 1968 to June 1969). They are derived from the monthly Command Chronologies of the 3rd Marine Division kept on file by the USMC History and Museums Division at the Washington Navy Yard, Washington, DC.

APPENDIX XII. ARMOR TRAFFICABILITY MAPS, VIETNAM

These are reproductions of the maps found in the US Army terrain analysis done in 1967, titled *Mechanized and Armor Combat Operations, Vietnam*, as found in General Donn A. Starry's *Armoured Combat in Vietnam* (Blandford Press: Dorset, England, 1981), pages 8, 11 and 13.